Department of M.Sc. MATHEMATICS

Semester	Components of Study	Course Code	Title of the Course	No of Credits	No of Hours	Practical Project	Internal Assessme	Semester End Exams	Total
SEMESTER - I	Core	MAT 15051	Algebra	4	6		25	75	100
		MAT 15052	Real Analysis	4	6		25	75	100
		MAT 15053	Ordinary Differential Equations	4	6		25	75	100
	Internal Elective	MAT 15054	(A) Numerical Methods (B) Finite Element Method (C) Fuzzy Sets & Fuzzy Logic	4	6		25	75	100
		MAT 15055	Complex Analysis	4	6		25	75	100
		MAT 15056	Practical -1(Problem Solving)	4		16		100	100
			SUB TOTAL	**24**	**30**	**16**	**125**	**475**	**600**
SEMESTER - II	Core	MAT 25051	Topology	4	6		25	75	100
		MAT 25052	Galois Theory	4	6		25	75	100
		MAT 25053	Partial Differential Equations	4	6		25	75	100
	Open Elective	MAT 25054	(A)Business Mathematics (B) Actuarial Mathematics (C)Swayam/MOOCs/NPTEL **(On Line Courses)**	4	6		25	75	100
		MAT 25055	Advanced complex Analysis	4	6		25	75	100
		MAT 25056	Practical -2 (Problem Solving)	4		16		100	100
			SUB TOTAL	**24**	**30**	**16**	**125**	**475**	**600**
SEMESTER - III	Core	MAT 35051	Functional Analysis	4	6		25	75	100
		MAT 35052	Discrete Mathematics	4	6		25	75	100
		MAT 35053	Semigroups	4	6		25	75	100
	Open Elective	MAT 35054	(A) Analytical Mathematics (B) Mathematical Methods (C)Foundation Course in Mathematical Statistics	4	6		25	75	100
		MAT 35055	Operation Research	4	6		25	75	100
		MAT 35056	(Skill oriented Course Practical) SCILAB	4		16		100	100
			SUB TOTAL	**24**	**30**	**16**	**125**	**475**	**600**
SEMESTER - IV	Core	MAT 45051	Graph Theory	4	6		25	75	100
		MAT 45052	Analytical Number Theory	4	6		25	75	100
		MAT 45053	Measure and Integration	4	6		25	75	100
	Internal Elective	MAT 45054	(A)Fluid Dynamics (B) Cryptography (C)Coding Theory	4	6		25	75	100
		MAT 45055	MAT-Lab	4		16		100	100
		MAT 45056	(Multidisciplinary Project) / Mathematical Modelling	4	6		25	75	100
	SUB TOTAL			24	30	16	**125**	**475**	**600**
	GRAND TOTAL			**96**	**120**	**64**	**500***	**1900****	**2400**

Note :* Internal Assessment Total 500 instead of 400.Semester End Exam Total 1900 instead of 2000**

- All core papers are Mandatory
- Compulsory Foundation choose one paper.
- Internal/Open Elective – Choose one paper each.Open Electives are for thstudents of other Departments in the varsity.
- Skill Oriented course is mandatory. Relevant society along with practical (10 marks internal, 40 final theory and 50 for practical's).
- Interested students may register for SWAYAM /MOOCs/ NPTEL with the approval of the concerned DDC for the award of the grade as 'open elective'.
- Choose one from Multi-Disciplinary (Circle formation with other subjects/Dept. of Arts/ Commerce) Course or Project (Collaboration with various firms/companies/societies) work.

MISSION OF THE DEPARTMENT OF APPLIED MATHEMATICS

- To be the centre of excellence in research and dissemination of knowledge in the field of Mathematics.
- To pursue collaborative programs and research with reputed National and International institutions.
- The Department is committed in providing an excellent MAJOR for students, whose career goals are teaching, immediate entry into the workforce.
- The Department plays an active role in Inter Disciplinary Courses by providing specialized mathematical training or expertise.
- The Department is committed to high quality instruction for all students in Mathematics courses, and it nurtures pleasant and constructive faculty-student interaction.

VISSION OF THE DEPARTMNET OF APPLIED MATHEMTAICS

- To contribute to advancement of Mathematics and to produce Mathematicians of high caliber who could engage in original research, and to produce employable and adaptable graduates in related fields.
- The Department aspires to be regionally and nationally recognized for its distinction.
- The Department also strives to convince all students that mathematics plays a meaningful role in their lives and to improve their overall attitude toward mathematics.
- The Department further aspires to be a valuable and expert resource to the University community, and to Society.

M.Sc. Mathematics

Program Code : MATYVUC
M.Sc. Mathematics

PROGRAM OUT COMES (PO) OF PG IN MATHEMATICS

Students are expected to know or able to do by the time of graduation.At the end of theprogramme, the students will be to :

- Apply Knowledge in Mathematics in all the fields of learning including higher research and its extensions.
- Utilize Number Theory in the field of Cryptography that helps in hiding information and maintaining secrecy in military information ,transmission, computer password and e-commerce.
- Facilitate the study of groups in crystallography in chemistry and Lie symmetry groups in physics.
- Ability to think, acquire knowledge and skills through logical reasoning and in culture the habit of self- learning throughout life.
- Inculcate critical thinking to carry out scientific investigation objectively.
- Equip the student with skills to analyse problems, formulate the hypothesis, evaluate and draw reasonable conclusions.
- Imbibe effective, scientific / technical communications in both oral and write.
- Demonstrate the high standards of ethical issues.
- Investigate and apply mathematical problems and solutions in a variety of contexts related to science, technology, business and industry.
- Illustrate solutions using numeric or graphical or programming methods.
- Investigate and solve unfamiliar math problems and allow to think on unsolved mathematical problems.

PROGRAM SPECIFIC OUTCOMES OF PG IN MATHEMATICS

- To develop problem – solving skills and apply them independently toproblems in pure and applied mathematics.
- To assimilate complex mathematical ideas and argument.
- To develop abstract mathematical thinking.
- To improve own learning and performance.

****

SEMESTER - I

Course code	Title of the course	No. of Hours	No of Credits	Internal Marks	External Marks	Total Marks
MAT 15051	Algebra	06	04	25	75	100

Program Education Objectives(PEOs)

- Concept of group action and theorems about group actions.
- Structure of permutation groups.
- Polynomial rings, EDs, PIDs, & UFDs, and relations among them.
- Comprehensiveness of Modules.

UNIT I: Conjugacy and G-Sets - Normal series - Solvable groups and Sylow theorems.

(22 Hours)

UNIT II: Permutation Groups: Cyclic Decomposition - Alternating group A_n - Simplicity of A_n.

(23Hours)

UNIT III: Unique Factorization domains and Euclidean Domains: Unique factorization domains – Principal ideal domains - Euclidean domains - Polynomial rings over UFD.

(22Hours)

UNIT IV Modules: Definition and examples - Submodules and direct sums - R - homomorphisms and quotient modules - Completely reducible modules - Free modules.

(23 Hours)

Text Book: Scope and Standard as in **"Basic Abstract Algebra"** by P.B. Bhattacharya, S.K.Jainand S. R. Nagpaul, Cambridge University Press.

Chapter 5: Section 4; Chapter 6 : Sections 1 and 2; Chapter 8 : Section 4;

Chapter 7; Chapter 11; Chapter 14: Sections 1 to 5.

Reference books :

1. Topics in Algebra, by I.N. Hierstein .

2. Commutative algebra, by Zariski and Samuel, Affiliated East – West Press.

Program Specific Outcomes(PSOs)

- Solving problems using the powerful concept of group action.
- Facility in understanding the structure of a problem where the problem involves a permutation group - e.g. nature of the roots of a polynomialequation.
- Ability to understand a large class of commutative rings by regarding them as quotients of polynomial rings by suitable ideals.

Program Outcomes(Pos)

- Applying the concept of a group action to real life problems such as Counting.
- Facility in handling problems involving polynomial equations.
- Facility in working with situations involving commutative rings, in particular monogenic algebras of matrices. Implies facility in working with matrices, a concept that finds a large number of applications in real life including the graphs and networks.
- To learn abstract algebraic structures groups, rings , modules and fields which have applications in cryptography.

*****

Course code	Title of the course	No. of Hours	No of Credits	Internal Marks	External Marks	Total Marks
MAT 15052	Real Analysis	06	04	25	75	100

Program Education Objectives (PEOs)

This Course is intended to expose the ideas of Real Analysis by Learning Continuity, Differentiation, Riemann Integral, Improper Integral of functions.

UNIT I : The Remiann - Steiltjes Integral: Definition and Existence of Integral- Properties of theIntegral - Integration and Differentiation-Integration of Vector – valued Function.

(22 Hours)

UNIT II: Sequences and Series of Functions: Discussion of Main Problem-Uniform Convergence - Uniform Convergence and Continuity - – Uniform Convergence and Differentiation, Uniform Convergence and Integration The Stone - Weierstrass Theorem. *(23 Hours)*

UNIT III: Improper Integrals: Introduction - Integration of Unbounded Functions with Finite Limits of Integrations - Comparison Tests for Convergence at a of $\int_b^a f\,dx -$ Infinite Range of Integration. **(22Hours)**

UNIT IV : Functions of Several Variables : –Continuity - Partial Derivatives – Differentiability - Partial Derivatives of Higher Order- Differentials of Higher Order - Functions of Functions - Change of Variables –Taylor's Theorem . **(23 Hours)**

Text Book: Scope and Standard as in "**Principle of Mathematical Analysis**" by Walter Rudin's (Third Edition 1976) Mc Graw Hill International Student Edition 1976.

Unit-I: Chapter 6: Sections 6.01 to 6.24

Unit-II:Chapter :7 Sections :7.1 to 7.18 & 7.26.

Scope and Standard as in "**Mathematical Analysis**" By S.C.Malik 1994 of Wiley Eastern limited

Unit-III: Chapter 11:Sections 1 to 4,

Unit-IV:Chapter15: Sections 1 to 9.

Reference books: "Mathematical Analysis" By Tom .M .Apostol (Second Edition) AddisonWeslay publishing company.

Program Specific Outcomes (PSOs)

- The notion of convergence in c[0,1] and related theorems.
- Differentiability of functions in several variables and their relation topartial derivatives.

Program Outcomes (POs)

This Course able to helps the student how to apply the concepts of Real Analysis and understand the Improper Integrals concept and to construct the Mathematical proofs of basicresults in Real Analysis.

*****

Course code	Title of the course	No. of Hours	No of Credits	Internal Marks	External Marks	Total Marks
MAT 15053	Ordinary Differential Equations	06	04	25	75	100

Program Educational Objectives (PEOs)

To provide some standard methods for solving first-order, second-order and higher-order homogeneous and nonhomogeneous ordinary differential equations with constant and variable coefficients, linear equation with regular singular points, and to study the method of successive approximations, Lipshitz condition and non-local existence of solutions.

UNIT-I : Oscillation Theory and boundary value problems: Qualitative properties of solutions –The Sturm comparison theorem-Eigen values, Eigen functions and the vibrating string.

(22 Hours)

UNIT-II: **Power series solutions**: Series solutions of first order equations –Second order linear equations-Ordinary points-Regular singular points- Gauss's hyper geometric equation.

(23 Hours)

UNIT-III: Some special functions of Mathematical Physics : – properties of Legender polynomials –Bessel functions –The gamma function- Properties of Bessel functions. Legender polynomials **(22 Hours)**

UNIT-IV: **The existence and uniqueness of solutions** : The method of successive approximations-Picard's theorem-systems - The second order linear equations. **(23 Hours)**

Text book: Scope and standard as in "**Differential Equations with Applications and Historical notes"** by George F. Simmons . (1992) Tata Mc Graw Hill Publications.

Chapter 4 :Sections 22 to 24, (excluding Appendices A), Chapter 5: Sections 26 **to 30, Chapter 6: Sections 32 to 35, (excluding Appendices), Chapter 11:**

Sections 55 to 57.

References books :

1. Advanced Differential Equations, M.D. Raisinghania , S. Chand Publications
2. "Differential Equations" Ross, Shepley L Wieley India Pvt LTD.

Program Specific Outcomes (PSOs)

- Upon completion of this unit, the student will be able to: Obtain the solutions of second order homogeneous and nonhomogeneous linear differential equations with constant coefficients and understand the utility of Wronskian, linear independence and independence of solutions.
- Upon completion of this unit, the student will be able to: learn how to solve homogeneous and nonhomogeneous differential equations with variable coefficients and homogenious equation with analytic co-efficients.
- Upon completion of this unit, the student will be able to: Understand the concepts regular singular points and solve the Euler equation and the Bessel equation
- Upon completion of this unit, the student will be able to: Understand the concepts of successive approximations, The Lipschitz condition and prove local and Non-local existence theorems.

Program Outcomes (POs)

The students shall receive good introduction to the study of solutions of equations in higher order derivatives of a variable function with variable coefficients in general and constant coefficients as well as the student also learns technique of finding solutions of some special types of equations. Finally the student learns how to establish existence and uniqueness of $y' = f(x, y)$ when f satisfies the Lipschitz condition.

*****

INTERNAL ELECTIVE

Course code	Title of the course	No. of Hours	No of Credits	Internal Marks	External Marks	Total Marks
MAT 15054	(A)Numerical Methods	06	04	25	75	100

Program Educational Outcomes (PEOs)

The course is delivered a wide variety of Numerical strategies for fixing Mathematical, issues that get up in Science and Engineering and facilitates to choose broader and observe the suitable Numerical strategies for the Mathematical issues.

UNIT I: Interpolation: Interpolation with Unevenly Spaced Points: Lagrange's Interpolation Formula – Error in Lagrange's Interpolation Formula – Hermite's Interpolation Formula . **Interpolation with Cubic Splines**: Derivation of the Governing Equations – End conditions – Minimizing Property of Cubic Splines – Errors in Cubic Spline Derivatives –Error Analysis of the Cubic Splines . **Divided Differences and their Properties:** Newton's General Interpolation Formula – Interpolation by Interation. **Inverse Interpolation:** Method Successive Approximations – **Double Interpolation.** **(22 Hours)**

UNIT II : **Curve Fitting**: Least-Squares Curve Fitting Procedures, Fitting a Straight line – Nonlinear Curve Fitting- Curve Fitting by a Sum Of Exponentials. **Weighted Least Squares Approximation**; Linear Weighted least Squares Approximation- Nonlinear weighted Least Squares Approximation. **(23 Hours)**

UNIT III : Numerical Solution Of Ordinary Differential Equations: Predictor-Corrector Methods Adams – Moultan Method- Milne's Method. The Cubic Spline Method .**Boundary- Value Problems:** Finite-Difference Method- the Shooting Method- the Cubic Spline Method.

(22 Hours)

UNIT IV: Numerical Solution of Partial Differential Equations: Introduction- Finite-

Difference Approximations to Derivatives. Laplace's Equation Jacobi's Method – Gauss-Seidel

Method- SOR Method- The ADI Method- Parabolic Equations – Iterative Methods for theSolution Of Equations- Hyperbolic Equations. **(23 Hours)**

Text Book : Scope and Standard as in **"Introductory Methods Of Numerical Analysis"** by(Thirty-Third Printing (Fourth Edition February,2005) , Published by Prentice-Hall Of IndiaPvt.Ltd.,Delhi. S.S.Sastry.

Unit-I : Chapter 3: Sections 3.9 to 3.13

Unit-II: Chapter 4 : Sections 4.1, 4.2, 4.2.1 ,4.2.2 4.2.3, 4.3, 4.3.1, 4.3.2,

Unit-III:Chapter 7 : Sections 7.6, 7.6.1, 7.6.2, 7.7, 7.10,

Unit-IV: Chapter 8 : Sections 8.1 to 8.6.

Program Specific Outcomes(PSOs)

- Upon completion of this unit, the student will be able to: Use different data types in a Computer program and Design programs involving Decision structures, Loops and Functions.
- Upon completion of this unit, the student will be able to: Apply various Mathematical operations and tasks, such as Interpolation of Polynomials.
- Upon completion of this unit, the student will be able to: Ability to solve theProblems based on Numerical Integration.
- Upon completion of this unit, the student will be able to: find Numericalsolution of ordinary differential equations such as Runga-Kutta methods.

Program Outcomes (POs)

At the end of this course the students, should be able to learn.

- Some useful approximation and interpolation techniques in Mathematics.
- Students realize the importance of the subject in solving some problems of algebra and calculus .
- Apply the knowledge of advanced Numerical methods in order to solve different types of

problems

- Viz, Linear systems , ordinary and partial Differential equations arising in various field of applications for example in science engineering and economics etc...
- Identify the challenging problems and extend their knowledge to do research work on Numerical methods and similar type of other methods.

*****

Course code	Title of the course	No. of Hours	No of Credits	Internal Marks	External Marks	Total Marks
MAT 15054	(B)Finite Element Method	06	04	25	75	100

Program Educational Objectives (PEOs)

- Describe the Finite Element Analysis procedure.
- Identify the application and characteristics of Finite Element Analysis such as bars, beams, planar elements, and common 3- D elements.
- Develop the stiffness equation for common FEA elements, and assemble element stiffness equations in to a global equation.
- Explain the underlying concepts behind variational methods and weighted residual methods in FEM.
- Explain how the finite element method expands beyond the structural domain, for problems involving dynamics, heat transfer, and fluid flow.

UNIT–I :Integral Formulations and Variational Methods : Need for Weighted-Integral Forms; Some Mathematical Concepts and Formulae-Boundary, Initial and Eigenvalue problems-Integral Relations-Functionals-The Variational Symbol ;Weak formulation of Boundary Value problems – Introduction-Weighted-Integral and Weak formulations- Linear and Bilinear forms and Quadratic Functionals - Examples. **(22 Hours)**

UNIT – II: Variational Methods of Approximation – Introduction- The Rayleigh-Ritz Method- The Method of Weighted Residuals. **(23 Hours)**

UNIT – III: Finite Element Analysis of One-Dimensional Problems : Second-Order Boundary Value Problems: Introduction; Basic Steps of Finite Element Analysis-Model Boundary Value Problem-Discretization of the Domain-Derivation of Element Equations-Connectivity of

Elements-Imposition of Boundary Conditions-Solution of Equations-Postprocessing of the Solution- Radially Symmetric Problems. **(22Hours)**

UNIT-IV: Applications: Heat Transfer –Fluid Mechanics- Solid Mechanics. **(23 Hours)**

Text Book: Standard and Treatment as in **Chapters 2:Section2.1, 2.2, 2.3, 2.4 ;**

Chapter3 : Section 3.1, 3.2, 3.3 of "AN INTRODUCTION TO THE FINITE

ELEMENT MEHTOD"By J. N. Reddy, McGraw-Hill Inc. (Second Edition).

Program Specific Outcomes (PSOs)

- Possess a good understanding of the theoretical basis of the weighted residual Finite Element Method.
- Be able to validate a Finite Element model using a range of techniques.
- Ability to solve engineering problems using the commercial software ANSYS.
- Be able to implement the Galerkin residual weak formulation into the Finite Element Method for the solution of Ordinary and Partial Differential Equations, using mathematical software such as Maple.
- Be able to discuss the accuracy of the Finite Element solutions.
- Ability to solve the practical problems using mathematical software such as boundary value problems, fluid mechanics, heat transfer.

Program Outcomes (POs)

The course Finite Element Method for strength analysis shows how the basic linear theory behind the method combined with numerical calculations leads to the key variables such as displacements, strains and stresses in various structures, primarily the disc, plate, shell and solid structures. This course constitutes a necessary basis for the secondary topic Nonlinear Finite Element analysis.

*****

Course code	Title of the course	No. of Hours	No of Credits	Internal Marks	External Marks	Total Marks
MAT 15054	(C)Fuzzy Sets &Fuzzy Logic	06	04	25	75	100

Program Educational Objectives (PEOs)

The objective of this course is to teach the students the need of fuzzy sets , operations on fuzzy sets, arithmetic operations on fuzzy sets and fuzzy relations.

UNIT I : Fuzzy Sets : An overview – Basic Types and Concepts – Characteristics and significance of the Paradigm – Properties of α- Cuts – representation of Fuzzy sets – Extension Principle for Fuzzy Sets. **(22 Hours)**

UNIT II :Operations on Fuzzy Sets : Types of Operations – Fuzzy complements – t-norms, t- conforms – combinations of operations- aggregation of Operations – Fuzzy Arithmetic – Fuzzy Nembers- Linguistic Varibles – Arithmetic Operations on Intervals – Arithmetic Operations on Fuzzy Numbers – Lattice of Fuzzy Numbers – Fuzzy Equations. **(23 Hours)**

UNIT III: Fuzzy Relations : Crisp versus Fuzzy Relations – Projections and Cylindric Extensions – binary Fuzzy Relations – Binary Relations on a Single Set- fuzzy Equivalence Relations – Fuzzy Compatibility Relations - Fuzzy Ordering Relations – Fuzzy Morphisms – Sup – I Compositions of Fuzzy Relations – inf- w_i Compositions of Fuzzy Relations – Fuzzy Relation Equations - General Discussion – Problem Partitioning – Solution Method – fuzzy Relation Equations Based on sup – I compositions – Fuzzy Relation Equations Based on inf- w_i Compositions – Approximate Solutions – The use of Neural Networks. **(22 Hours)**

UNIT IV :Possibility Theory : Fuzzy Measures – Evidence Theory- Possibility Theory – Fuzzy sets and Possibility Theory – Possibility Theory Versus – Orobability Theory – Fuzzy logic – Classical Logic – Multivalued Logics – Fuzzy Propositions – Fuzzy Quantifiers – Linguistic

hedges – Inference from Conditional Fuzzy Propositions – Inference from Conditional and Qualified Propositions – Inference from quantified propositions. **(23 Hours)**

Text Book: Scope and standard as in **"Fuzzy sets and Fuzzy logic Theory and Applications"**

by George J. Klir / Bo Yuan, PHI, 2001. **Chapters 1 to 8.**

Program Specific Outcomes (PSOs)

- Upon completion of this unit, the student will be able to: Understand the basic concepts of fuzzy sets, properties of α-cut sets and extension principle of fuzzy sets.
- Upon completion of this unit, the student will be able to: Describe fuzzy compliments, fuzzy intersections and fuzzy unions.
- Upon completion of this unit, the student will be able to: Understand the concept of fuzzy arithmetic.
- Upon completion of this unit, the student will be able to: Determine the difference between crisp relations, fuzzy relations and understand the concepts of fuzzy compatibility relations, fuzzy ordering relations and fuzzy morphisms.

Program Outcomes (POs)

After completing this course, the student shall be able to: Understand the basic concepts of fuzzy sets, fuzzy arithmetic and fuzzy relations. Construct the appropriate fuzzy numbers corresponding to uncertain and imprecise collected data and also determine the concepts of fuzzy compatibility relations, fuzzy ordering relations and fuzzy morphisms.

******

Course code	Title of the course	No. of Hours	No of Credits	Internal Marks	External Marks	Total Marks
MAT 15055	Complex Analysis	06	04	25	75	100

Program Educational Objectives (PEOs)

Complex analysis, traditionally known as the theory of functions of a complex variable, is thebranch of mathematical analysis that investigates functions of complex numbers.

- To define analytic functions and derivative rules of complex functions.
- To introduce Mobius transformations and explain its applications.
- To evaluate definite integrals using Cauchy integral formula.
- To understand power series and expansion of analytic function**.**

UNIT –I :Differentiation: Analytic Functions : Derivative Rules for Differentiating Complex Functions- The Cauchy-Riemann Equations, Analytic Functions-Geometrical Interpretation of Arg $f^{1}(z)$ and $\left|f^{1}(z)\right|$, Conformal Mapping –The Mapping w = $\frac{az+b}{cz+d}$ -Conformal Mapping of the Extended Plane. **(22 Hours)**

UNIT – II:Mobius Transformations: ***– The*** The Group Property of Mobius Transformations Circle –Preserving Property of Mobius Transformations-Fixed points of a Mobius Transformation-Invariance of Cross Ratio-Mapping of a circle onto a Circle –Symmetry Transformations. **(23 Hours)**

UNIT – III: Complex Integrals. Cauchy Integral Theorem: Rectifiable Curves-Complex Integrals-The Case of Smooth Curves-Cauchy's Integral Theorem-The Key Lemma-Proof of Cauchy's Integral Theorem(**for 2-gons and Triangles only**) - Application to the Evaluation of Definite Integrals:

Cauchy's Integral Formula And Its Implications: Indefinite Integrals- Cauchy's IntegralFormula – Morera'sTheorem – Cauchy's Inequalities. **(22 Hours)**

UNIT-IV: Power Series: The Cauchy-Hadamard Theorem – Taylor Series. The Uniquenessin Theorem for Power series-Expansion of an Analytic Function a power series –Liouvill'es

Theorem. The Uniqueness Theorem for Analytic functions-A Points and Zeros-Weirstrass' Double Series Theorem . *(23 Hours)*

Text Books : Scope and Standard as in "**Introductory Complex Analysis**" by Richard A.Silverman Dover Publications, Inc. (1972). New York.

Unit I :Section 13,14 15,16,17 of Chapters 3,

Unit II: Section 23,24,25,26, 27 of Chapter 5,

Unit III: Section 34, 35,36,37,38 of Chapter 7 & section 40,41,42 of Chapter 8

Unit IV: Section 46, 47,48,49,50,51 of Chapter 10

Reference books :

1. A Text book of "Functions of a Complex variable" by J. N. Sharma.
2. A Text book of "Complex variables theory and applications " by H. S. Kasana, Second Edition.
3. Complex Variables - . Schaum outline series, 2/E by Speige
4. An Introductions to Complex Analysis, by C.L. Siegel :North Holland.

Program Specific Outcomes (PSOs)

- Identify curves and regions in the complex plane defined by simple expressions.
- Describe basic properties of complex integration and having the ability to compute such integrals.
- Decide when and where a given function is analytic and be able to find it series development.
- Describe conformal mappings between various plane regions.
- Apply the concepts of Complex Analysis in many branches of mathematics, including

algebraic geometry, number theory, analytic combinatorics, applied mathematics; as well

as in physics, including the branches of hydrodynamics, thermodynamics and particularly quantum mechanics.

Program Outcomes (POs)

Understand the analyticity of complex functions and conformal mappings. Apply Cauchy's integral formula and Cauchy's integral theorem to evaluate improper integrals along contours. Solve the problems using complex analysis techniques applied to different situations in engineering and other mathematical contexts. Establish the capacity for mathematical reasoning through analysing, proving and explaining concepts from complex analysis. Extend their knowledge to pursue research in this field.

******

Course code	Title of the course	No. of Hours	No of Credits	Internal Marks	External Marks	Total Marks
MAT 15056	Practical -1(Problems Solving)	06	04	25	75	100

Algebra

- Concepts based on Sylow theorem
- Concepts of permutation groups
- Concepts of Ring Theory
- Concepts of Modules.

Real Analysis

- Concepts on Continuity and Differentiation.
- Concepts on uniform convergence and problems
- Problems on Improper Integrals.
- Concepts on functions of several variables(Maxima and Minima and Extreme Values)

Ordinary Differential Equations

- Problems on Eigen values, Eigen functions.
- Problems Ordinary points and Regular Singular points.
- Problems on Legendre's polynomials and Bessels functions.
- Problems on successive approximations.

Complex Analysis

- Problems based on Analytic Functions, Conformal Mapping
- Problems based on images are region of Mobious Transformation
- Verification of Cauchy's Integral Theorem Problems.
- Problems based on Radius of Convergence of Power Series.

Numerical Methods

- Solving algebraic and Transcendental equations using Numerical Methods.
- Solving System of Linear Algebraic Equations using Numerical Methods.
- Concepts of Interpolations
  Concepts on Numerical Differentiations and Integrations
-

*****

SEMESTER - II

Course code	Title of the course	No. of Hours	No of Credits	Internal Marks	External Marks	Total Marks
MAT 25051	Topology	06	04	25	75	100

Program Educational Objectives (PEOs)

To study the properties space dimension and transformation that are preserved under continuous deformations including stretching and bending but not tearing and gluing. This includes properties such as connectedness continuity compactness and boundary.

UNIT-I: **Metric Spaces:** Open sets-closed sets- convergence-completeness and Baire's theorem-Continuous mappings spaces of continuous functions-Euclidean and Unitary Spaces. **(22 Hours)**

UNIT- II: **Topological Spaces**: Definition & examples-open bases and open sub bases - weak topologies. **(23 Hours)**

UNIT- III: **Compact spaces**: Product spaces-Trychonoff's theorem and loally compact Spaces compactness in Metric spaces- Ascoli's Theorem. **(22Hours)**

UNIT-IV: Separation: T_1 Spaces and Hausdorff spaces –completely regular spaces and Normal spaces –Urysohn's lemma- Urysohn's imbedding theorem – Connected spaces-Components of a space. – Tietz Extension Theorem *(23 Hours)*

Text Book: Scope and Standard as in "**Introduction to Topology and Modern Analysis**" by G.M. Simmons, MC Graw Hill Book company, inc. International student edition. **Chapter II, Chapter III : articles 16-19, Chapter IV: articles 21-25 , Chapter V: articles 26-30, and Chapter VI: articles 31 and 32 .**

Reference books:

1. Topology by K.Chandra Sekhara Rao, Narosa Publications
2. Topology by J.P. Chauhan, J.N. Sharma, Krishna Publications
3. General Topology" by M.G. Murdeshwar, new age International Publications

Program Specific Outcomes (PSOs)

- Upon completion of this unit, the student will be able to: Understand the basic concepts of metric spaces, open sets, closed sets and continuous functions on metric spaces.
- Upon completion of this unit, the student will be able to: Define and illustrate the concept of topology and prove a selection of theorems concerning Topological spaces, continuousfunctions and product topologies.
- Upon completion of this unit, the student will be able to: Characterize compact spaces using the Heiene-Borel theorem.
- Upon completion of this unit, the student will be able to: Define and illustrate the concepts of the separation axioms and appreciate the beauty of deep mathematical results like Urysohn's lemma, Urysohn imbedding theorem and understand the dynamics of the proof techniques. Characterize connected spaces, components of a space.

Program Outcomes (POs)

The student shall be able to appreciate generalization of the properties of intervals on R and ideas of continuity on the real line in a more general context. The student shall also be able to appreciate the generalization of Heiene- Borel to compactness in topological spaces.

*****

Course code	Title of the course	No. of Hours	No of Credits	Internal Marks	External Marks	Total Marks
MAT 25052	Galois Theory	06	04	25	75	100

Program Educational Objectives (PEOs)

- Solving polynomial equations using formulas for roots and testing if a polynomial is irreducible over Q.
- Construction of Splitting Fields and finding the degrees of extension over Q for polynomials.
- Understanding about fixed fields and finite separable extensions.
- Understanding which equations can be solved using radials.

UNIT- I: **Algebraic Extensions of Fields:** Irreducible polynomials and Eisenstein Criterion - Adjunction of roots - Algebraic extensions - Algebraically closed fields. **(22 Hours)**

UNIT- II: Normal and Separable Extensions: Splitting fields - Normal extensions - Multiple roots - Finite fields - Separable extensions. *(23 Hours)*

UNIT- III: Galois Theory: Automorphism Groups and Fixed Fields - Fundamental theorem of Galois Theory - Fundamental theorem of Algebra. *(22 Hours)*

UNIT- IV: Applications of Galois Theory to Classical Problems: Roots of unity and Cyclotomic Polynomials - Polynomials solvable by radicals - Ruler and Compass constructions . *(23 Hours)*

Text Book: Scope and Standard as in **Basic Abstract Algebra by** P.B. Bhattacharya, S K.Jain and S.R. Nagpaul, Cambridge University Press. **Chapter 15: Sections 1,2,3 & 4; Chapter 16: Sections 1,2,3,4 & 5; Chapter 17: Sections 1,2 &3**

Chapter 18: Sections 1,3 & 5Reference books:

Topic in Algebra by I.N.Herstein.

Program Specific Outcomes (PSOs)

- Ability to understand/obtain the roots of a polynomial equation if the same has (or can be reduced to) degree less than five.
- Facility in working with finite fields.
- Establishing a one to one correspondence between the set of sub fileds of a separable a polynomial and the set of subgroups of the group of automorphism of splitting fields.
- Applying the concept of a field extension to various mathematical problems including geometric constructions and perfect division of acircle into n parts.

Program Outcomes (POs)

- Facility in working with mathematical problems that involve polynomial equations and irreducible polynomials.
- Applying mathematical methods to the real-life problems includingcryptography.
- To gain the knowledge of irreducibility of polynomials , fields extension splitting fields, fundamental theorem of algebra, cyclotomic polynomials and solvability of polynomials and solvability of polymonials and solvability of polynomials by radicals.
- Galois Theory Serves as the basis of Galois's criterion for solvability of an equation by radicals.
- Providing solutions to many ancient Geometric Problems by the theory of Fields.
- To gain the knowledge of irreducibility of polynomials , fields extension splitting fields, fundamental theorem of algebra, cyclotomic polynomials and solvability of polynomials and solvability of polymonials and solvability of polynomials by radicals.

*****

Course code	Title of the course	No. of Hours	No of Credits	Internal Marks	External Marks	Total Marks
MAT 25053	Partial Differential Equations	06	04	25	75	100

Program Educational Objectives (PEOs)

This course is designed to strengthen the fundamental knowledge of P.D.Es which lead tounderstand the real world problems.

- To provide the students various methods to find solutions of O.D.Es and P.D.Es
- To introduce orthogonal trajectories in 3D space
- To explain methods to solve Linear P.D.Es with constant and Variable coefficients.
- To discuss the boundary value problems and Laplace Equation

UNIT - I : Ordinary Differential Equations In More Than Two Variables: Methods of solutions of dx/P = dy/Q = dz/R – Orthogonal Trajectories of a system of Curves on a Surface- Pfaffian Differential Forms and Equations – Solution of Pfaffian Differential Equations in Three Variables. **(22 Hours)**

UNIT - II : Partial Differential Equations Of The First Order : Partial Differential Equations – Origins of First- Order Partial Differential Equations – Linear Equations of First Order – Integral Surfaces Passing Through a Given Curve – Surfaces Orthogonal to a Given System of Surfaces – Charpit's Method – Jocobi's Method. **(23 Hours**)

UNIT - III : Partial Differential Equations of the Second Order : The Origin of Second- Order Equations – Linear Partial Differential Equations With Constant Coefficients – Equations With Variable Coefficients. **(22 Hours)**

UNIT - IV :Laplace's Equation : Elementary Solutions of Laplce's Equation – Families of Equipotential Surfaces –Boundary Value Problems –Separation of Variable. **(23 Hours)**

Text book : Scope and Standard as in "**Elements of Partial Differential Equations**" by IAN Sneddon Macgraw Hill Company.

Unit I : Chapter1: Sections 3,4,5,6;

Unit II: Chapter2: Sections 1, 2, 3, 4,5,6,10 ,13;

Unit III: Chapter 3: Sections 1,4,5; Unit IV : Chapter 4: Sections 2,3,4,5.

Reference book:

1. "**Ordinary And Partial Differential Equations"** By M.D.Raisinghania, Published By S.Chand & Co, New Delhi.
2. **Advanced Differential Equations** by M.D.Raisinghania, S. Chand Company Limited, New Delhi, 2021.
3. **An elementary course to P.D.E** by T.Amarnath, Second Edition, Narosa publishing house.

Program Specific Outcomes (PSOs)

Students will be able to

- Analyze the origin of first order PDEs and Integral surfaces passing through a given curve
- Identify linear and nonlinear PDE and solve nonlinear PDE by Charpit's method.
- Apply Variables separable methods to solve Laplace Equation in cylindrical or spherical coordinates.
- Obtain equipotential surfaces using Laplace's equation.
- Understand the importance of partial differential equations in geometry, physics and other subjects.

Program Outcomes (POs)

Understand partial differential equations of first order (linear and nonlinear), second and higher order. Apply various analytic methods for computing solutions of various PDEs. Understand the formation and solution of some significant PDEs like wave equation, heat equation and diffusion equation. Apply the knowledge of PDEs and their solutions in order to understand physical phenomena.

*****

OPEN ELECTIVE

Course code	Title of the course	No. of Hours	No of Credits	Internal Marks	External Marks	Total Marks
MAT 25054	(A) Business Mathematics	06	04	25	75	100

Program Educational Objectives(PEOs)

- To understand the basic concepts of Mathematics.
- To have a proper understanding of mathematical applications in Business, Finance, Commerce, Civil Engineering and Management

UNIT- I : Percentage

UNIT- II: Profit - Loss

UNIT – III: Pie – Chart

UNIT –IV : Bar Diagram

Text Books : Scope and standard as in "**Objective Arithmetic''**, by Dr.R.S.Aggarwal: S.Chanda Publications, **Chapters 10, ,11,41,42,** Revised edition 2018.

Program Specific Outcomes (PSOs)

- Gains the Knowledge to solve problems related to profit and loss, simple interest , pie-chart and Areas
- Gains the Knowledge to calculate simple interest, percentage of profit / loss, Areas and pie-chart.

Program Outcomes (POs)

Math helps a student to think analytically and develops better reasoning abilities. In this Paper an interdisciplinary student is given practice in problems related to Chain Rule, Time and work, Time and Distance, Types and Applications of Menstruation and Matrix Algebra.

*****

Course code	Title of the course	No. of Hours	No of Credits	Internal Marks	External Marks	Total Marks
MAT 25054	(B) Actuarial Mathematics	06	04	25	75	100

Program Educational Objectives(PEOs)

- To understand the basic concepts of Mathematics.
- To have a proper understanding of mathematical applications in Economics, Finance, Commerce and Management

UNIT – I : Number - H.C.F. and L. C.M. of Numbers

UNIT – II : Surds and Indices **UNIT**

– III: Ratio and Proportion.**UNIT –**

IV: Linear Equations in Two Variables

Text book: Scope and standard as in "**Objective Arithmetic''**, by Dr.R.S.Aggarwal: S.Chanda Publications **Chapters 1,2, ,9,12,31,** Revised edition 2018.

Program Specific Outcomes(PSOs)

- Gains the Knowledge to solve problems related to HCF AND LCM of numbers, surdsand Indices, Linear Equations in Two variables Ratio and Proportion – Variation.
- Gains the Knowledge about number systems, decimal numbers binary numbers and conversion to one another
- Gains the Knowledge about Octal numbers, Hexadecimal number and Binary Arithmetic.

Program Outcomes(POs)

On completion of this course, the students will be able to: CO1. Explain the concepts and use equations, formulae, and mathematical expressions and relationships in a variety of contexts CO2. Apply the

knowledge in mathematics (algebra, matrices, calculus) in solving business problems

CO3. Analyse and demonstrate mathematical skills required in mathematically intensive areas in Economics and business. CO4. Integrate concept in international business concepts with functioning of global trade.

*****

Course code	Title of the course	No. of Hours	No of Credits	Internal Marks	External Marks	Total Marks
MAT 25054	(C)Swamy/MOOCs/NPTEL	06	04	25	75	100

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1 https://nptel.ac.in/courses/111/105/111105035/

2 https://nptel.ac.in/courses/111/106/111106046/

3 https://www.youtube.com/watch?v=gZNm7L96pfY

******

Course code	Title of the course	No. of Hours	No of Credits	Internal Marks	External Marks	Total Marks
MAT 25055	Advanced Complex Analysis	06	04	25	75	100

Program Educational Objectives (PEOs)

- Expansion of an analytic function in a power series of positive and negative integral powers of a variable in an annulus and study of zero and singularities.
- To establish the Residue theorem. which gives the value of the integral in a closed contour L in terms of its Residues.
- To establish that the real and imaginary part of an analytic function are harmonic functions.
- To obtain the harmonic conjugates (of a given real valued function of two variable).
- To establish the Weierstrass –theorem and Mittag-Laffler's theorem on the representation of an entire function with infinitely many zeros and on the existence of an entire function with arbitrarily preassigned poles.

UNIT - I : Laurent Series – Singular Points : Laurent Series – Laurent 's Theorem – Poles and Essential Singular Points – Behavior at an Essential Singular Point. Picard's Theorem (Statement only) – Behaviour at Infinity. **(22 Hours)**

UNIT - II : The Residue Theorem And its Applications: The Residue Theorem. Residue at Infinity – Jordan's Lemma. Evaluation of Definite Integrals – The Argument Principle. The Theorems of Rouch'e and Hurwitz – Local Behavior of Analytic Mappings. The Maximum Modulus Principle and Schwarz's Lemma**.** **(23 Hours)**

UNIT - III : Harmonic Functions: Laplace's Equation. – Conjugate Harmonic Functions Poisson's Integral Schwarz's Formula . *(22 Hours)*

UNIT- IV : Infinite Product : Preliminary Results, Infinite Products – Weierstrass Theorem – Mittag – Leffler's Theorem – The Gamma Function *(23 Hours)*

Text Books: Scope and Standard as in "**Introductory Complex Analysis** " by R.A. Silverman Macgraw Hill Company. **Chapter 11: Sections 54,55,56,57 & 58; Chapter 12:** *Sections 59,60,61,62; Chapter 13: Sections 63,64,65; Chapter 14: Sections 66,* **67, 68, 69.**

Reference book:

1. A Text book of complex variables and Applications (Higher Math) by James Ward Brown (Author), Ruel V. Churchill Prof. (Author).
2. A Text book of "Functions of a Complex Variable" by J. N. Sharma.
3. A Text book of "Complex Variable Theory and Applications" by H. S. Kasana, Second edition.

Program Specific Outcomes (PSOs)

Student gains knowledge by :

- Expanding some simple functions as their Taylor and Laurent series, classify the nature of singularities, find residues and apply Cauchy Residue theorem to evaluate integrals.
- Determining whether a sequence of analytic functions converges uniformly on compact sets.
- Acquiring knowledge about different types of functions viz. analytic, entire and meromorphic functions occur in complex analysis along with their properties.
- Expressing some functions as infinite series or products.

Program Outcomes (POs)

- Gains the skill of expanding a given complex function $f(z)$ on the indicated domains.
- Identify the singular points and investigated the behavior at infinity.

- Calculation of Residues and evaluation of infinite integrals using Residue Theorem.

- Finding the number of zeros of complex polynomial.
- Gain the knowledge of finding Harmonic conjugate of a function and construction meromorphic function.
- Learns Gamma Function and its properties
- The students should be able to participate in scientific discussions and conduct researches on high international level in contemporary and classical complex analysis and its applications. Utilize the concepts of complex analysis to specific research problems in mathematics or other fields.
- Enhance and develop the ability of using the language of mathematics in analyzing the real-world problems of sciences and engineering.

*****

Course code	Title of the course	No. of Hours	No of Credits	Internal Marks	External Marks	Total Marks
MAT 25056	Practical -2 (Problems Solving)	06	04	25	75	100

Topology

- Concepts on Metric Spaces.
- Concepts on Topological Spaces.
- Concepts on Compactness for Metric Spaces.
- Concepts on Connectedness.

Galois Theory

- Concepts based on the polynomials which are irreducible over Q.
- Concepts based on the minimal polynomials and their degree of extensions.
- Concepts based on the degree of extension of the splitting fields.
- Concepts based on applications of Galois Theory to Classical problems.

Partial Differential Equations

- Problems based on Solution of Pfaffian Differential Equations in Three Variables.
- Problems based on Charpit's Method and Jocobi's
- Problems based on Linear Partial Differential Equations With Constant Coefficients.
- Problems based on Separation of Variable

Advanced Complex Analysis

- Problems based on singular points and investigate the behavior at infinity
- Find the residues of analytic function $f(z)$ at all its isolated singular points and at infinity.
- Evaluation of definite integrals.
- Find the conjugate harmonic function $v(x, y)$ corresponding to the given function $u(x, y)$

SEMESTER - III

Course code	Title of the course	No. of Hours	No of Credits	Internal Marks	External Marks	Total Marks
MAT 35051	Functional Analysis	06	04	25	75	100

Program Educational Objectives (PEOs)

To introduce basic concepts of Functional Analysis namely normed spaces, bounded linear functional, and study their applications and also to introduce fundamental results in Functional Analysis namely Hahn-Banach Theorem, open mapping theorem and closed graph theorem and study their applications.

UNIT-I: Banach Spaces: The Definition and some Examples – Continuous Linear Transformations - The Hahn – Banach Theorem. **(22 Hours)**

UNIT-II: The natural imbedding of N in N ** - The open mapping theorem - The conjugate of an Operator. *(23 Hours)*

UNIT-III: Hilbert Spaces: The definition and some simple properties - Orthogonal complements - Orthonormal sets - The Conjugate space H * . **(22 Hours)**

UNIT- IV : The adjoint of Operator - Self - adjoint operators - Normal and Unitary Operators Projections.

Finite Dimensional Spectral Theory: Determinants and the Spectrum of an operator - The Spectral Theorem. *(23 Hours)*

Text Book: Scope and Standard as in "**Introduction To Topology And Modern Analysis"** by G.F.Simmons, Mc Graw – Hill book Company , Inc., International Student Edition.

Chapters: 9,10, Chapter 11 :Sections 2 and 3.

Reference book:-

1. Functional Analysis By G.Backmenn and Narici.
2. Functional Analysis By P.K.Jain IP.Ahuja and Khalil Ahmed.
3. Introduction Functional Analysis with Application By E.Krayszing. Functional Analysis By B.V,Limage.
4. A First course in Functional Analysis By C.Goffman and G.Pederick Prentice Hall of India.

Program Specific Outcomes (PSOs)

- Upon completion of this unit, the student will be able to: Understand basicproperties of finite dimensional normed spaces.
- Upon completion of this unit, the student will be able to: Analyse bounded linear functionals of finite dimensional normed spaces and apply them to linear and differential equations.
- Upon completion of this unit, the student will be able to: Demonstrate theknowledge of continuous linear transformations and the Hahn-Banach theorem.
- Upon completion of this unit, the student will be able to: Describe uniformboundedness principle, open mapping theorem and closed graph theorem

Program Outcomes (POs)

After completing this course, the student gets introduced to the basics that are required for analysis of continuous linear functions on Banach space. The student also learns the famous Hahn-Banach, Open mapping, Closed Graph theorem and Uniform boundednessprinciples.

*****

Course code	Title of the course	No. of Hours	No of Credits	Internal Marks	External Marks	Total Marks
MAT 35052	**Discrete Mathematics**	**06**	**04**	**25**	**75**	**100**

Program Educational Objectives (PEOs)

The purpose of introducing this course is to develop logical thinking and its application to computer science of proving statements.

UNIT I - Mathematical Logic : Normal forms- Disjunctive, Conjugative Principle Disjunctive – Conjunctive normal forms- Ordering and uniqueness of normal forms Statements – Principle Connectives -Tautologies –The Theory of inference for Statement calculus - Predicate Calculus - Inference theory for predicate Calculus. - Rules of inference *(22 Hours)*

UNIT II - Relations : Properties - Equivalence Relations - Partial order relations and partially ordered sets - Semi groups and monoids - Sub semi - groups and Submonoids - Homomorphism of Monoids and Semi groups. *(23 Hours)*

UNIT III - Lattices : Lattices as Partially order sets – Complete - Complemented and Distributive Lattices – Sub Lattices – Direct Product and Homeomorphisms. **(22 Hours)**

UNIT IV - Boolean Algebra : Boolean algebras as lattices - Examples - Join irreducible elements - Mini terms - Boolean forms and their Equivalence - Sum of products - Canonical forms - Minimization of Boolean functions - Karnaugh maps - Application to switching algebras.

(23 Hours)

Text Book: Scope and Standard as in "**Discrete Mathematical Structures With Application To Computer Science**" by J.P Trembley and P.Manohar , Mc Graw-Hill book Co.1997.

Chapter 1: Articles 1.2, to 1.6, Chapter 2: Article 2.3, Chapter 3: Article 3.2

Chapter 4: Articles 4.1, 4.2, 4.3 and 4.4 .

Reference books: C.L Liu, "Elements of Discrete Mathematics" Tata Mc Graw Hill Publishing Company Ltd. New Delhi.(Second Edition).

Program Specific Outcomes (PSOs)

- Gains the Knowledge to solve problems related to Mathematical logic normal forms, statements connectives theory inference and predicate calculus
- Gains the Knowledge to solve relations, Equivalence Relations partially ordered sets - Semi groups and monoids - Sub semi - groups and Submonoids - Homomorphism of Monoids and Semi groups.
- Gains the Knowledge to solve Lattices Lattices as Partially order sets – Complete - Complemented and Distributive Lattices – Sub Lattices – Direct Product and Homeomorphisms.
- Gains the Knowledge to solve problems Boolean Algebra : Boolean algebras as lattices - Karnaugh maps - Application to switching algebras.

Program Outcomes (PSOs)

From this course students are able to acquire ability to learn relations, lattices, boolean algebraand mathematical logic.

*****

Course code	Title of the course	No. of Hours	No of Credits	Internal Marks	External Marks	Total Marks
MAT 35053	SemiGroups	06	04	25	75	100

Program Educational Objectives (PEOs)

- To concepts of Semigroups, Binary relations ,ideals, Congruences.
- To know and understand Green's equivalences.
- To know the structure of Regular $\mathcal{D}$ - classes.
- To know the concepts of 0-Simple semigroups and Congruences on Completely 0-Simple semigroups.

UNIT – I : Introductory Ideas : Basic Definitions – Monogenic Semigroups - Ordered sets , Semilattices and Lattices - ; Equivalences. **(22 Hours)**

UNIT – II: Congruences Binary Relations – Lattices of Equivalence and Congruences. The Equivalences $f, R, \mathcal{H}, \mathcal{J}$ and $\mathcal{D}$ - the structure $\mathcal{D}$ - Classes **(23 Hours)**

UNIT – III: Regular $\mathcal{D}$ – Classes - Regular Semigroups Simple and 0 – Simple semigroups ; Principal Factors **(22 Hours)**

UNIT – IV: Rees's Theorem – Primitive Idempotents – Congruences on Completely 0 – Simple Semigroups. **(23 Hours)**

Text Books: ***Scope and Standard as in*** *"An Introduction to Semigroup Theory"* ***by J.M.HOWIE***

Sections 1,2,3 & 4 of Chapter 1, Sections 5,8 (Excluding Propositions 8.8 and 8.9) of Chapter 1; Sections 1 , 2 of Chapter 2, Sections 3,4*

(Excluding Proposition 4.5 & Lemma 4.7) of Chapter 2; Section 1 (Excluding

1.6 & Theorem 1.9) of Chapter 3, Section 2 (Excluding Theorem 2.8), Section 3, (Excluding Theorem 3.5 and Corollary 3.6) & Section 4 (Excludinglemma 4.19,4.20 & Theorem 4.22) of Chapter 3.*

Program Specific Outcomes (PSOs)

- Gain the Knowledge of Monogenic semigroups and lattices, Equivalences and congruences.
- The notion of ideal in certain equivalence relations on a semigroup.
- Gain the knowledge of mutual divisibility of various kinds and reducing to the Universal equivalence in a group.
- Gain the knowledge of the difference in usage of words simple, ideal and congruences used in Semigroup theory , Group theory and Ring theory.

Program Outcomes (POs)

- Importance of Semigroup structure in lattices and congruences.
- The various equivalences that played a fundamental role in the development of Semigroup theory
- The significance of Green's equivalences in the study of regular semigroups.
- Classification of congruences on a completely O-Simple semigroups, Using the Ree's structure Theorem.
- The Theory of Semigroups attracts many algebraists due to their applications to automata theory, formal languages network analogy .
- The student realizes the richness of properties enjoied by Semigroups, an algebraicstructure with fewer facilities than Groups.

*****

OPEN ELECTIVE

Course code	Title of the course	No. of Hours	No of Credits	Internal Marks	External Marks	Total Marks
MAT 35054	(A)Analytical Mathematics	06	04	25	75	100

Program Educational Objectives (PEOs)

- To understand the basic concepts of variables and constants, Degree of the equation, methods of solving linear and quadratic equations.
- To understand Numbers, series, sequences and summation.

UNIT-I : Time and Work

UNIT – II : Time and Distance

UNIT – III : Quadratic Equations

UNIT – IV : Arithmetic and Geometric Progressions

Text Book : Scope and standard as in "Objective Arithmetic'', by R.S.Agrrwal: S.Chanda

Program Specific Outcomes (PSOs)

Publications, , **Chapters 15, 17, 32, 33,** Revised 2018.

- Gains the Knowledge to solve problems related to linear and Quadratic equations.
- Gains the Knowledge about numbers involving series, sequences and Arithmetic and Geometric Progression

Program Outcomes (POs)

On completion of this course, the students will be able

- To have a proper understanding of mathematical applications in Economics, Finance, Commerce and Management.
- To explain the concepts and use of equations, formulae, mathematical expressions and relationships in a variety of contexts
- To apply the knowledge of mathematics (algebra, matrices, calculus) in solving business Problems.

****

Course code	Title of the course	No. of Hours	No of Credits	Internal Marks	External Marks	Total Marks
MAT 35054	(B)Mathematical Methods	06	04	25	75	100

Program Educational Objectives (PEOs)

The aim of this course is provide the students with the basic knowledge of various mathematicalmethods like partial fractions, matrices and basics in statistics.

UNIT-I: Partial Fractions

UNIT-II: Matrices

UNIT-III: Measures of Central tendency(Mean, Median and Mode)

UNIT- IV: Measures of Dispersion(Range, Semi-interquartile range, mean deviation, standarddeviation)

Text Books: Elementary Engineering Mathematics by B.S.Grewal, Khanna Publishers.

Program Specific Outcomes (PSOs)

- Gains the Knowledge to solve problems related to fractions and Matrices..
- Gains the Knowledge about Averages, central average and maximum values of the given data in a bounded region.
- Gains the Knowledge about Range, Semi-interquartile range, mean deviation, standard deviation and their coefficients for a given data.

Program Outcomes (PSOs)

On completion of this course, the students will be able

- To have a proper knowledge identifying and solving proper and improper fractions
- Gains the knowledge of matrices and its Applications for Real life problems.
- For a given data student can analize data in different fields to monitor changing patterns and to draw conclusions

*****

Course code	Title of the course	No. of Hours	No of Credits	Internal Marks	External Marks	Total Marks
MAT 35054	(C)Foundation Course in Mathematical Statistics	06	04	25	75	100

Program Educational Objectives (PEOs)

The main objective of this course is to introduced students with the

- Fundamental meaning of statistics and collection of data
- Different types of diagrammatic and graphic representation of data.
- Measures of central Tendency
- Measures of dispersion.

UNIT-I : Meaning and Scope of Statistics - Classification and Tabulation - Diagrammatic and Graphic Representation of Data – I :Diagrams - Interaction based on three modules covered - deadline for submitting assignments. **(22 Hours)**

UNIT-II : Diagrammatic and Graphic Representation of Data – II: Graphs - Diagrammatic and Graphic Representation of Data – III :Graphs - Measures of Central Tendency – Arithmetic Mean - Interaction based on the three modules covered - Deadline for Submitting assignments.

(23 Hours)

UNIT-III : Measures of Central Tendency – Median and Mode - Partition Values , Measure of dispersion – I : Quartile Deviation and standard deviation – Interaction based on the three modules covered- deadline for submitting assignments. **(22 Hours)**

UNIT-IV: Measures of dispersion – I – Quartile Deviation and standard deviation - Skewness and Kurtosis – Interaction based on the two modules covered – deadline for submitting assignments. **(23 Hours)**

Text Books:

Medhi J, Statistical Methods – an Introductory Text (New Age international(p)Ltd)

References book :-

1. Bhat. B. R. ,Srivenkatramana T. & Madhav Rao K. S., Statistics A beginner's text (New Age international (p) Ltd).
2. S.C.Gupta, V.K.Kapoor, Introduction to Mathematical Statistics (Sulthan Chand and Sons), 2003.
3. T.K.Chandra , D.Chatterjee , A first course in Probability (Narosa), 2003.
4. Sheldon M Ross, A first course in Probability (Pearson Education), 2007.
5. Marcello Pagano and Kimberlee Gauvreau, Principles of Biostatistics (Cenage Learning).

Program Specific Outcomes (PSOs)

- Gains the knowledge of scope of statistics, classification and tabulation and collection of data.
- Learns to effectively present the data through graphs and diagrams.
- Learns to analyze and interpret the given data through mean, median and mode
- Learns to analyze and interpret the given data through deviations, namely,

Program Outcomes (POs)

- Statistics helps in providing a better understanding and accurate description of nature's phenomena.
- Statistics helps in the proper and efficient planning of statistical inquiry in any filed of study.
- Statistics helps in collecting appropriate quantitative data.
- Statistics is the root of data analysis and applied in various fields such as Business, Medicine, finance, information Technology .

*****

Course code	Title of the course	No. of Hours	No of Credits	Internal Marks	External Marks	Total Marks
MAT 35055	Operation Research	06	04	25	75	100

Program Educational Objectives (PEOs)

- Operations research helps in solving problems in different environments that needs decision.
- This module aims to introduce students to use quantitative methods and techniques for effective decisions-making: model formulation and applications that are used in solving business decision problems.

UNIT I: Linear Programming Problem: Mathematical Formulation: ***Introduction*** - Mathematical Formulation of the Problem **Linear Programming problem : Graphical solution** Introduction- Graphical Solution Method – Some Exceptional Cases **Linear Programming : Simplex Method** :- The Computational Procedure – Use of Artificial Variables. **(22 Hours)**

UNIT II : **Transportation Problem:** Introduction – General Transportation Problem – The Transportation Table – Duality in Transportation Problem –Loops in Transportation Tables- LP Formulation of the Transportation Problem – Solution of a Transportation Problem – Finding an Intial Basic Feasible Solution – Test for Optimality – Degeneracy in transportation Problem – Transportation Algorithm (MODI Method) . *(23 Hours)*

UNIT III: **Assignment Problem:** Introduction – Mathematical Formulation of the problem – The Assignment Method – Special cases in Assignment problems. **(22 Hours)**

UNIT IV: Games and Strategies : Introduction – Two-Person Zero-Sum Games – Some Basic Terms- The Maximin – Minimax Principle – Games Without Saddle Points—Mixed Strategies – Graphic Solution of 2 x n and m x 2 Games – Dominance Property- Arithmetic Method for n x n Games – General Solution of m x n Rectangular Games. *(23 Hours)*

Text Books: Scope and Standard as in "**Operations Research**" by Kanti Swarup , P.k.Gupta andManMohan , Sultan Chand & Sons , New Delhi.

Unit I :Chapter 2: Sections 2.1 and 2.2, Chapter 3: Sections 3.1 to 3.3;
Chapter 4: Sections 4.3 and 4.4

Unit II :Chapter 10: Sections 10.1 to 10.11;
Unit III:Chapter 11: Sections 11.1 to 11.14,

Unit IV:Chapter 17: Sections 17.1 to17.7. 17.9.

Reference books:

1. S.D. Sharma, "Operations Research"
2. H.A Taha, "Operations Research – An Introduction".
3. Operation Research " By Pannerselvam R, Published by Prentice Hall of India New Delhi , 2002 Edition

Program Specific Outcomes (PSOs)

Apply the knowledge of basic optimization techniques in order to get best possible results from a set of several possible solution of different problems viz. linear programming problems, transportation problem, assignment problem and unconstrained and constrained problems etc. Formulate an optimization problem from its physical consideration. Select and implement an appropriate optimization technique keeping in mind its limitations in order to solve a particular optimization problem. Continue to acquire knowledge and skills of optimization techniques that are appropriate to professional activities. Extend their knowledge of basic optimization techniques to do interesting research work on these types of optimization techniques.

Program Outcomes (POs)

- Formulate some real life problems into Linear Programming Problem.
- Solve linear programming problem by using algebraic graphical method.
- Use the simplex method to find an optimal vector for the standard linear programming problem and the corresponding dual problem.
- Use operations research to solve transportation problems during the allocation of trucks to the formulate operation research models to solve real life problem.

****

Course code	Title of the course	No. of Hours	No of Credits	Internal Marks	External Marks	Total Marks
MAT 35056	(Skill Oriented Course practical) SCILAB	06	04	25	75	100

Program Educational Objectives (PEOs)

1. To give students the basic knowledge about SCI-LABTo train students thoroughly in methods of analysis and algebra, including the computational skills appropriate for mathematicians to use when solving problems.
2. To develop the skills pertinent to the practice of mathematics, including the students' abilities to formulate problems, to think creatively, and to synthesize information.
3. To teach students to use current mathematical concepts and data analysis techniques for problem solving.
4. To provide the student with the concepts of matrices, numerical techniques curve fitting and all basic concepts of differentiation, Integration and interpolation

List of experiments:

1.Basic Operations on Matrices/D.E/integrations.

2.Find the root of equation by Bisection and Regula Falsi Methods.

3.Find the root of equation by Newton Raphson Method

4.Find the root of equation by Iteration Method

5.Find the Lagrange's interpolating polynomial.

6.By method of least square fit a straight line

7. By method of least square fit a second degree polynomial.

8. By method of least square fit a power curve and exponential curve.

9.Find the area by Trapezoidal Rule

10. Find the area by Simpsons $1/3^{rd}$ and Simpsons $3/8^{th}$ Rule.

11. Find the solution of given differential equation by Euler's method and Picard's Rule.

12. Find the solution of given differential equation by R-K second and fourth order method.

Text Books:

1. Numerical Methods for Scientific and Engineering Computation by M.K.Jain, S.R.K.Iyengar and R.K.Jain, New Age International Publishers.
2. Mathematics for engineers and scientists by Alan Jeffrey,6th edition, CRC press.

References:

1. Fundamentals Of Mathematical Statistics by S.C.Guptha & V.K.Kapoor, S.Chand.
2. Introductory Methods of Numerical Analysis by S.Sastry, PHI Learning Pvt. Ltd.

Program Specific Outcomes (PSOs)

After completion of this course using SCILAB students will be able to

- solve problems on Algebraic, Matrices and Calculus
- find roots of an equation using different Methods
- solve interpolation problems
- fit a curve for straight line, parabola, exponential and power curves
- evaluate Numerical differentiation and integration

Program Outcomes (POs)

After completion of this course using SCILAB students will be able to

- solve problems on Algebraic, Matrices and Calculus
- fit a curve for straight line, parabola, exponential and power curves
- evaluate Numerical differentiation and integration

******

SEMESTER - IV

Course code	Title of the course	No. of Hours	No of Credits	Internal Marks	External Marks	Total Marks
MAT 45051	Graph Theory	06	04	25	75	100

Program Educational Objectives (PEOs)

The main objective of this course is to introduce students with the fundamental concepts in graphTheory, with a sense of some its modern applications and ithelps students to solve live problems that can be modelled by graphs.

UNIT-I: Introduction to Graphs : Definition - Graphs As Models - Vertex Degrees - Sub graph paths and cycles - The Matrix Representation of Graphs - Fusion. **(22 Hours)**

UNIT-II: Tress and connectivity : Definition and simple properties - Bridges -Spanning tress - Connector Problems - Shortest path Problem - Cut Vertices and connectivity. **(23 Hours)**

UNIT- III: Euler tours and Hamiltonian cycles: Euler tours - The Chinese Postman Problem – Hamiltonian graphs - The Traveling salesman Problem. **(22 Hours)**

UNIT –IV: Planar Graphs : Plane and Planar graphs - Euler's Formula - The platonic bodies - Kuratowski's Theorem - Non Hamiltonian plane graphs - The Dual of a plane graph. **(23 Hours)**

Text Book: Scope and Standard as in "**A First Look At Graph Theory**" By John Clark and Derek Allan Holton, Allied Publishers Ltd. **Chapters 1,2,3 and 5.**

Reference Books :-

1. Graph Theory With Application" J.A.Bondy and U.S.R.Murthy, Millon Press.
2. Discrete Mathematical Structure and Graph Theory" – By Rao.
3. A Text Book of "Graph Theory and its Applications" – By B.Suryanarayana and G.K.Ranganath.

Program Specific Outcomes (PSOs)

- Upon completion of this unit, the student will be able to: Understand the basic concepts of Graphs and Euler and Hamiltonian graphs and obtain a solution for Travelling salesman problems.
- Upon completion of this unit, the student will be able to: Study the properties of trees and able to find a minimal spanning tree for a given weighted graph.
- Upon completion of this unit, the student will be able to: Understand the purpose of introduction of concepts like cut-set, cut-vertex, Connectivity and separability.
- Upon completion of this unit, the student will be able to: Understand the utility planar, dual graphs and vector spaces of a graph.

Program Outcomes (POs)

After completing this course, the student will be able to: Understand the basic concepts of graphs , directed graphs, weighted graphs, trees, minimal spanning trees for a given graphs, Eulerian graphs, Hamiltonian graphs and apply the shortest path algorithm to solve some real life problems.

*****

Course code	Title of the course	No. of Hours	No of Credits	Internal Marks	External Marks	Total Marks
MAT 45052	Analytical Number Theory	06	04	25	75	100

Program Educational Objectives (PSOs)

- Identify and apply various properties of and relating to the integers including the Well-Ordering Principle, primes, unique factorization, the division algorithmand greatest common divisors.
- Identify certain number theoretic functions and their properties.
- Understand the concept of a congruence and use various results related to Congruence including the Chinese Remainder Theorem.
- Solve certain types of Diophantine equations.
- Identify how number theory is related to and used in cryptography.

UNIT I Arithmetical Functions and Dirichlet Multiplication: Introduction – The Mobius function $\mu(n)$ – The Euler totient function $\phi(n)$ –A relation connecting ϕ and μ - A product formula for $\phi(n)$ – The Dirichlet product of arithematical functions – Dirichlet inverses and the Mobius inversion formula – The Mangoldt function $\Lambda(n)$ – Multiplicative functions Multiplicative functions and Dirichlet multiplication – The inverse of a completely multiplicative function – Liouville's function – The divisor function $\sigma_\alpha(n)$ – Generalized Convolutions – Formal Powerseries – The Bell series of an Arithmetical function – Bell series and Dirichlet multiplications – Derivatives of arithmetical functions – The Selberg identity. **(22 Hours)**

UNIT II Averages Of Arithmetic Functions : Introduction - The big on notation- Asymptotic equality of functions – Euler's summation formula – Some elementary asymptotic formulas – The average order of d(n) - The average order of the divisor functions $\sigma_\alpha(n)$ – The average order of $\phi(n)$ – An application to the distribution of lattice points visible from the origin – The average order of $\mu(n)$ and of $\Lambda(n)$ – The partial sums of a Dirichlet product. **(23 Hours)**

UNIT III Congruences: Definition and basic properties of congruences – Residue classes and complete residue systems – Linear congruences – Reduced residue systems and the Euler – Fermat theorem – Polynomial congruences modulo p. Lagrange's theorem – Applications of Lagrange's theorem – Simultaneous linear congruences – The Chinese remainder theorem – Application of the Chinese remainder theorem –Polynomial congruences with prime powermoduli – The principle of cross – Classification – A decomposition property of reduced residue system. **(22 Hours)**

UNIT IV Quadratic Residues and The Quadratic Reciprocity Law: Quadratic residues – Legender's symbol and its properties – Evaluation of (-1|p) and (2|p) – Gauss' lemma – The quadratic reciprocity law – Application of the reciprocity law – The Jacobi symbol.

Primitive Roots : The exponent of a number mod m. Primitive roots – reduced Primitive roots and residue systems – The non existence of primitive roots mod 2^{α} for $\alpha \leq 3$.

(23 Hours)

Text Book :- Scope and Standard as in "**Introduction to Analytical Number Theory**", by Tom. M. Apostol, Springer International Student Edition

Unit I: Chapter 2: Section 2.1 to 2.19

Unit II : Chapter 3: Sections 3.1 to 3.10

Unit III: Chapter 5: Section 5.1 to 5.11

Unit IV : Chapter 9: Sections 9.1 to 9.7;

Chapter 10: Sections 10.1 to 10.3

Reference book :- Niven , I and Zuckerman , H.S (1972) "**An Introduction to the Theory of Numbers**", 3rd Edition, New Yory " John Wiley and sons, Inc.

Program Specific Outcomes (PSOs)

Understand the different types of partitions & compositions. students will have a working knowledge of the various types of identities. work with congruence's, solve congruence equations and systems of equations with one and more variables. be literate in the language and notation of number theory. Understand the concept of for n-colour partitions. Demonstrate knowledge and understanding of topics including, but not limited to divisibility, prime numbers, congruences.

Program Outcomes (POs)

- Find quotients and remainders from integer division
- Apply Euclid's algorithm and backwards substitution
- Understand the definitions of congruences, residue classes and least residues
- Add and subtract integers, modulo n multiply integers and calculate powers, modulo n
- Determine multiplicative inverses, modulo n and use to solve linear congruences

*****

Course code	Title of the course	No. of Hours	No of Credits	Internal Marks	External Marks	Total Marks
MAT 45053	Measure and Integration	06	04	25	75	100

Program Educational Objectives (PSOs)

To introduce Lebesgue's theory of measure and Integration which extends the familier notions of volume and " Area under a Graph" associated with the Riemann integral. It will be demonstrated that the Lebesgue integral can be computed by familier methods when they are applicable and that it is sufficient wide in scope to give the powerful convergence theorems needed for more advanced applications.

UNIT- I: Unions, Intersections and Compliments – Algebras of sets-Countable sets, Relations and Equivalences- Well Ordering and the Countable Ordinals, Open and Closed Sets of Real Numbers- continuous Functions – Borel sets. **(22 Hours)**

UNIT - II: Lebesgue Measure : Introduction, Outermeasure, Measurable sets and Lebesguemeasure, a non measurable set, Measurable functions, Little wood's three principles. **(23 Hours) UNIT- III:** The Lebesgue Integral : The Riemann integral, the Lebesgue integral of a bounded function over a set of finite measure, the integral of a non negative function, the general Lebesgue integral, convergence in measure. *(22 Hours)*

UNIT- IV: Differentiation and Integration : Differentiation of Monotone function- Functions of bounded variations- Differentiation of an integral – Absolute continuity-Convex functions.

(23 Hours)

Text Books: Scope and standard as in **"Real Analysis** "by H.L.Royden, Prentice Hall of India private limited, New Delhi, 2001-Third edition. **Chapter 1:Sections 1.3, 1.4, 1.6, 1.7and 1.9, Chapter 2: Sections 2.5, 2.6, 2.7, Chapter 3, Chapter 4 and**

Chapter 5.

Program Specific Outcomes (PSOs)

From this course a student will be able to

- Understand the need of development of modern theory of measure and integrations.
- Understand the Lebesgue integration is more general theory than Riemann integration theory and will be aware with some examples of functions which are not integral in sense of Riemann theory of integration but they are integrable in sense of Lebesgued integration.

Program Outcomes (POs)

After completing this course the student will be able to understand the need of development of modern theory of measure and integrations, Lebesgue integration, Riemann integration theory, functions of bounded variations and absolutely continuity and convex functions

*****

INTERNAL ELECTIVE

Course code	Title of the course	No. of Hours	No of Credits	Internal Marks	External Marks	Total Marks
MAT 45054	(A)Fluid Dynamics	06	04	25	75	100

Program Educational Objectives (PEOs)

The course on Fluid Dynamics is to introduce fundamental aspects of fluids flow behavior. Fluiddynamics is a subsection of fluid Mechanics.

- Clarify the actual properties of fluid and the result of such properties on fluid flow.
- Recognize the fundamental kinematics of a fluid element.
- To impart knowledge of source sink doubt and axi – symmetric flows.
- To impart knowledge on stream function, The milne Thomson circle theorem and The theorem of Blasius.

UNIT I - Kinematics of Fluid in Motion: Real Fluids and Ideal Fluids - Velocity of a Fluid at a Point – Streamlines and Path lines - Steady and Unsteady Flows - The Velocity Potential- The Vorticity Vector - Local and Particle Rates of change - The Equation of Continuity – Worked Example - Accelerations of a Fluid- Condition at a Rigid Boundary – General Analysis of Fluid Motion. **(22 Hours)**

UNIT II - Equations of Motion of a Fluid:-Pressure at a point in Fluid at Rest- Pressure at a point in a moving Fluid- Conditions at a Boundary of Two Inviscid Immiscible Fluids- Euler's Equations of Motion - Bernoulli's Equation - Worked Examples - Discussion of the case of Steady Motion under Conservative Body Forces. *(23 Hours)*

UNIT III - Some Three Dimensional Flows:- Introduction – Sources - Sinks and Doublets- Images in Rigid Infinite Plane – Images in Solid Spheres – Axi - Symmetric Flows : Stokes's Stream function – Some special Forms of the stream Function for Axi-Symmetric Irrotational Motions. **(22 Hours)**

UNIT IV - Some Two Dimensional Flows :- Meaning of Two – Dimensional Flow – Use of Cylindrical polar Co-ordinates – The Stream Function – The Complex Potential for Two- Dimensional – Irrotational – Incompressible Flow- Complex velocity Potentials for Standard Two – Dimensional Flows –The Milne – Thomson circle Theorem - The Theorem of Blasius Theorem. **(23 Hours)**

Text Book: Scope and Standard as in "**Text Book of Fluid Dynamics**" by F.Chorlton, C.B.S. Publishers and Distributors, Delhi , 1985, **Chapter 2, Chapter 3:Sections 3.1 to 3.7, Chapter 4 , and Chapter 5: Sections 5.1 to 5.5, 5.8 and 5.9**

Reference books:

1."**Classical Mechanics**" By Herbert Goldstain, Narosa Publishing House, Second Edition

2. "**Foundations Of Fluid Mechanics**" By S.W Yuvan Printice Hall of India Pvt.Ltd

Program Specific Outcomes (PSOs)

- Develop an appreciation for the properties of Newtonian fluids.
- Study analytical solutions to variety of simplified problems,
- Understand the dynamics of fluid flows and the governing non-dimensional param-eters,
- Apply concepts of mass, momentum and energy conservation to flows, grasp the basic ideas of turbulence.

Program Outcomes (POs)

At the end of this course a student will be able to

- Develop appreciation properties of fluids and understand the concept of rotational and irrotationl flow, stream functions velocity potential , sink, sourbe, vortex etc.
- Apply Scientific method strategies to fluid dynamics analyze qualitatively and

quantitatively the problem situation propose hypotheses and solutions.

- Acquire the knowledge of boundary layer and apply to solve problems and learn about the fundamental equations of the flow and energy.
- Understand concept of magnet hydrodynamics and understand the concept of thermal conductivity.

*****

Course code	Title of the course	No. of Hours	No of Credits	Internal Marks	External Marks	Total Marks
MAT 45054	(B)Cryptography	06	04	25	75	100

Program Educational Objectives (PEOs)

- Cryptography is the science of using Mathematics to encrypt and decrypt data.
- Cryptography enables you to store sensitive information or transmit it across insecure networks (Like the internet so that it cannot the read by anyone except the intended recipient

UNIT –I : Definition, Cryptography Encryption Schemes- Symmetric and asymmetric Cryptosystems- Cryptanalysis – Alphabets and Words- Permutations- Block Ciphers-Multiple Encryption- The use of Block Ciphers - Stream Ciphers- The Affine Cipher-Matrices and Linear Maps- Affine Linea Block Ciphers -Vigenere, Hill and Permutation Ciphers – Cryptanalysis of Affine Linear Block Ciphers – Secure Cryptosystems. **(22 Hours)**

UNIT – II: DES Feistel Ciphers-DES Algorithm-An Example-Security of DES-Exercises.

(22 Hours)

UNIT – III: AES - Notation-Cipher-Key Expansion- AN Example- Invcipher- Exercises.

(23 Hours)

UNIT-IV: Public Key Encryption Public –Key Encryption: Idea- Security-RSA Cryptosystem - Rabin Encryption-Diffie-Hellman Key Exchange-ElGamal Encryption- Exercises.

(22 Hours)

TextBook: Scope and Standard as in **Sections 3.1 to 3.15 of chapter 3, 5.1 to 5.5 of Chapter 5,and6.1 to 6.6 of chapter 6, and 8.1 to 8.7 of chapter 8** above of the Book "**Introduction to Cryptography**" of Johannes A. Buchmann, Springer Publishers.

References : Cryptography and Network Security- authors Forozezan,

Program Specific Outcomes (PSOs)

- There are four main goals in Cryptography: confidentiality, integrity , authentications and non-repudiation.

Program Outcomes (PSOs)

- Understand and anyasle data encryption standard such as Diffie-Hellman key exchange EIGamal Cryptosystem etc, protocols

*****

Course code	Title of the course	No. of Hours	No of Credits	Internal Marks	External Marks	Total Marks
MAT 45054	(C)Coding Theory	06	04	25	75	100

Program Educational Objectives (PEOs)

To recognize mistakes in transmission of messages and to introduce the basic concepts of codingtheory such as linear codes, awesome and Related codes, and cyclic Linear codes.

UNIT I : Introduction to Coding Theory : Introduction – Basic Assumptions- Correcting and Detecting Error Patterns – Information Rate – The Effects of Error Corrections and Detection – Finding the Most Likely Codeword Transmitted Some Basic Algebra – Weight and Distance – Maximum Likelihood Decoding Reliability of MLD – Error Detecting Codes – Error Correcting Codes. **(22 Hours)**

UNIT II : Linear Codes : Two Important Subspaces – Independence, Basis, Dimension – Matrices – Bases for C = < S > and C - Generating Matrices and Encoding – Parity – Check Matrices – Equivalent Codes – Distance of Linear Code – Cosets – MLD for Linear Codes – Reliability of IMLD for Linear Codes. **(23 Hours)**

UNIT III : Perfect and Related Codes : Some Bounds for Codes – Perfect Codes – Hamming Codes – Extended Codes- The Extended Golay Code – Decoding the Extended Golay Code- The Golay Code – Reed – Mullar Codes – Fast Decoding for RM (1,m). **(22 Hours)**

UNIT IV : Cyclic Linear Codes : Polynomials and Words – Introduction to Cyclic Codes – Polynomial Encoding and Decoding – Finding Cyclic Codes – Dual Cyclic Codes. **(23 Hours)**

Text Books: Scope and Standard as in **"Coding Theory The Essentials"** by D.G.Hoffman, D.A. Leonard, C.C. Linder, K.T.Phelps, C.A.Rodger, J.R.Wall, Monographs and text books in Pure and Applied Mathematics. Chapter 1, Chapter 2, Chapter 3, Chapter 4.

Program Specific Outcomes (PSOs)

- To understand how to write codes and Correcting and Detecting Error Patterns.
- To Know and write how to decode and encode the given Cyclic linear codes.

Program Outcomes (POs)

After completing this course , the student will be able to the under study will actually want to become familiar with some logarithmic properties of particulars kinds of codes that at generallyutilized in Engineering.

****

Course code	Title of the course	No. of Hours	No of Credits	Internal Marks	External Marks	Total Marks
MAT 45055	MAT - LAB	06	04	25	75	100

Program Educational Objectives (PEOs)

There are no formal prerequisites for this course. It is intended to assist undergraduates in learning the basics of programming in general and programming MATLAB® in particular. Only the very basics of programming in MATLAB will be covered, with the goal of having students become comfortable enough to continue learning MATLAB and other programming languages on their own

The students should have a way to access their files whenever they start working. If no other solution is possible, a USB "stick" can easily hold the student's files. The students need to haveaccess to MATLAB outside of class hours.

Elementary operations: Arithmetic Operations- Numbers and its Operations – Vectors and matrices Operations with vectors -Functions for vectors - Trigonometric operations – Exponential operations – matrix Operations--Polynomials

2D and 3D Plots: MATLAB Plotting – 2D plots – Axis Scales – Multiple Graphs – Subplots – Color plots – Plotting Polynomial – Drawing Contours – Polar Plots – 3D Plots – Curves in Space – Save Plots.

Matrices: Properties of Eigen Values and Eigen Vectors- Cayley Hamilton Theorem-Diagonalization by Similarity transformation- Orthogonal transformation

Differentiation and Integration: Finding first Order Ordinary Derivatives – second order Derivatives – Partial Derivatives.- Indefinite Integrals – Definite Integrals – Multiple integrals.

Solution of Differential Equations: First order Differential Equations – Second and Higher order Differential Equations – Solution of system of homogeneous first order and second order Differential Equations by Matrix Method.

Text Books : 1. A Guide to MATLAB for Beginners and Experienced Users-Brian R. Hunt Ronald L. Lipsman Jonathan M. Rosenberg with Kevin R. Coombes, John E. Osborn, and Garrett J. Stuck- Cambridge University Press.

2. B A S I C S O F and Beyond MATLAB- Andrew Knight--CHAPMAN & HALL/CRC

Andrew Knight- CRC Press-Boca Raton London New York Washington, D.C.

Reference Books :

1. A Guide to MATLAB for Beginners and Experienced Users-Brian R. Hunt Ronald L. Lipsman Jonathan M. Rosenberg with Kevin R. Coombes, John E. Osborn, and Garrett J. Stuck-Cambridge University Press.

2. B A S I C S O F and Beyond MATLAB- Andrew Knight--CHAPMAN & HALL/CRC Andrew Knight- CRC Press-Boca Raton London New York Washington, D.C.

Program Specific Outcomes (PSOs)

- To Under stand elementary operations involving in mathematical functions.
- Write the programmes 2D and 3D PLOTS
- Develop the programs using matrices
- Implement simple differentiation and integration techniques in MAT Lab
- Understand the real solutions of differential equations

Program Outcomes (PSOs)

- Understand the elementary operations by using mathematical functions
- Understand the main features of the MATLAB program development environment to enable their
  usage in the higher learning.
- Implement simple mathematical functions/equations in numerical computing environment such as MATLAB
- Interpret and visualize simple mathematical functions and operations thereon using plots/display.
- Analyze the program for correctness and determine/estimate/predict the output and verify it under simulation environment using MATLAB tools.

*****

Course code	Title of the course	No. of Hours	No of Credits	Internal Marks	External Marks	Total Marks
MAT 45056	(Multidisciplinary Project) Mathematical Modelling	06	04	25	75	100

Program Educational Objectives (PEOs)

- To know concepts of Mathematical Modelling for live examples through ordinary Differential Equation First order.
- To construct Mathematical Modelling for Population dynamics, planetary motions, medicine, Arms race, international trades, epidemics by using ordinary differential equation of first order.
- To model a mathematical modeling of motion of satellites , plantery bodies so on Through Ordinary differential Equations of second order.
- To construct Mathematical Modelling for Economics ,population dynamics, mass – Balance, Moment um Balance through difference equations

UNIT-1:- Mathematical Modelling Through Ordinary Differential Equations of First Order Linear Growth And Decay Models - Non Linear Growth And Decay Models - Compartment Models-Mathematical Modeling in Dynamics through Ordinary Differential Equations of FirstOrder - Mathematical Modelling of Geometrical problems through Ordinary Differential Equations of First order. **(22 Hours)**

UNIT-II:- Mathematical Modelling Through Systems of Ordinary Differential Equations of theFirst order.Mathematical Modelling in population Dynamics – Mathematical Modelling ofEpidemics through systems of Ordinary Differential Equations of First order – CompartmentModels Through systems of Ordinary Differentional Equations – Mathematical Modelling In Economics based on Systems of Ordinary Differntal Equations of first order-MathematicalModelling in Medicine, Arms race Battles and International Trade in terms of systems of

Ordinary Differential Equations - Mathematical Modelling in Dynamics through systems of Ordinary Differential Equations of First order. **(23 Hours)**

UNIT III :-Mathematical Modelling Through Ordinarry Differential Equations of Second order.Mathematical \Modelling of planetary motions- Mathematical Modeling of Circular Motion And Motion of Satellites- Mathematical Modelling Through Linear Differential Equatins of Secnd Order-Miscellaneous Mathematical Models Through Ordinary Differential Equations of the Second Order. **(22 Hours)**

UNITIV :- (A) Mathematical Modelling through Difference Equations:-Basic Theory of Linear Difference Equations with constant Co-effcients - Mathematical Modelling through Difference Equations in Economics and Finance – Mathematical Modelling through Difference Equations In Population Dynamics and Genetics. (B) Mathematical Modelling Through Partial Differential Equations:-Mass-Balance Equations –Momentum-Balance Equations. **(23 Hours)**

Text Book: Scope and Standard as in **"MATHEMATICAL MODELLING"** by J.N.Kapur, Wiley Eastern Limited (1988).**Chapter 2, Chapter 3, Chapter 4, Chapter 5:** *Sections 5.2 to 5.4, Chapter 6 : Sections 6.2 & 6.3.*

Program Specific Outcomes (PSOs)

To gain knowledge and create mathematical models of empirical or theoretical phenomena in domains such as the physical, natural, or social science; create variables and other abstractions to solve college-level mathematical problems in conjunction with previously-learned fundamental mathematical skills such as algebra.

Program Outcomes (POs)

To draw inferences from models using college-level mathematical techniques including problem solving, quantitative reasoning, and exploration using multiple representations such as equations, tables, and graphs; take an analytical approach to problems in their future endeavors.

*****

PAPER CODE:

M.Sc. Degree Examination, Month – Year I /
II / III / IV Semesters Core & Non-Core
Department of Applied Mathematics

Time : 3 Hours **Max. Marks:75**

(No additional Sheet will be supplied)

Part- A **5 x 5 = 25**

Answer **Any Five (5)** of the Following
Each Question Carries **Five (5)Marks**

UNIT-I

1.
2.

UNIT-II

3.
4.

UNIT-III

5.
6.

UNIT-IV

7.
8.

Part- B

Answer **Any Four (4)** of the FollowingEach Question Carries **12** marks

10.

9.

UNIT -I

4 X 12 ½ =50

{OR}

UNIT-II

11.

{OR}

12.

UNIT-III

13.

{OR}

14.

UNIT-IV

15.

{OR}

16.


THE END

Syllabus Template for M.Sc. Biotechnology

Program Code:BIOTECHYVUC

YOGI VEMANA UNIVERSITY

(NAAC Accreditation 'B' Grade with CGPA 2.54) http://www.yvu.edu.in/ NIRF Ranking -2020 in the band of 101-150

Based on

National Education Policy (NEP)-2020

Choice Based Credit System (CBCS)

(With effect from the Academic Year 2021-2022)

Program Educational Objectives (PEOs)	
PEO1	To make a significant contribution to the National Goals of promoting Knowledge to the Society through high Quality Education, Quality Teaching, Innovative Research in the Recent and Allied Fields of Life Sciences
PEO2	Create, select and apply appropriate techniques, resources and modern technology in multidisciplinary way
PEO3	To Motivate and Produce Highly Qualified Post Graduate Students who Can cater the Needs of Academic, Research Institutions as well Industry
PEO4	To train the Knowledgeable disciple students with good values, ethics, kind heart to help in nation building globally
PEO5	To create students with individual thinking as well a good team work oriented personnel with practical oriented, skilled to handle a variety of equipment, record, analyze and interpret the data generated

Program Specific Outcomes (PSOs)	
PSO1	
PSO2	Students would perform functions that demand higher competence in national/international organizations with sporty and helping spirits. Prepare the students for many competitive exams like CSIR-UGC NET, APSET, GATE, UPSC, APSC, and other Competitive Examinations
PSO3	
PSO4	Knowledgeable, disciplined students with good values, ethics, and kind heart will help in nation building globally. Student should be aware of ethical issues and regulatory considerations while addressing society needs for growth with honesty

Program Outcomes (POs)	
PO1	Biotechnology is an interdisciplinary course, empower the students to the Knowledge and Hands on Training in Advanced Areas of Biotechnology
PO2	Development Future Leaders in the Area of Biotechnology
PO3	Development of Scientific Temperament linked with social responsibilities

Alternatively, Course Code can be prepared based on the YVU OMR (as shown above)

YOGI VEMANA UNIVERSITY

Program: M.Sc., Biotechnology
Course: M.Sc., Biotechnology
Syllabus for Semester: I, II, III and IV

SYLLABUS FOR APPROVAL

S. No	Heading	Particulars
1	Title of the Course	M.Sc., Biotechnology
2	Eligibility for Admission	Passed B. Sc., / B.Sc., (Vocational) degree with Biotechnology / Chemistry as one main subject along with any of the two subjects from Microbiology / Biochemistry / Botany / Zoology / Agricultural Sciences / Nutrition/Food Science & Quality Control / Environmental Sciences / Human Genetics / Fisheries / Mathematics (OR) B.Sc. in Farm Science / Veterinary Science (OR) Bachelor's degree in Medicine / Pharmaceutical Sciences/Agriculture/Fishery (OR) B.E / B.Tech. in Biotechnology
3	Passing Marks	40%
4	Regulations	YVU-Academic Regulations-2021 (Proposed)
5	No. of Years / Semesters	Full Time 2 Years / 4 Semesters
6	Level	
7	Pattern	
8	Status	
9	To be Implemented From	From Academic Year 2021-2023 (Batch of Students 2021-23 to 2023-25)

Details of the Board of Studies:

S. No	Name of the Member	BOS Committee	Signature
1	Dr. A. Chandra Sekhar	Chairman	
2	Prof. P. Chandramathi Shankar	Internal Member	
3	Prof. G. Padmaja	External Member	
4	Dr. Lakshminarayana R. Vemireddy	External Member	
5	Dr. P. Kalpana	Member (UG Board Chairman)	
6	Dr. Ratnagiri Polavarapu	Industry Management	
7	Mr. P. Bharath Naveen	PG Meritorious Student	

YOGI VEMANA UNIVERSITY
Vemanapuram, Kadapa-516 005, A.P., INDIA

(A State University, Accredited with "B" Grade by NAAC)
M.Sc. Biotechnology Syllabus

(For the students admitted during the academic year 2021 – 22 onwards)

Semester	Components of Study	Course Code	Title of the Course	No. of credits	No. of hours per week	Practical / Project	Internal Assessment	Semester End Exams	Total
SEMESTER-I	Core	BIOTECH15081	Core Paper-I: Cell Biology and Genetics	04	04		25	75	100
		BIOTECH15082	Core Paper-II: Structure and Functions of Biomolecules	04	04		25	75	100
		BIOTECH15083	Core Paper-III: Fundamental Microbiology	04	04		25	75	100
	Internal Elective	BIOTECH15084	(A) Bioanalytical Techniques	04	04		25	75	100
			(B) Basics in Bioinformatics and Biostatistics		04				
			(C) Introduction to Nanobiotechnology		04				
			Tutorial and Seminar	00	04		00	00	000
	Practical	BIOTECH15085	Practical-I>Cell Biology Genetics and Biomolecules	04		16		100	100
	Practical	BIOTECH15086	Practical-II>Microbial and Analytical Techniques	04		16		100	100
	Sub-total			24	28	32	100	500	600
SEMESTER-II	Core	BIOTECH25081	Core Paper-I: Molecular Biology	04	04		25	75	100
		BIOTECH25082	Core Paper-II: Immunology	04	04		25	75	100
		BIOTECH25083	Core Paper-III: Enzymology	04	04		25	75	100
	Open Elective	BIOTECH25084	(A) Essentials of Biotechnology	04	04		25	75	100
			(B) Environmental Biotechnology		04				
			(C)SWAYAM /MOOCs/ NPTEL		04				
			Tutorial and Seminar	00	04	00	00	00	000
	Practical	BIOTECH25085	Practical-III>Molecular Biology and Bioinformatics	04		16		100	100
	Practical	BIOTECH25086	Practical-IV>Immunology and Enzymology	04		16		100	100
	Sub-total			24	28	32	100	500	600
SEMESTER-III	Core	BIOTECH35081	Core Paper-I: Genetic Engineering	04	04		25	75	100
		BIOTECH35082	Core Paper-II: Food and Industrial Biotechnology	04	04		25	75	100
		BIOTECH35083	Core Paper-III: Bioprocess Engineering	04	04		25	75	100
	Open Electives	BIOTECH35084	(A) Introduction to Bioethics in Biotechnology	04	04		25	75	100
			(B) Biotechnological Basis for Organic Farming		04				
			(C) SWAYAM /MOOCs/ NPTEL		04				
	Practical	BIOTECH35085	Practical-V>Bioprocess and Industrial Biotechnology	04		16		100	100
	Skill				04		10	40	

I	Oriented Course Practical	BIOTECH35086	Mushroom Culture (Theory) Mushroom Culture (Lab)	04		08		50	100
			Tutorial and Seminar	00	04	00	00	00	000

			Problem Based Learning (Industrial Visit and Report)	00	00	00	00	00	000
	Sub-total			24	32	24	110	490	600
SEMESTER-IV	Core	BIOTECH45081	Core Paper-I: Plant Biotechnology	04	04		25	75	100
		BIOTECH45082	Core Paper-II: Animal Biotechnology	04	04		25	75	100
		BIOTECH45083	Core Paper-III: Functional Genomics / Multiomics	04	04		25	75	100
	Internal Elective	BIOTECH45084	(A) IPR, Bioethics and Management	04	04		25	75	100
			(B) Medical Biotechnology and Vaccinology		04				
			(C) Stem Cell Technology and Regenerative Medicine		04				
	Practical	BIOTECH45085	Practical-V[> Plant and Animal Biotechnology Lab	04		16		100	100
	Multi-Disciplenary / Project	BIOTECH45086	Multi Disciplinary Project	04		16		100	100
	Sub-total			24	28	32	100	500	600
Grand Total				**96**	**116**	**120**	**400**	**2000**	**2400**

- All core papers are Mandatory
- Compulsory Foundation choose one paper.
- Internal/Open Elective – Choose one paper each.Open Electives are for the students of other Departments in the varsity.
- Skill Oriented course is mandatory. Relevant society along with practical (10 marks internal, 40 final theory and 50 for practical's).
- Interested students may register for SWAYAM /MOOCs/ NPTEL with the approval of the concerned DDC for the award of the grade as 'open elective'.
- Choose one from Multi-Disciplinary (Circle formation with other subjects/Dept. of Arts/ Commerce) Course or Project (Collaboration with various firms/companies/societies) work.

Programme: ***M. Sc.*****, Biotechnology**
Core Paper-I: **Cell Biology and Genetics**
Type of Course: **Core**
Course No.: **BIOTECH15081**

Semester: **I**

UNIT – I (16hrs):

Cell Theory and The Cell: Discovery of cell and the cell theory, exceptions to the cell theory. Overview of Prokaryotic *vs.* Eukaryotic Cells. Eukaryotic cell compartmentalization. Cell Membrane: Historical models for structure of plasma membrane. Membrane proteins.. Cytoskeleton: Microtubles, Actin Filaments and Intermediate Filaments and functions. Role of cytoskeleton in intercellular transport and motor movements; implications in flagellar and other movement. **Structure and Function of Cell Organelles:** Mitochondria, structural organization and biogenesis, Chloroplast (plastids): Polymorphic forms of plastids. Structural organization and functions of chloroplast. Role of mitochondria and chloroplast in cellular energy transactions., Endoplasmic Reticulum (E.R): structure and functions, Ribosomes: prokaryotic and Eukaryotic, Golgi complex, Lysomes and Peroxisomes.The Cell Nucleus: Structure and function of Nuclear Envelope, Nucleolus.

UNIT – II (16hrs):
Cell Signalling: Cell adhesion and Cell Junctions, Membrane transport and Vesicular transport. Hormones and their receptors, cell surface receptor, signaling through G-protein coupled receptors, signal transduction pathways, second messengers, regulation of signaling pathways, bacterial and plant twocomponent systems, light signaling in plants, bacterial chemotaxis and quorum sensing. **Cellular communication** Regulation of hematopoiesis, general principles of cell communication, cell adhesion and roles of different adhesion molecules, gap junctions, extracellular matrix, integrins, neurotransmission and its regulation. **Cancer** Genetic rearrangements in progenitor cells, oncogenes, tumor suppressor genes, cancer and the cell cycle, virus-induced cancer, metastasis, interaction of cancer cells with normal cells, apoptosis, therapeutic interventions of uncontrolled cell growth.

UNIT – III (16hrs):
Eukaryotic chromosome structure and charactaerstics– chromatin, and heterochromatin. Polytene and lamp brush chromosomes. .Cell Division: **Mitosis:** Mechanism of cell division – mitiotic apparatus, cytokinesis, chromosome movement – present concept. Meiotic process – stages, Metaphase Chromosomes: Centromere and Kinetochore. **Meiosis:** Stages of Meiosis, chromosome pairing, molecular mechanisms of recombination - synaptonemal complex and Gene Conversion. Comparison of mitosis and meiosis. Significance of Meiosis. **Cell Cycle:** Overview of Cell Cycle, Cell division control in multi cellular animals (regulation of eukaryotic cell cycle).

UNIT – IV (18hrs):
Classical Genetics: Phenotype, Genotype, Trait, Mendelian Laws of Inheritance.

Modification of Mendelian Ratios: Incomplete Dominance, Codominance. Gene Interactions

– Lethal Genes, Recessive Epistasis, Dominant Epistasis, Multiple Alleles, Pleiotropy, Penetrance and Expressivity. **Extra chromosomal inheritance**: Cytoplasmic or Organellar Inheritance. Inheritance of mitochondrial and chloroplast genes, Maternal inheritance.
Linkage - Linkage and crossing over, cross over frequency, **Recombination**: Types, Molecular

mechanism of recombination. Homologous, site specific and non-homologous recombination. Factors affecting recombination: interference.

Sex Determination: Genetics of sex chromosomes – sex determination, and dosage compensation: molecular mechanism of selective chromosomal condensation (Barr body formation).

Mutations: Types of mutations and chromosomal mutations. Chromosomal aberrations: deletions, duplications, translocations and inversions. Numerical changes in chromosome number – euploidy, haploidy, polyploidy – their fundamental and practical significance. Induction of mutations and mutagenesis – types of mutagens. Practical applications of mutations.

COURSE OBJECTIVES:

The entire course is designed to brushup the student with the Cell structure. Further, the different subunits of the present course / paper is designed to have more of the molecular basis of life (Cell), structure of subcomponents of the cell and its multiplication. Further, to lay a strong foundation in the

inheritance patterns of the phenotypes / genes and make them ready for the versatile and most challenging research fields of Life Sciences.

COURSE OUTCOMES:

At the formal end of the course student will be able to

I- Get basic knowledge of Difference Cell types, Molecular insights of Plasmamembrane and Cytoskeleton

II: It will enhance their knowledge on the molecular structures of sub-compartments and components ofliving cell

III: It will enhance their knowledge on the genetic inheritance of the traits and will lay a strong base for their upcoming semesters as well for their future research in Biological Sciences

IV: It will give the knowledge of the molecular mechanisms of cell division, cell division and controland basics of cancers induction.

Suggested Practical's:

1) Problems related to Mendel's laws, Probability, Pedigree analysis
2) Problems related to codominance, multiple alleles, lethal alleles, epistasis, complementation
3) analysis, X linkage, sex-limited and sex influenced inheritance.
4) Problems related to two-point test cross, three point mapping
5) Sex determination in Drosophila humans, and plants

Suggested Readings:

1. D. Peter Snustad, Michael J. Simmons. 2012. Principles of Genetics. John Wiley & Son, USA.
2. Peter J. Russell 2014. iGenetics: A Molecular Approach. Pearson Ltd. USA.
3. Klug S.W, Cummings M.R., Spencer C.A., Palladino M.A. 10th Edition, Concepts of Genetics. Pearson Ltd. USA.
4. Daniel L. Hartl, Elizabeth W. Jones. 1997. Genetics: Principles and Analysis. Jones and Bartlett Publishers Inc. USA.
5. Singh B.D. 2015. Plant Breeding principles and Methods. Kalyani Publishers. India
6. Tamarin, R. H. 2004. Principles of Genetics. McGraw-Hill Higher Education. USA
7. Hartwell, et al. 2004: Genetics:From Genes to Genomes. McGraw-Hill Higher Education. USA
8. Pierce, B. A. (2012). Genetics: A conceptual approach. WH Freeman. USA.
9. George Acquaah. 2012. Plant Genetics and Breeding. Wiley-Blackwell. USA.
10. Karvita B. Ahluwalia. Genetics.1985. Wiley Eastern Limited. India.
11. P K Gupta.2010. Genetics. Rastogi Publications. India.
12. P.S.Verma and V.K.Agarwal. 2010. Genetics. S. Chand Publishing. India.
13. V.K.Khanna. 2017.Fundamentals of Genetics Laboratory Manual. Kalyani Publishers. India.
14. Gardner and Simmons Snustad, 2005. Principles of Genetics, John Wiley and Sons, Singapore.

15. De Robertis EDP & EMF De Robertis. 2001. Cell and Molecular biology. Lippincott Williams & Wilkins.Bombay.
16. Harvey Lodish et al , Molecular Cell Biology, (W. H. Freeman; Sixth Edition edition)
17. Alberts B, Johnson A, Lewis J, Raff Martin, Roberts K and Walter P. (2007) Molecular Biology of the Cell. Garland Publ., New York.
18. John Nelson, 2008. Structure and Function in Cell Signalling, Wiley
19. Hand book cell signaling. 2009. Ralph A. Bradshaw and Edward A Dennis

(Second Edition), Science direct.

Programme: ***M. Sc.,*** **Biotechnology**

Core Paper-II: **Structure and Functions of Biomolecules**
Type of Course: **Core**
Course No.: **BIOTECH15082**

Semester: **I**

UNIT – I (16hrs):: Nucleic acids – Types of Nucleic acids, chemistry of Nucleic acids, structure of purines and pyramidines, modified bases nucleosides and nucleotides; structural polymorphism of DNA and RNA types. Identification of DNA and RNA molecules, Ribose Puckering, Melting Temperature ™, DNA binding proteins, forms of DNA (A,B and Z).

UNIT – II (17hrs):: Chemical bonds – covalent, coordinate, electrostatic hydrogen, ionic bonds; VanderWal forces; hydrophilic and hydrophobic interactions; functional groups. Definition and classification of carbohydrates. Outlines of structures of starch, cellulose, lignins, suberins, hemicellulose, amylose, amylopectin.

UNIT – III (16hrs):– Outline structures of Proteins: Primary, Secondary and Tertiary. Structures: Peptide Bond, Protein Ramachandran Plot. Classification of Aminoacids and Sequencing. Chemical reactions of proteins and amino acids. Outline structures of lipids and their classification, functions of lipids and characteristics of lipopolysaccharides. Outline Structures of Vitamins and Plant Growth Regulators: Auxins (IAA, IBA), Gibberellins (GA1, GA3, GA15, GA17), Cytokinin's, ABA, Ethylene, Jasmonic Acid, Brassinosteroids (BRs), Salicylic acid, Florigen

UNIT – IV (18Hrs): Introduction to Secondary Metabolites: Outline structures and biological functions of Pigments (Chlorophylls, Carotenoids, Anthocyanins, Betalains, Phycobilins, Cytochromes A3, Cytochrome P450, Haemoglobin and Bile Pigments), Tannins (Melanin), Phenolics (Phenolic Acetic Acids) Alkaloits: Isoprenoids, Mono, bi, Tri and Sesqui terpernoids; Microbial Toxins: Endo and Exotoxins. Antibiotics: Types, Structure and Mode of Action.

Objectives:

The major goal of biomolecules is to study the cellular process of living organisms and how these are often the end product and a critical component, and an individual to best to achieve the learning objectives in all the other laboratory based of life science related trainings. It also describes the structure and function of lipids, nucleic acids, carbohydrates and proteins. 2. Show the relationship between lipids, nucleic acids, proteins and carbohydrates including the connection between their subunits and elements that make up the molecules.

Outcomes:

1. students will demonstrate knowledge in Biomolecular science, including an understanding of: a) The connection between molecular properties and cellular activities; b) The connection between cellular activities and biological responses; c) Cellular structure and function, including chemical composition, physiochemical and functional

organization of organelles, and basic cellular metabolism;
2. students will develop research questions and the approach they will use to address that question.
3. students will do a research project, analyse and evaluate the data generated and present their findings in both an oral and written format.

REFERENCES

1. Biochemistry. 1992. R.H. Abeles, Panima Publication. PP 894.
2. Principles of Biochemistry. 2nd ed. 1993. A.L. Lehninger, D.L.Nelson.M.Cox. Paniama Publications. PP. 1090.
3. Harper's biochemistry. 1988. R.K. Murray. D.K. Granner, P.A. Mayes. Printice Hall International.
4. Biochemistry of the Nucleic acids. 1992. 11th ed. R.L.P. Adams, J.T. Knowler, D.P. Leader, Chapman and Hall.
5. Proteins: Structure, function and evolution. Dickerson & Geis, 2nd Edn.Banjamin/Cummings, Meulo park, Calif 1983.
6. The Proteins: Neurath and Hill, 3rd Edn. Academic New York.
7. Biochemistry, A problem approach, 2nd ed. Wood, W.B., Addison Wesley, 1981.
8. Biological Chemistry, Mahler & Cordes.
9. Text book of Biochemistry West, W.S. Todd, Mason & Vanbruggen, Macmillian & Co.
10. Principles of Biochemistry – White –A, Handler, P and Smith E.L.Mc.Graw-Hill.
11. Biochemistry – Cantrow, A. Sehepartz. B. Sunders – Japan.
12. The Carbohydrates: Pigman & Hartman Vol.II – A & II-B.
13. Biochemistry Voet & Voet.
14. Comprehensive biochemistry – Florkin & Storz, Academic Press.

Programme: ***M. Sc.,*** **Biotechnology**

Core Paper-III: **Fundamental Microbiology**
Type of Course: **Core**
Course No.: **BIOTECH15083**

Semester: **I**

UNIT – I (17hrs): History and scope of microbiology- Discovery of microorganisms, Theory of spontaneous generation, germ theory of diseases, Major contribution and events, scope and relevance, systematic diversity, Carl wooes 3 domain system, five kingdom systems. Nutritional requirements to microorganisms – mode of nutrition – phototrophy, chemotrophy – methylotrophy organotrophy, mixotrophy, saprophytic, symbiotic and parasitic, Interaction of microbes. Microorganisms and disease

UNIT -11 ((17hrs): Isolation, enumeration. approaches for obtaining pure cultures from different sources, cultivation of aerobic and anaerobic microorganisms, (continuous, batch, synchronous and stock cultures), maintenance and preservation of microbial cultures, methods of identification and characterization of microorganisms by staining techniques, Control of microorganisms – principles, physical and chemical agents, assay of antimicrobial action. Batch and continuous sterilization of media and air.

UNIT – 111 (16 hrs): Ultra structure of nucleus and nuclear envelop. Organization of prokaryotic and Eukaryotic chromosomes – structure of nucleosome, c-value, cell cycle overview, cell growth and extra cellular signals, regulations of cell cycle progressions, unit of genes, establishments of cistrons, recons and mutons, complementation, modern concept of gene, mutagenesis, mutation screening, AMES test.

UNIT IV(17hrs):: Gene transfer mechanisms in bacterial and viruses: Plasmids : types, properties, detection, transfer. Transposable elements and insertion sequences – types of transposons and transposition. Bacterial transformation –molecular mechanisms, Bacterial conjugation – Hfr transfer, Rec proteins. Bacteriophages T4 and Lamba – Genome organization, replication, recombination, generalized and specialized transduction. Eukaryotic viruses, Sub-Viral Agents (Prions).

Course Objective:

- This course intends to provide insights into the historical developments in microbiology, classification, growth, culture methods, control, metabolic activities and different types of Interaction of microbes
- Insight into current, exciting topics in microbial genetics and related fields

Course Outcome:

- At the end of this course, student will have thorough knowledge of the history of microbiology, classification, culturing & preservation techniques and control of microorganism.
- By the end of this course, student will be well equipped with the knowledge of the morphology, nutrition and growth of bacteria.
- By the end of this course, student will have detailed knowledge of microbial metabolism.
- Understanding of fundamental concepts in microbial genetics
- At the end of this course, the student will be well equipped with the knowledge of diverse group of prokaryotic organisms and also the structure and classification of viruses.
- By the end of this course, the student will have a thorough knowledge of different types of Gene transfer mechanisms.
- Understanding of fundamental concepts in microbial genetics

REFERENCES

1. **Microbiology: concepts and Applications. Michael J. Pelczar, Jr., E.C.S., Chan, Noel R. Krieg, 1993. Mc. Graw Hill, Inc.**

2. **Introductory Microbiology. 1995, by Trevor Gross.**
3. **Fundamentals of Microbiology. 4th ed. 1994. I.E. Alcamo. Scientific Publication.**
4. **Microbiology, 1990. 4th Ed.B.D. Davis, R. Dulbeco, H.N. Eisen and H.S. Ginsberg and J.B. Lippincott Company.**
5. **Fundamental Principles of Bacteriology. 1994. A.J. Sake. Tata McGraw Hill.**
6. **Laboratory Experiments in Microbiology. 3rd ed. Brief Version. 1992. T.R. Johnson and C.L. Case. Addision Wesley International Publications. PP 350.**
7. **Microbiological Applications : A Laboratory Manual in General Microbiology. 5th ed. 1990. H.J. Benson. Panima Publications. PP 459.**

Practical Course

1. **Skerman, N.B.D. A guide to the identification of the Genera of Bacteria.**
2. **Bergey's Manual of Determinative Bacteriology.**

Programme: ***M. Sc.,*** **Biotechnology**

Type of Course: **Internal Elective**
Internal Elective : (A) **Bioanalytical Techniques**
Course No.: **BIOTECH15084-A**
Semester: **I**

UNIT – I(15 Hrs):

Microscopy: Principles and applications of Light, Phase contrast, Fluorescent, Electron Microscopy (SEM and TEM). Resolving powers of different microscopes. Different fixation and Staining techniques for

Electron Microscopy. Preparation of specimen for microscopy: Freeze-etch and Freeze-fraction methodsfor Electron Microscopy. Image processing methods in Microscopy.

Centrifugation –principles of sedimentation, preparative and analytical centrifuges, rotors, sedimentation analysis, density gradient centrifugation.

UNIT –II(18 Hrs):

Buffers: pH, Reaction kinetics, Thermodynamics, Colligative Properties.

Chromatography – general principles. paper, thin layer, gas-liquid, ion exchange, HPLC, molecular sieve and affinity chromatography techniques.

Electrophoresis: Horizontal and Vertical Gel Electrophoresis. PAGE - Native and SDS PAGE. Agarose

Gel Electrophoresis. Applications of PAGE and Agarose Gel Electrophoresis

UNIT – III(18 Hrs):

Spectroscopy – Electromagnetic spectrum of light Beer-Lambert law. UV-visible spectrophotomety fluorescence spectroscopy, Atomic Absorption spectroscopy, NMR spectrophotometry. Mass spectroscopy, MALDI-TOF. X-ray diffraction and X-ray crystallography (Molecular Structure Determination). Molecular Analysis using light scattering.

ESR Spectroscopy. Surface Plasma

Resonance methods.

UNIT – IV(18 Hrs):

Radioisotope tracer techniques – Nature and types of radioactivity, decay units, preparation of labelled biological compounds (Probe preparation), detection and measurement of different types of radio isotopesused in biology (GM counter, scintillation counter auto radiography). Incorporation of Radioisotopes in Biological Tissues and Cells.

Non-radio labelled Probes (DIG labelling). Molecular Imaging of Radio

active materials. Biological uses of radioisotopes, safety measures in handling radio-

Objective:

- The primary objectives of this course are to develop the skills to understand the theory and

practice of bio analytical techniques.

- To provide scientific understanding of analytical techniques and detail interpretation of results.

COURSE OUTCOMES:

- Understand microscopy and centrifugation.
- Understand different chromatography and Electrophoresis techniques for bio molecules separation
- Understand Spectroscopy techniques analysis.
- Understand Radioisotope tracer techniques

REFERENCE:

1. Biochemical techniques : Theory and Practical. 1987. J.F. Robft and B.J. White, Waveland Press, Inc. Prospect Heights, IL, PP 407.
2. Principles and Techniques of Practical Biochemistry, 1994. 4th ed. Eds. K. Wilson and J. Walker.
3. Physical Biochemistry: Applications to Biochemistry and Molecular Biology. 2nd ed. David Freifelder. W.H. Freeman and Company, New York.
4. Affinity Chromatography: Bio selective adsorption on insert matrices. 1992. W.H. Scouten, John Wiley & Sons, New York, PP 348.
5. Applications of HPLC in Biochemistry : Laboratory Techniques in Biochemistry and Molecular Biology. 1987. A. Fallon, R.F.G. Booth and L.D. Bell, eds. Elsevier Science Publishers, Amsterdam, the Netherlands. PP 338.

6. Electron microscopy: Principles and Techniques for biologists. 1992. J.J. Bozola and L.D. Rusel, Jones and Bartlett Publishers, Boston, M.A. PP 542.
7. Electrophoresis : Theory, techniques and biochemical applications. 2nd ed. 1986. A.T. Andrews, Oxford University Press, Oxford. PP 452.
8. Enzymatic analysis : A practical guide. 1993. Janet. V. Passonneau and Oliver. H. Lowry, Humana Press, Totowa, N.J. PP 400.
9. Enzyme assay : A Practical Approach. 1992. R. Eisenthal and M.J. Danson, Eds. IRL Press. PP. 351.
10. Flow Cytometry: A practical approach. 1990. M.G. Ormerod. Ed. IRL Press. PP 279.
11. Introduction to Biophysical methods for protein and Nucleic acid research. (1995). J.A. Glasel; and Murray P. Deutscher. Academic Press. PP 505.
12. Special Analytical techniques in Nutritional Biochemistry. 1991. Gopalakrishna and S.K. Ranjhan. Kalyani Publishers.
13. Methods in Non-radioactive deteraction, 1993. Gary C Howard. Ed. Appleton & Lange Earwalk. CT. PP. 342.
14. Preparative centrifugation : A Practical approach. 1992. D. Rickwood. Ed.IRL Press, PP 400.
15. Principles of Laboratory Instruments. 1993. L.E. Schoeff, R.H. Williams, Mosby Year-book Inc. Pp 473.
16. Radioisotopes in Biology : A Practical approach. 1990. R.J. Slater, Ed., IRL Press, PP 307.
17. Physical Chemistry. 1986. P.W. Atkins, W.H. Freeman. Sanfrancisco Pub.
18. Principles and techniques of Practical biochemistry, 1994 (4th ed.) by K. Wilson and J. Walker (eds).

Programme: ***M. Sc.,*** **Biotechnology**

Type of Course: **Internal Elective**
Internal Elective : (B) **Basics in Bioinformatics and Biostatistics**
Course No.: **BIOTECH15084-B**

Semester: **I**

UNIT – I (18 Hrs): Introduction to computers, Definition, block diagram, Components such as CPU etc. Storage devises, concept of hardware and software, Organization and working of computers operating systems: basics of operating systems and types – DOS, Windows. Classification of computers based on technology, usage and working principle,

UNIT –II (20 Hrs): Bioinformatics- Overview, History, Scope, Importance, Objectives of Bioinformatics, Kind of Data used, Major Bioinformatic Data Bases and search tools: NCBI, EMBL, DDBJ. Data integration and Data Analysis. Sequence analysis: Concepts, importance and alignment methods, comparative and multiple alignments and scoring methods. Applications of Bioinformatics: gene isolation (primer designing), comparative genomics, Insilico analysis drug designing and modeling.

UNIT –III (17 Hrs): Biostatistics- Introduction and scope of biostatistics – variables and attribution, diagrammatic representation of biological data. Measures of location and dispersion and skewness, Raw data, group data, construction of frequency distribution,

UNIT IV (18 Hrs):, Mean, Standard deviation and coefficient of variation, Correlation and regression concept,Tests of significance: Null hypotheis,T test, f-test, Dunken Hypothesis. Analysis of variance (ANOVA)-one-way and two-way classification. Elements of statistical quality control. Elements of Statistical packages and uses.

COURSE OBJECTIVES:

The entire course is designed to give the knowledge on the basics of computers, and how we can apply the knowledge of computers to solve the difficulties of the modern biotechnological / biological problems. Further it has a component of the Statistics that will give the knowledge on various methodologies available and their applications to solve and predict the output of biological data.

COURSE OUTCOMES:

At the formal end of the course student will be able to
I- It will give the basic knowledge on the computer and its components. Different operating systems and applications
II: It will give the knowledge on various databases and programs that are useful solving some of the problems in biological data
III: & IV: They give the knowledge on the methodologies and their applications for the prediction of the biological data authenticity as well the results outcome from the biological data generated from various experiments.

REFERENCES

1. Computing supplement to Models in Biology: Mathematics, Statistics and Computing. 1994. B. Brown

and P. Rothery. Sciential Publication.
2. Meical informatics: Computer applications in Health care. 1990. E. H. Shortliffe, L.E. Pereault, G. Wiederhold and L.M. Fagan. Addision-Wesly International Publications. PP 714.
3. Computing for Biologists. 1985. A Fielding Addison-Wesley Publishers.

4. Microcomputers in Biology: A Practical approach. 1985. C. R. Ireland and S.P. Long. IRL Press.
5. Subhas Mehta, “Dos made simple”, Golgotia Publications, New Delhi.
6. Taxali R.K., “Wordstat 4.0”, Tata Mc. Graw-Hill Publishing Company Ltd., New Delhi.
7. Statistical methods in Agriculture and Experimental biology. 2nd ed. 1993. R. Mead, R.N. Curnow, A.H. Hasted, Panima Publication, PP 415.

8. Introduction to Biostatistics. 1995. R.N. Forthafter and E.S. Lee. Academic Press. PP 656.
9. Statistics with application to the biological and health sciences. 1985. R.D. Remington and M.A. Schork, Prentice-Hall.
10. Biostatistics an introductory text, Goldstein, Avrom, New York, The Mac Millian Company, 1971.

Programme: ***M. Sc.,*** **Biotechnology**

Type of Course: **Internal Elective**
Internal Elective : (C) **Introduction to Nanobiotechnology**
Course No.: **BIOTECH15084-C**

Semester: **I**

UNIT-I

Introduction to Nanotechnology - Nanomaterials - Self-assembly to artificial assembly for creation of useful nanostructures – Bottoms up and Top down approach (Nano rods, nano cages, nanotubes, quantum dots, nanowires, metal / polymer-based nanostructures) – Preparation and Characterization of nanoparticles (particle size analyzer, microscopy viz., electron microscopy, atomic force microscopy

UNIT-II

Cell structure – Bio macromolecules: Types, Structure, Dynamics and interaction with water – Cellular nano machines – cellular transducers, membrane channels, membrane transporters, Membrane motors – Creation of bio-nanostructures (Nano liposomes, Nano micelles, Nanomotorsetc).

UNIT-III

Chemical, physical and biological properties of biomaterials and bio response: biomineralization, biosynthesis, and properties of natural materials (proteins, DNA, and polysaccharides), structure-property relationships in polymeric materials (synthetic polymers and structural proteins); Aerosol properties, application and dynamics; Statistical Mechanics in Biological Systems,

UNIT-IV

Nanoparticular carrier systems; Micro- and Nano-fluidics; Drug and gene delivery system; Microfabrication, Biosensors, Chip technologies, Nano- imaging, Metabolic engineering and Gene therapy.

Course Objectives

To understand the application of nanotechnology in the field of research, industry and developmental domains.

- To study basics in Nano- biotechnology and Nanoparticular carrier systems
- To provide the professional services to industry, research organization, institutes.
- To Study professional consultancy and research support for the relevant organization in the domain of super specialization.
- To provide, value based and ethical leadership in the professional and social life

COURSE OUTCOMES:

At the formal end of the course student will be able to

I- It will give the basic knowledge on the Nanotechnology - Nanomaterials and CharacterizationII: It will give the knowledge on various cell components in Nano sizes

III: & IV: They give the knowledge on the Chemical, physical and biological properties of biomaterials and Drug and gene delivery system

Suggested Readings:

1. Nalwa, H. S. 2005. Handbook of Nanostructured Biomaterials and Their Applications in

Nanobiotechnology. American Scientific Publications.
2. Niemeyer CM & Mirkin CA. Eds (2005). Nanobiotechnology: Concepts Applications and Perspectives, Wiley Inter-science publications.
3. Cao, G., and Wang, Y., (2004) Nanostructures and Nanomaterials: Synthesis, properties and applications, Imperial College Press.

Programme: ***M. Sc.,*** **Biotechnology**

Practical : Cell Biology Genetics and Biomolecules Lab
Type of Course: Practical
Course No.: BIOTECH15085

Semester: I

PRACTICALS

Programme: ***M. Sc.,*** **Biotechnology**

Practical : Microbial and Analytical Techniques Lab
Type of Course: Practical
Course No.: BIOTECH15086

Semester: I

PRACTICALS

Programme: ***M. Sc.*****, Biotechnology**
Core Paper-I: **Molecular Biology**
Type of Course: **Core**
Course No.: **BIOTECH25081**

Semester: **II**

UNIT – I (16hrs):

Identification of genetic material as DNA or RNA – Fred Griffith, Avery, Hershey Chase Experiments. Central dogma theory and flow of genetic information. Molecular organization of genetic material in prokaryotes and eukaryotes - DNA and histone proteins. Role of Histone proteins in genome organization. Replication of DNA- Semi conservative replication of DNA, replication fork, fidelity of replication, extrachromosomal replicons, rolling circle model of replication, enzymology of replication – Helicases, topoisomerases, SSB, DNA ligases, primases. DNA polymerase – *E. coli* DNA polymerase I, II and III and Eukaryotic DNA polymerases. DNA damage and repair mechanisms– Photoreactivation, excision, homologous and site-specific recombination and SOS response.

UNIT – II (17hrs):

Transcription – RNA polymerases – nature of prokaryotic and eukaryotic RNA polymerase. Mechanism of transcription in prokaryotes and eukaryotes – Initiation, elongation and termination of RNA synthesis. Polycistronic and monocistronic RNAs, Post transcriptional modifications of eukaryotic transcripts – capping, polyadenylation and RNA splicing. Types of introns and splicing mechanisms – group I and group II. Alternate splicing and mechanism of RNA Editing.

UNIT – III (18hrs):

Translation - genetic code and its elucidation, experimental studies of Nurenburg and Khorana. Codon degeneracy, Wobble hypothesis, structure and composition of prokaryotic and eukaryotic ribosomes, structures of mRNA and tRNA. Events of protein synthesis - amino acid activation, initiation, elongation and termination in prokaryotes and eukaryotes, Inhibitors of protein synthesis. Mechanism of inhibition. Post-translational modification of proteins – Protein sorting and targeting, molecular chaperons, Protein folding and protein degradation.

UNIT – IV (16hrs):

Regulation of gene expression- Terminology – Operon, operator, promoter, attenuater, repressor, co-repressor, inducer, apoinducer, gratituous inducer, induction, repression. Organization of Prokaryotic genes- Operons and their regulation, Lac operon, Trp operon, negative regulation, positive regulation. Organization of eukaryotic genes and their regulation – Transcriptional factors, activators, and enhancers – Eukaryotes – Yeast: gal operon. Hormones and environmental factors affecting gene expression.

COURSE OBJECTIVES:

The entire course is designed to study about DNA replication and repair mechanisms, transcription, translation and regulation of gene expression.

COURSE OUTCOMES:

At the formal end of the course student will be able to

I- Understand the Central dogma theory and flow of genetic information. Molecular organization of genetic material in prokaryotes and eukaryotes, modes of DNA replication, enzymology of replication and DNA damage and repair mechanisms.
II- Transcription – RNA polymerases – nature of prokaryotic and eukaryotic RNA polymerase and Post transcriptional modifications of eukaryotic transcripts, splicing and mechanism of RNA Editing.
III- Understand the translation - genetic code and its elucidation, experimental studies of Nurenburg and Khorana Mechanism of inhibition. Post-translational modification of proteins, Events of protein synthesis Inhibitors of protein synthesis.
IV- Understand the Regulation of gene expression, Transcriptional factors, activators, and enhancers, Operons and their regulation, Lac operon, Trp operon, negative regulation, positive regulation

REFERENCES

1. Molecular Biology. 2nd ed. 1994. D. Freifelder. Springer.
2. Molecular Biology by G. Padmanabhan, K. Sivaram Sastry, C. Subramanyam, 1995, Mac Millan.
3. Molecular Biology and Biotechnology 2nd ed. J.M. Walker and E.B. Gingold. Panima Publications. PP 434.
4. Dictionary of microbiology and molecular biology. 2nd ed. 1994. Sigleton. P. and Sainsbury, D. Sciential Publication.
5. Molecular Biology of the Gene, 1987. 4th Ed. J.D. Watson, N.H. Hopkins, J.W. Roberts, J.A. Steitz and A.M. Weiner, 2 Vol. Benjmin/Cummings.
6. Biochemistry of the Nucleic acids. 1992. 11th ed. R.L.P. Adams, J.T. Knowler, D.P. Leader. Chapman and Hall.

Practical Course

1. Techniques in molecular biology. Vol.2. 1987. ed. J.M. Walker and Wim Gaestra. Panima Publications. PP 332.
2. Methods in Plant Molecular Biology. 1989. M.A. Schuler and R.E. Zielinski. Academic Press.
3. Methods for cloning and Analysis of eukaryotic genes. 1990. A Bothwell, G.D. yancoponlos and F.W. Alt: Jones and Bartlett Publishers. PP 1990.

Programme: ***M. Sc.*****, Biotechnology**
Core Paper-II: Immunology
Type of Course: Core

Course No.: BIOTECH25082
Semester: II

UNIT – I (16hrs): specific and non-specific; Primary and Immunity – natural and acquired; Secondary organ of immune system – thymus, spleen, lymph nodes, bursa fabricus, other types of lymphoid tissue. Cells of the immune system; B and T lymphocytes, neutrophils, macrophages, plasma cells, eosinophils and basophils. Blood groups and cytokines, interferons and interleukins

UNIT–II (17hrs): Antigen – definition, properties, specificity, cross reactivity, immunogenicity, antigenic determinants and haptens. Antibody: nature and formation, classification of immunoglobulings and types, valency and avidity. production of polyclonal antibodies, Hybridoma technology

UNIT – III (17hrs): *In vitro* serological tests: precipitation in liquid, single and double diffusion tests using agar gel media, immune oelectrophoresis, rocket immune electrophoresis, hemagglutination, and Enzyme-Labeled Immune Assays (ELISA), Radio immune assay, GISH and FISH Techniques.

UNIT – IV (17hrs): Complement –definition, complement cascade pathway, complement fixation. Hyper sensitivity and its types. The major histo compatability complex. Transplantation and G.V.H. reactions. Immuno pathology – Autoimmune diseases; immune complex diseases; immunodeficiency diseases, Tumor immunity

Course Objective:

- This course intends to provide the knowledge of innate and acquired immunity, cells and organs of immune system, humoral immunity, cell mediated immunity and the role of immunity in infectious diseases
- To provide overview of immune system, antigen antibody structure
- To integrate immunology with health and enrich the knowledge for autoimmune disorders, hypersensitivity reaction.
- The subject provides knowledge about the immune precipitation techniques

Course **Outcomes**

- By the end of the course the students will be able understand role of importance of Innate and Adaptive Immunity.
- Students will be able to understand role on antigen antibody interactions in various immune techniques
- They will be able to understand the mechanisms generating diversity and specificity in Immune System
- They will be able to understand the behavior of body towards complex disorders
- At the end of this course the student will have a thorough understanding of immunotherapy
- Upon completion students will gain theoretical knowledge of Hybridoma technology
- Will be able to apply the knowledge gained to understand the phenomena like host defense, hypersensitivity (allergy), organ transplantation and certain immunological diseases

REFERENCES

1. Advanced immunochemistry. 2nd ed. 1990. E.D. Day, Wiley Liss, Inc, New York. PP 633.
2. Basic and clinical immunology, 7th ed. 1991. D.P. Stites and A.I. Terr Eds, Appleton and Lange, Norwalk, CT, pp. 870.
3. Clinical immunology : A practical approach. 1990. H.C. Goo, and H. Chapel. Eds. IRL Press, Oxford, PP 263.
4. Immunology: A short course, 2nd. 1991. B. Benjamin and S. Leskowitz, Wiley-Liss, NY. PP 459.
5. Immunochemical protocols : Methods in Molecular biology. Vol. 10, 1992, M.M. Manson. Ed. Humanma Press. Totowa. NJ, PP 480.
6. Immunology, 1995, R.B. Gallagher, J. Gilder, G.J.V.Nossal and G. Salvatore. Ed. Academic Press. PP 300.
7. Cellular and Molecular Immunology. 1991. A.K. Abbas, A.K. Lichtman, J.S. Pober, Harcourt Brace. PP 480.
8. Monoclonal antibodies. 1992. J.H. Peters and H. Baumgarten. Eds. Springer –Verlag. New York. PP 488.

Practical Course

1. Serological methods for detection and identification of viral and bacterial plant pathogens. 1990. R. Hampton, E. Ball and S.De.Boer (eds.) American Phytopathological Society.

2. Practical immunology. 1989. 3rd ed. Hudson and F.C. Horp. Blackwell Scientific Publication. Antibodies : A Laboratory Manual. 1988. E. Harlow and D

Programme: ***M. Sc.*****, Biotechnology**
Core Paper-III: Enzymology
Type of Course: Core

Course No.: BIOTECH25083
Semester: II

UNIT – I (16hrs): Introduction to Enzymes:, history, Nomenclature and Classification, structure and function, specificity of enzyme action, Fischer Lock and Key Hypothesis, Koshland induced Fit hypothesis, Monomeric enzymes – the Serine proteases, Zymogen activation, Oligomeric enzymes – Isoenzymes (LDH) and multienzyme complexes - pyruvate dehydrogenase complex, Enzyme extraction and purification methods of enzymes.

UNIT – II (17hrs): Introduction to bioenergetics, catalysis and kinetics. Concepts of Bioenergetics- 1st and 2nd Law of thermodynamics, enthalpy, entropy and free energy, free energy, factors effecting the rate of chemical reactions, Kinetics of single substrate enzyme catalysed reactions- Henry and Michaelis – Menton equation, Lineweaver Burk Plot.

UNIT III (17hrs): Enzyme inhibition- competitive, uncompetitive, non competitive, mixed inhibitors, Partial inhibition, substrate inhibition, Allosteric inhibitors, Reversible inhibition, Irreversible inhibitors, concept of active site and catalytic sites, stereo-specificity.The chemical nature of enzyme catalysis, chymotrypsin, Ribonuclease, Lysozyme, Metalloenzymes, Cofactors, Coenzymes- Nicotinamide nucleotides, Flavin nucleotides, Co-enzymes A, Lipoic acid, Thiamine pyrophosphate, Biotin, Tetrahydrofolate and Co-enzyme B12, Hills coefficient, +/- cooperativity. Iso enzymes and its physiological significance, Ribozymes and Abzymes (catalytic antibodies), Synzymes (Synthetic enzymes)

UNIT IV (17hrs): Ligand protein interaction, application of enzymology, enzymes as analytical reagents, instrumental techniques available for using enzymatic analysis in Medicine and Industry, Biotechnological applications of enzymes- Food and Drink Industry, Recombinant DNA Technology, Immobilised Enzymes. Inborn errors of metabolism-Phenylketonuria, Alkaptonuria, Sickle Cell Anaemia, Fructosaem

Objectives:

This course helps to adhere to the ethical practices appropriate to the discipline at all times and to adopt safe working practices relevant to the bioindustries & field of research.

Outcomes:

1. Students will gain awareness about Intellectual Property Rights (IPRs) to take measure for the protecting their ideas.
2. They will able to devise business strategies by taking account of IPRs.
3. They will be able to assists in technology upgradation and enhancing competitiveness.
4. They will acquire adequate knowledge in the use of genetically modified organisms and its effect on human health.
5. They will gain more insights into the regulatory affairs.

REFERENCES

1. Principles of Biochemistry: White. A, Handler, P., and Smith.
2. Biochemsitry, Lehninger A.L.
3. Biochemistry, David E. Metzler.
4. Biochemistry, Lubert Stryer.

5. Review of Physiological Chemistry: Harold A. Harper.
6. Biochemistry, 2nd Edition, G. Zubay (1988).

Practical Course

1. Practical Biochemistry – H. Varley.
2. Methods in Enzymology S.P. Colowick & N.O. Kapalan, Academic Press.
3. Methods in Biochemical analysis.
4. Oser: Hank's Physiological Chemistry.
5. Food analysis – Woodman.

Programme: ***M. Sc.,*** **Biotechnology**

Type of Course: **Open Elective**
Internal Elective : (A) **Essentials of Biotechnology**
Course No.: **BIOTECH25084-A**

Semester: **II**

UNIT I: History of Biotechnology. Introduction to Plant, Animal and Microbe cell structure.

Introduction to Macromolecules: Nucleic Acids, Proteins, Carbohydrates. Mitosis, Meiosis, and its significance.

UNIT II: Introduction to Genetic Engineering and Bioinformatics. Genetic Engineering tools: Enzymes, Cloning Vehicles, Principle of cloning. Databases and their application in Biotechnology.

Application of biotechnology in Agriculture, Industry, Medicine and Animal Biotechnology.

UNIT III: Introduction to

UNIT IV:

Introduction to Intellectual property Rights, Patents, Principles of Biosafety, GMO's

OBJECTIVES:

This course aims to develop in the students' mind a concept regarding

- The history of biotechnology and types of cells and their structures.
- To get overview of classes of cells and structural and function aspects of plasma membrane and cell organelle.
- To develop skill to understand molecular aspects of cell cycle and cell division
- To provide a foundation in biology with engineering of living systems
- To provide overview of applications and intellectual property rights of biotechnology

Course Learning Outcomes

Students will be able to

1. History and introduction of biotechnology and living cells
2. Apply systems engineering to living systems with applications across a wide domain of biological sciences.
3. Study about applications of industrial, agricultural and medical biotechnology.
4. Understand Property rights, bio safety and patents of biotechnology

References

1. Basic Biotechnology-Colin Rotledge and Kristainsen
2. Cell and Molecular Biology-P.K.Gupta
3. Cell Biology-Verma and Agarwal
4. Cell Biology-Rastogi
5. Biochemical Techniques:Theory and Practical.1987.J.PRobftand B.J.White,waveland Press,Inc.Prospects HeightsIL,pp407
6. Biochemical Techniques:Theory and Practical.1987.J.PRobftand B.J.White,waveland Press,Inc.Prospects HeightsIL,pp407
7. Molecular Biology by G.Padmanabhan,K.Sivram Sastry,C.Subramanyam,1995,Mac Millan

8. Molecular Biology and Biotechnology2nd ed.J.M.Walker and E.B.Gingold,Panima Publications.PP434.
9. Dictionary opf microbiology and molecular biology2nd ed.1994.sigleton .P.and Sainsbury,D.Sciential Publications
10. Molecular Biology of Gene 1987.4th Ed.J.D.Watson,N.H.H opkins,J.W.Roberts,J.A.Steitz and A.M Weiner.2 VOL.Benjimin/Cummings
11. Biochemistry of Nucleic Acids.1992.11th ed.R.L.P.Adams.J.T.Knowler.D.P Leader.Chapman and Hall.
12. Genetic Engineering –Sandhya Mitra.
13. Biotechnology,IPRs and Biodiversity-M.B.Rao and Manjula garu

Programme: ***M. Sc.,*** **Biotechnology**

Type of Course: **Open Elective**
Internal Elective : (B) **Environmental Biotechnology**
Course No.: **BIOTECH15084-B**

Semester: **II**

Components of Ecosystems, Food chain, Food Web, Trophic levels, Energy flow, Role of

UNIT I: ECOLOGY AND ECOSYSTEMS: Fundamentals of Ecology and Ecosystems, Producers, Consumers and Decomposers. Ecosystems: Types, characteristic features, structure and functions of the following ecosystems: Pond ecosystem- Marine ecosystem - Grassland ecosystem - Forest ecosystem- Desert ecosystem – Cropland Ecosystem.

UNIT-II: ENVIRONMENTAL POLLUTION AND CONTROL: Introduction to Environmental pollution, Air, water and soil pollution- Types, common effects and control measures Air Pollution Treatment Technologies: Biofilters and Bioscrubbers for treatment of industrial Waste BIOENERGY & BIOMINING: Bio Energy: Energy and Biomass Production from wastes, biofuels, bio hydrogen production. Biomining: Bioleaching, Types, Applications. Biofilms formations and its use, microbially enhanced oil recovery, microbial fuel cells and their applications

UNIT-III: WASTE WATER TREATMENT: Water: Waste water, Types of waste water, Major contaminants in waste water, Physical, chemical and biological methods of waste water treatment Aerobic: Activated Sludge Process, Trickling Filters, Biological Filters, Rotating Biological Contractors, Fluidized Bed Reactor Anaerobic: Anaerobic digestion, anaerobic digesters, Contact Digesters, Packed Column Reactors, UASB for biological treatment process

UNIT-IV: BIOREMEDIATION AND PHYTOREMEDIATION: Role of environmental biotechnology in management of environmental problems. Definition, constraints and priorities of Bioremediation, Types of bioremediation: In-situ and Ex-situ bioremediation techniques, Factors affecting bioremediation, Applications of bioremediation. Phytoremediation: Definition, Types and their role in degradation of pollutants, Natural attenuation and Vermicomposting. GEMS in Environment: Microbial degradation of pesticides and other recalcitrant chemicals, microbial degradation of petroleum and hydrocarbons; biodeterioration and control.

Course Objective:

The main objective of this course is to impart students an understanding of

ecology and ecosystems, functions of all various components in the ecosystem. It also familiarizes them with various Technologies used in treatment of air, water, soil and other persistent chemicals in the environment.

COURSE OUTCOMES:

At the end of the course students will be able to

CO1. Understand the basic information of Ecology and Ecosystems.

CO2. Evaluate the Knowledge of Air, Water and soil Pollution and their control technologies.CO3. Analyzing the various Waste water treatment technologies.

CO4. Evaluate the Knowledge of Bioremediation and Phytoremediation Technologies.
CO5. Understand the Bioleaching and Bio-mining technologies their Applications.

References:

1. Wastewater Engineering – Treatment, Disposal and Reuse, Metcalf and Eddy. Inc. Tata McGraw Hill, New Delhi. 1991 2. Environmental Science (5th Edition) by WP Cunninghum & BW Saigo., Mc Graw Hill. 1999. 3.

Introduction to Biodeterioration , D Allsopp and K J Seal, ELBS/Edward Arnold. Cambridge Univ Press. 2004. 4. Biotechnology for Wastewater Treatment. P Nicholas Cheremisinoff. Prentice Hall Of India. 2001 5. Biotechnological Methods of Pollution Control. SA Abbasi and E Ramaswami. Universities Press 1999 6. Environmental Biotechnology, Concepts and Applications. Hans-Joachin Jordening and Josef Winter. Winter-VCH. 2005 7. Biology of wastewater Treatment. N F Gray. Mc Graw Hill . 2004. 8. Fundamentals of ecology (5th Edition) by EP Odum and GW Barrett, Thomson Books/Cole, 2005. 9. An Introduction to Environmental Biotechnology by Milton Wain Wright. Kluwar Acad Publ. Group, Springer, 1999.

Fundamentals of Ecology by Eugene P. Odum (Author), Gary W. Barrett
Introduction to Environmental Science Hardcover – 2004 by Y Anjaneyulu

Wastewater Engineering-Treatment, Disposal, and Resuse, Metcalf and Eddy, Inc., Tata McGraw Hill, New Delhi.

2. Industrial Pollution control Engineering- AVN Swamy., Galgotia Publication,
(2006). Environmental Biotechnology- Allan Stagg.

Programme: ***M. Sc.,*** **Biotechnology**

Type of Course: **Open Elective**
Internal Elective : (C) **SWAYAM / MOOCs / NPTEL**
Course No.: **BIOTECH15084-C**

Semester: **II**

Note: STUDENT HAS OPTION TO SELECT ON HIS / HER OWN (WITH PRIOR PERMISSION ANDAPPROVAL OF THE HEAD OF THE DEPARTMENT AND CHAIRMAN, BOS

Programme: ***M. Sc.,*** **Biotechnology**

Practical : **Molecular Biology and Bioinformatics Lab**
Type of Course: **Practical**
Course No.: **BIOTECH25085**

Semester: **II**

PRACTICALS

Programme: ***M. Sc.,*** **Biotechnology**

Practical : **Immunology and Enzymology Lab**
Type of Course: **Practical**
Course No.: **BIOTECH25086**

Semester: **II**

PRACTICALS

Programme: ***M. Sc.*****, Biotechnology**
Core Paper-I: **Genetic Engineering**
Type of Course: **Core**
Course No.: **BIOTECH35081**

Semester: **III**

UNIT – I (16hrs): Introduction to Genetic Engineering: Outlines and tools for cloning - DNA cutting and joining. **Enzymes –** Restriction endonucleases, types, properties and applications, DNA ligases, polynucleotide kinase, alkaline phosphotases, S1 nuclease, terminal transferase, topoisomerases, methylases and gyrases. **Molecular vectors** – Properties and Characters of Cloning Vectors. *E. coli* Compatible Vectors - . Plasmids, Bacteriophage derivatives, Cosmids, BACs), yeast (YACs, shuttle vectors) and Algal Vectors. Characteristics of expression vectors. Molecular cloning strategies: **Generation of DNA fragments:** RE digestion, mechanical shearing. **Joining of DNA fragments to vectors:** homopolymer tailing, linkers and adaptors, Cohesive and blunt end ligation

UNIT – II (18hrs): Cloning and Sequencing of nucleic acids: Isolation of Desired Gene / Fragment – Genomic DNA Libraries and cDNA Libraries. Screening of Libraries for selection of desired genes. Principles of preparation of DNA probes and their application. Applications of Genomic and cDNA libraries.

Sequencing Techniques: Maxam –Gilbert chemical degradation and Sanger's dideoxy chain termination **Modification Techniques:** Principle and applications of Polymerase chain reaction (PCR) in recombinant DNA technology, Site Directed Mutagenesis and its applications in Genetic Engineering. Screening techniques - Southern, Northern and Western blotting.

UNIT – III (17hrs): Molecular Transformation: Delivery/introduction of recombinant molecules into selected host cells (transformation) - Introduction of Recombinant DNA molecules into appropriate hosts. Bacterial - Competent cells preparation, **e**lectroporation. Plant transformation methods – Agrobacterium (the natural genetic engineer, Ti- Plasmid, Agrobaterium mediated) Role of vir-genes in Agrobacterium, microinjection, Other Methods of Transformation: Particle bombardment, Microinjection, PEG mediated and Electroporation. Chloroplast transformation, selection of transformants and its applications.

UNIT – IV (16hrs):

Genetic Engineering – Applications in Medicine, Agriculture and Industry, social and moral implications.. Transgenic plants for Insect, pest,disease, abiotic stress, herbicide tolerance, Nutrition quality improvement and phytovaccines. Possible Ecological concerns and risks of transgenic crops and animals.

Course Objectives

- To understand the concept of recombinant DNA technology and outlines and tools for cloning.
- To compare different types of cloning and expression vectors, To learn about construction and screening of gene libraries.

- To learn about different types of gene transfer and blot analysis techniques.
- List several present day applications of genetic engineering and analyze the benefits and drawbacks of manipulating an organism's DNA

- To study various methods of gene therapy, delivery systems for gene therapy and applications of genetic engineering.

Learning outcomes:

By the end of this unit, the student will be able to

- To learn about Genomic DNA Libraries and cDNA Libraries, Sequencing Techniques and Principle and applications of Polymerase chain reaction.
- Explain the features of Transformation, selection of recombinants and Strategies of gene delivery, gene replacement/ augmentation
- Role of Genetic Engineering in Medicine, Agriculture and Industry.

REFERENCES

1. Principles of Gene Manipulation. 1991. R.W. Old and S.B. Prim-Rose. 2nd ed. Blackwell Scientific.
2. Genetic Engineering – Sandhya Mitra
3. Biotechnology, IPRs and Biodiversity – M. B. Rao and Manjula Guru
4. DNA replication, 2nd ed. 1991. A. Kornberg and T.A. baker. W.H. Freeman and Company, New York. Ny. PP 931.
5. Glossary of Genetics. 5 ed. Classical and molecular, 1994, Reiger. R. et al., Springer.
6. Gene regulation, 2nd ed. 1994. D. latchman. Sciential Publication.
7. Bacterial and Bacteriophage genetics. 1994. E.A. Birge. Springerscan Publication.

Programme: ***M. Sc.,*** **Biotechnology**

Core Paper-II: **Food and Industrial Biotechnology**
Type of Course: **Core**
Course No.: **BIOTECH35082**

Semester: **III**

UNIT – I:

Scope of biotechnology in the food and drink industry, Traditional fermented foods – Curd, yoghurt, cheese, butter milk, dosa. Modern fermented products – Wine, beer, baker's yeast, sauerkrauts, sausages, , Fruit juices preparation, ice-cream and frozen desserts, Cereal products. milk products; khoa, chhana, paneer

UNIT – II:

Definition, Introduction to preservation, History of preservation, general principles of food preservation, Need & benefits of industrial food preservation

Principles and methods of food preservation-freezing, heating, dehydration, canning, additives, fermentation, irradiation, microwave processing. Juices and concentrates/membrane technology. Storage of food, modified atmosphere packaging. Refrigeration, freezing and drying of food, minimal processing, radiation processing. Milk processing and preservation Food contamination and food borne disease, control and food safety. Food laws and standards,

UNIT – III:

Isolation, screening and maintenance of industrially important microbes; starter cultures & their importance in dairy, Products of microbial synthesis:-In medicine –antibiotics;
Enzymes:- Application of microbial enzymes in food industry, amino acids production from microbes, Organic acid production , Role of bioreactors in industrial biotechnology.

UNIT – IV:

Industrial productions – High fructose corn syrup, Cheese making, Single Cell Protein (SCP) and food flavours. Industrial production of penicillin via fungal route, insulin from recombinant E. coli; astaxanthin from algae, and Production of HBsAg using yeast cultures.

Objectives

1. To prepare students for successful career in Food industry and research institutes.
2. To develop the ability amongst the students to apply modern techniques in industry and research.
3. To enable students to work in a team with multidisciplinary approach.
4. To provide students with fundamental strength in analysing, designing and solving industry related problems.
5. To promote and inculcate ethics and code of professional practice among students.

Outcomes:

1. The students will be able to demonstrate basic knowledge in Food industry sciences
2. The students would acquire basic knowledge to design and conduct experiments, analyse data and interpret the results.
3. The students will be able to demonstrate understanding of basic knowledge and its application in Food and Industrial Biotechnology disciplines.
4. The students will be able to acquire knowledge to apply solutions in various industries and be able to integrate scientific and technological knowledge on the use of bioprocesses for industrial products

6. The students will be able to communicate effectively and demonstrate professional and ethical responsibilities
7. Students will master the basics of Food and industrial biotechnology

REFERENCES:

1. Frazier, W.C., and D.C. Esthoff: Food Microbiology, 4 th ed., Mc Graw-Hill, New York, 1988.
2. Fermentation : A Practical approach. 1990. B. Mc Neil and L.M. Harvey. IRL Press. PP 226.
3. Manual of Industrial Microbiology and Biotechnology. 1986. Edited by Arnold L. Demain and Nadine. A. Solomon. PP 466.
4. Bioreactors in Biotechnology – A Practical Approach. AR. Seregg.
5. Industrial Microbiology by Samuel Cate Prescott and Cecil Gordon Dunn
6. Industrial Microbiology by L.E.J.R.Casida

Practical Course

1. Manual of Industrial microbiology and biotechnology. 1986. Edited by Arnold L. Demain and Nadine. A. Solomon. PP 466.
2. Vanderzant, C., and D. Splittstoesser. : Compendium of Methods for the Microbiological Examination of Foods, American Public Health Association, Washington, D.C. 1992.

Programme: ***M. Sc.*, Biotechnology**
Core Paper-III: **Bioprocess Engineering**
Type of Course: **Core**
Course No.: **BIOTECH35083**

Semester: **III**

Unit-I

Introduction to Bioprocess technology, Upstream processing- strain selection, media formulation, sterilization (Thermal death kinetics, modes of sterilization), scale up of inocula. Design and construction of fermenter, types of Bioreactors - Air Lift Reactor, bubble column reactor, Fluidized bed fermenter, Tower fermenter, Packed bed fermenter, Rotating disc, continuous Stirred tank reactor.

Unit-II

The Range of fermentation process; Types of fermentation / microbial culture- Batch, Fed batch, Continuous fermentation, Aerobic and Anaerobic fermentation, Solid and submerged fermentation. Factors effecting on fermentation process, Parameters measurements and control systems in fermentors, Computer applications in fermentation technology.

UNIT – III:

Importance of Down Stream Processing (DSP) in Biotechnology, Cell disruption(physical, mechanical and chemical methods), Filtration (batch filters and continuous filters), centrifugation (Continuous Flow method) , extraction(liquid-liquid), chromatography(Adsorption, Ion, Affinity chromatography, HPLC), membrane processes (ultrafiltration and reverse osmosis), drying (spray drying, freeze drying, fluidized bed drier), crystallization, whole broth processing.

UNIT – IV

Applications of Bioprocess Technology- Industrial production of Alcoholic beverages – Ethanol, Beer, Wine, Organic acids – Citric acid , Lactic acid,. Antibiotics -Penicillin, Streptomycin, Tetracyclin, Amino acid - Lysine, Glutamic acid, Monoclonal antibodies (mAb's) and Bio-therapeutics Eg.: Insulin , vaccines, Human growth hormone

Course Objectives

- To understand the basic concepts of Upstream processing and types of Bioreactors.
- To learn about the fermentation process and Isolation, preservation and improvement of industrially important microorganisms.
- To enable students to acquire knowledge on reaction engineering systems with emphasis on bioreactor design, operation and analysis of kinetics in biochemical engineering reactions along with separation and purification of desired products.

COURSE OUTCOMES: At the formal end of the course student will be able to:

- Acquire the knowledge of isolation and identification of microorganisms.
- Determine the mathematical expression of microbial growth kinetics & media formulation
- Design the process of fermentation
- The course imparts advanced knowledge on bioreactor design and it also gives knowledge on efficient utilization of the principles in bioprocess technology
- Understand the fundamentals downstream purification steps, role of bioprocess economics and cell disruption methods.
- Understand the techniques used for product isolation
- Evaluate the product purification techniques
- Evaluate evaporation, crystallization, and drying methods.

REFERENCES

1. Bio processing Engineering principles.1995. P.M.Doran. Har court Brace. PP 464
2.Biochemical engineering . 1992. James .M.Lee Prentice – Hall.

3. Biochemical engineering Fundamentals. 2ed 1986.J.E.Bailey and D.F.Oilis. Mc Graw-Hill Publication.
4.Chemical Process Control: An Introducation to theory and practice. 1984.G.Stephanopoulos, Prentice-hall.
5. Modelling and controlling of fermentation Process. Ed. J.R.Leigh
6.Biochemical Engineering by S.Aiba, AE Humphery, NF Millis, University, of Tokyo Press.
7. Chemical Engineering by JM Coulson and JF Richarson ,Pergamen Press
8.Fundamentals of Biotechnology by P.Prave , U.Faust W.Sitting and DA Sukatsch, VCH.
9. A Text Book on Biotechnology by HD Kumar, Affliated East West Press Private

Programme: ***M. Sc.,*** **Biotechnology**

Type of Course: **Open Elective**
Internal Elective : (A) **Introduction to Bioethics in Biotechnology**
Course No.: **BIOTECH35084-A**

Semester: **III**

UNIT I: What is ethics? Definition of bioethics, Principles of Bioethics. Principle of Biosafety, Globalization of Biosafety and Bioethic Issues.

UNIT II: Food and Agriculture Organization (FAO), World Health Organization (WHO), United Nations Environment Program (UNEP), International Center for Genetic Engineering and Biotechnology (ICGEB). United Nations Education, Scientific and Cultural Orgaganization,(UNESCO),United Nation Industrial Organization(UNIDO),Global Environmental Facility(GEF)

UNIT III: Introduction to international conventions, treaties and agreements on biosafety. Overview of wide application of biotechnology and concerns worldwide, ethical. legal and social implications (ELSI) of biotechnology in agriculture, medical environmental.

UNIT IV:
Bioethical Issues in Biotechnology, Research and Application, Bioethical Issues on rDNA Technology. Other Scientific Research with Bioethics Considerations. Environmental and Health aspects of Biotechnology.

Objectives:

This course helps to adhere to the ethical practices appropriate to the discipline at all times and to adopt safe working practices relevant to the bioindustries & field of research.

Outcomes:

1. Students will gain awareness about Intellectual Property Rights (IPRs) to take measure for the protecting their ideas.
2. They will able to devise business strategies by taking account of IPRs.
3. They will be able to assists in technology upgradation and enhancing competitiveness.
4. They will acquire adequate knowledge in the use of genetically modified organisms and its effect on human health.
5. They will gain more insights into the regulatory affairs.

References

1. Gene Cloning-Brown
2. Concepts in Biotechnology-Balsubramanyam.D
3. Basic Biotechnology-Colin Rotledge and Kristainsen
4. Gene Biotechnology-Jogdand
5. From Genes to Clones.Introduction to Gene Technology-Winnacker, Ernst.L.
6. Safety,Moral,Social and Ethical issues related to geneticalls modified foods-SmithJ.E.
7. Molecular Biology and Biotechnology-Meyer R A
8. Biotechnology expanding horizons by B.D. Singh Kalyani Publisher
9. Biological warfare in the 21st century by M.R.Dando
10. Intellectual Property Rights in Agricultural Biotechnology by F.H. Erbisch and K.M.Maredia.

Programme: ***M. Sc.,*** **Biotechnology**

Type of Course: **Open Elective**
Internal Elective : (B) **Biotechnological Basis for Organic Farming**
Course No.: **BIOTECH35084-B**

Semester: **III**

Unit I: Preparation of bio-pesticide inputs recommended for organic farming : Name of the input, Source and Preparation and Time, rate and purpose of application : Panchagavya , Lantana leaf extract 10% , Derisom , Pestoneem , Vermiwash , Botanicals , Anonine.

Unit II:
Essentialities of Organic Farming: Soil and water conservation: Measures like stone pitching/contour wall construction are to be taken up to prevent soil erosion. Contamination control: It is necessary to take the following measures to minimise the contamination from outside and within farm. Processing: Processing technologies like solar drying, freeze drying, hot air chambers are permitted. Irradiation of agricultural produce is not permitted. No synthetic additives/days are to be added during processing Labelling: The label should convey clear accurate information on the organic status of the product. (i.e. conversion in progress or organic). Packaging: For packing, recycling and reusable materials like clean jute bags, shall be used. Use of bio-degradable materials shall also be used. Unnecessary packaging material should

Unit III:
Biofertilizers – Definition, kinds, microbes as biofertilizers, Symbioticassociates – Rhizobium taxonomy, Physiology, Host cell – Rhizobium interactions, inoculants and mass cultivation. Mycorrhiza - VAM association, types, occurrence, Collection, isolation and inoculum production. Biopesticides – Definition, kinds and commerce of biopesticide, Bacillus thuringiensis, insect viruses and entomopathogenic fungi – its characteristics, physiology, mechanism of action and application.

Unit IV:
Certification Process and Economics of Organic farming: Certification of organic farms. Role of Certification agency. Central and Stage Certification agencies. Certification Process and

its benefits. **Economics of Organic Farming** : Cost and Net Return of organic production Vs inorganic production. The cost of cultivation, handing of bulky nature of organic manures. Benefit: Cost ratio of important cropping systems experimented under NPOF.

Course Objectives

- To study basic concept of organic farming, various organic components, how to control disease and pest through organic inputs, certification of organic products
- To study Essentialities of Organic Farming and Biofertilizers
- To acquire the Advance methods of cetification of organic forming
- To study the importance of biopesticide
- To understand the Cost ratio of important cropping systems

COURSE OUTCOMES:

1- The goal of the instructor in this course is to introduce the students to the concept bio-pesticide inputs recommended for organic farming.
2- Acquire sufficient knowledge on Soil and water conservation: Measures like stone pitching/contour wall construction are to be taken up to prevent soil erosion. Contamination control: It is necessary to take

the following measures to minimise the contamination from outside and within farm.
3- Impart students an understanding of the different kinds of microbes as biofertilizers, Symbiotic associates and biopesticids.
4- Acquire knowledge about the Certification Process and Economics of Organic farming.

Reference:

1. Subba Rao, N.S. 2000 Soil Microbiology. Oxford and IBH Publishing Co.Ltd.
2. Verma A and Hock B. 1995. Mycorrhiza.
3. Yaacovokan, 1994 - Axospirillum, CBC press.
4. Wicklow, D.T. and B.E. Soderstrom. 1997, Environmental and microbial relationships. Springer

Programme: ***M. Sc.,*** **Biotechnology**

Type of Course: **Open Elective**
Internal Elective : (C) **SWAYAM / MOOCs / NPTEL**
Course No.: **BIOTECH35084-C**

Semester: **III**

Note: STUDENT HAS OPTION TO SELECT ON HIS / HER OWN (WITH PRIOR PERMISSION ANDAPPROVAL OF THE HEAD OF THE DEPARTMENT AND CHAIRMAN, BOS

Programme: ***M. Sc.,*** **Biotechnology**

Practical : **Bioprocess and Industrial Biotechnology**
Type of Course: **Practical**
Course No.: **BIOTECH35085**

Semester: **III**

Practical

Programme: ***M. Sc.,*** **Biotechnology**

Core Paper-I: Skill Oriented Course (Mushroom Cultivation Theory)
Type of Course: Core
Course No.: BIOTECH35086

Semester: III

Unit: I

Mushroom Biology and Nutrient profile Different parts of atypical mushroom & variations in mushroom morphology. Key to differentiate Edible from Poisonous mushrooms. Button, Straw & Oyster- General morphology, distinguishing characteristics, spore germination and life cycle. Natural Habitats of mushrooms, Color of spores- white, yellow, pink, purple brown & black, Morphology- Structure and texture of fruit bodies-gilled fungal and pore fungal, Nutrient composition protein, aminoacids, calorific values, carbohydrates, fats, vitamins &

Unit: II
Cultivation System and Composting Fundamentals of cultivation system-small unit & larger commercial unit. Principles of mushroom farm layout, location of building plot, design of farm, bulk chamber, composting platform, equipments & facilities , pasteurization room &growing rooms. Principles of composting, machinery required for compost making, materials for compost preparation. Methods of Composting- Long method of composting (LMC) & Short method of composting (SMC).

Unit: III
Spawn, Spawning and Casting materials: Facilities required for spawn preparation, Preparation of spawn substrate, preparation of pure culture, media used in raising pure culture, culture maintenance, storage of spawn. Importance of casing mixture, different types of casing mixtures, commonly used materials.

Unit: IV
Cultivation of Button, Oyster and Straw Mushrooms: Collection of raw materials, compost & composting, spawn & spawning, casing and crop management, picking & packing. Disease control and pest Management Inspection of Mushroom bags or beds for early detection of pests and diseases. Using sterilized casing to control nematodes

Course Overview and Objectives:

The course introduces methods of growing edible mushrooms, including culture maintenance, basic mushroom substrate preparation, composting, spawn generation techniques, inoculation methods, harvesting, and pests and pest management of mushrooms. Students will understand the principles of mushroom cultivation, acquire the practical knowledge to grow several species of fungi, and will have the confidence to approach the mushroom industry for potential employment opportunities. The history of mushroom production and recent trends in the diversification of edible mushrooms will be discussed. Every step in small-scale and industrial commercialization of edible mushrooms, from spawn production to mushroom harvest, will be covered. Lessons and reading material include an overview of the importance of fungi in nutrient recycling and symbiotic associations with plants. Construction of growth chambers and greenhouses will be presented for the small grower with little capital. Small business opportunities and marketing mushrooms will also be included. The objectives of the course are to introduce students to basic mycology as it relates to growing mushrooms, give students practical knowledge to begin growing mushrooms at home or with industry, and provide a foundation for starting a small business in mushroom cultivation.

OUTCOMES:

At the end of the training, the candidates will be able to

1. Appreciate the importance of embarking on self- employment and has developed the confidence and personal skills for the same.

2. Identify business opportunities in chosen sector / sub-sector and plan and market and sell products / services
3. Start a small business enterprise by liaising with different stake holders
4. Effectively manage small business enterprise
5. Takeup Mushroom Cultivation and run it profitably
6. Selection of important types of Mushroom and their cultivation
7. Maintain Mushroom farm in a hygienic and scientific way
8. Work out the economics of Mushroom Cultivation
9. Take up value added products of Mushroom i.e., preparation of Mushroom Pickle, Powder, Papad and different items of Food

References:

Textbook on Mushroom Cultivation: Theory and Practice (2021) , Ashok Agarwal, Vashpal Sharma, Esha Jangra
Mushroom Cultivation, Tripathi, D.P. (2005) Oxford & IBH Publishing Co. PVT .LTD, New Delhi.

Mushroom Cultivation in India, B.C. Suman, V.P. Sharma, Daya Books 2007

Hand Book of Mushroom Cultivation, Processing and Packaging (English, Board Eiri)
Publisher: Engineers India Research Institute

Mushroom Production and Processing Technology, Pathak Yadav Gour (2010) Published by Agrobios (India).A hand book of edible mushroom, S.Kannaiyan & K. Ramasamy (1980). Today & Tomorrows printers and publishers, New Delhi

Handbook on Mushrooms, NitaBahl, Oxford & IBH Publishing Co.

Programme: ***M. Sc.,*** **Biotechnology**

Core Paper-I: **Skill Oriented Course (Mushroom Cultivation Practical)**
Type of Course: **Core**
Course No.: **BIOTECH35086**

Semester: **III**

PRACTICALS

1.Study of Types of Mushroom and their General Morphology
2.Preparation of mushroom mycelial culture
3 Process of Spawn preparation
4.Preparation of Mushroom beds
5.Spawning of beds and casing process
6.Mushroom Harvesting and packing

Programme: ***M. Sc.*****, Biotechnology**
Core Paper-I: **Plant Biotechnology**
Type of Course: **Core**
Course No.: **BIOTECH45081**

Semester: **IV**

UNIT – I (16hrs):

History of Plant Biotechnology, Organization of Plant Tissue culture Lab, Types of Sterilization, Media Preparation and different types of media, concept of totipotency, Types of plant tissue culture-Anther culture, Protoplast culture, Embryo culture, Shoot tip, callus and Cell suspension culture. Regeneration- Organogenesis and Somatic Embryogenesis. Acclimatization. Hydrophonics and Aero Phonics

UNIT – II (18hrs):

Plant Genetic Engineering- Gene cloning techniques. Vector mediated or Indirect gene transfer (Agrobacterium-mechanism of T-DNA transfer,) Direct Gene transfer-microinjection, electroporation, particle gun. Development of Herbicide Resistant, Pest Resistant and Stress tolerant plants(drought and salt), methods to identify transgenic plants.

UNIT – III (17HRS):

Laboratory culture of micro algae, Large scale production of microalgae. Marine algae and their products, Edible sea weed and their production. biofertilizers- Azolla, Anabaena. Biopesticides.

UNIT – IV (16HRS):

Introduction to molecular markers, Production of industrially important compounds from culrtured cells. Phytodiagnostics using ELISA and PCR techniques, edible vaccines and plantibodies. Applications of tissue culture in Agriculture and horticulture

COURSE LEARNING OBJECTIVES

The overall objective of this course is to provide an environment for students to develop critical thinking on plant biotechnological tools for plant improvement. Principles and applications of plant biotechnologyfrom the cellular to whole-plant levels will be covered.

OUTCOMES OF THIS COURSE STUDENTS WILL BE ABLE TO:

•Distinguish plant culture techniques and culture types.
•Learn about plant transformation methods and development of transgenic plants. Agrobacterium and Ti Plasmid based and physical DNA delivery methods.
•Analysis of transgenic plants.
•Design strategies for plant genetic manipulation against biotic and abiotic stressors.
•Develop skills in plant tissueculture techniques ,which will make them employable in plant biotech industries.

REFERENCES

1. Plant Biotechnology by A.Slater,N.W.Scott and M.R.Fowler(Oxford University Press)
2. Plant cell and Tissue culture. A Laboratory Manual. 1994. Reinert. J. and Yeoman, M.M. Spring.
3. Plant Tissue culture theory and Practise, 2nd Ed,Elsevier publishers.
4. Gene transfer to plants. 1995. Potrykus-I and Spangenberg, G. Des. Springer Scan.
5. Microalgal Biotechnology. 1988. Borocotizka M.A. and Borocoitzka L.J. Cambridge University Press.
6. Algal and Cyanobacterial biotechnology, 1989. Cresswell. R.C. Rees, T.A.V. and Shah, N.Eds. Longman

Scientific and Technical, Essex, London.

Practical Course

1. Plant cell and Tissue culture. A laboratory manual. 1994. Reinert, J. and yeoman, M.M. Springer
2. Plant Biotechnology by H.S.Chawla

Programme: ***M. Sc.,*** **Biotechnology**
Core Paper-II: **Animal Biotechnology**
Type of Course: Core
Course No.: **BIOTECH45082**

Semester: **IV**

UNIT – I:

Definition and history of animal tissue culture; Equipments and materials needed for animal cell culture technology. Sources of tissues, types of tissues - epithelial, muscle, connective, nerve and blood. Cell culture media - components and their functions. Sterilization, Measurement of cell number - hemocytometer, coulter counter. Measurement of cell viability and cytotoxicity.

UNIT – II:

Primary culture – Mechanical and enzymatic mode of desegregation, establishment of primary culture. Subculture - passage number. Cell lines - maintenance and preservation of cell lines. Contamination - bacterial, viral, and fungal, detection and control, cell transformation – normal vs. transformed cells, Scale-up of animal cell culture –Batch reactor, continuous culture.

UNIT – III:

Cell culture based vaccines, Engineering animal cells for recombinant protein expression. Stable cell line generation, expression analysis. Scaffolds- types, preparation. Three-dimensional (3D) culture and tissue engineering, artificial organs. Applications of animal cell culture

UNIT – IV:

Aquaculture- fresh water fish culture practices and types. Freshwater prawn culture. Brackish water fish, shrimp and crab culture practices. Pearl culture - pearl producing mollusks, rearing of oysters, nucleation for pearl formation and harvesting of pearls Molecular tools for the identification of diseases in aquatic species. Sericulture - species of silkworm, artificial rearing, seed production, technology of silk production and recent advances.

Course Objectives

1. To understand the principles and techniques used for the animal tissue culture.
2. To study and understand the different tusse culter methods like primary culture, subculture, maintanance and preservation of cell lines, and detection as well as control of contamination caused by various microorganisms.
3. To study the techniques involved in the nuclear transfer and creation of dolly, IVF, embryo culture, stme cells, and transgenic animals.
4. To study the various types of aquaculture practices such as fish culture, prawn culture, crab culture, and pearl culture.
5. To study about the different species of silkworm and recent technology of silk production.

Course outcomes

a. Cell culture technology is a potential technology that involves diverse disciplines. From this couser students could undersatnd about the culture media, animal tissue culture facilities and several cell characterization tools, which are used in biotechnology.
b. The students can also know about the basics of animal tissue culture with historical background, types of cultures, their maintenance, and characterization tools involved in this process. It also

includes animal tissue cultures facilities and biosafety guidelines while working on animal cells under *in vitro* conditions.

c. One of the most challenging tasks in animal tissue culture laboratory is to prevent contamination; thus this course also involves steps that must be considered to prevent contamination.
d. Clones are superior breeding animals used to produce healthier offspring. Animal cloning offers great benefits to consumers, farmers, and endangered species: Cloning allows farmers and ranchers to accelerate the reproduction of their most productive livestock in order to better produce safe and healthy food.
e. Stem cells have the remarkable potential to renew themselves. They can develop into many different cell types in the body during early life and growth.
f. The students can understand the different potential culture practices for the culturing of various types fishes, crabs and prawns etc. and the advanced technology for the prduction of silk.

Reference:

1. Culture of Animal Cells, (3rd Edn) R Ian Fredhney. Wiley-Liss
2. Animal Cell Culture – Practical Approach, Ed. John RW. Masters, Oxford
3. Cell Growth and Division: A Practical Approach Ed. R. Basega, IRL Press
4. Cell Culture Lab Fax. Eds. M Butler & M Dawson, Bios Scientific Publications Ltd. Oxford
5. Animal Cell Culture Techniques Ed Martin Clynes, Springer
6. Methods in Cell Biology, Vol. 57, Animal Cell Culture Methods Ed. Jenni P Mather and David Bames. Academic Press

Programme: ***M. Sc.,*** **Biotechnology**

Core Paper-III: **Essentials of Functional Genomics**
Type of Course: **Core**
Course No.: **BIOTECH45083**

Semester: **IV**
UNIT I (16hrs):

Introduction to Genomics and Transcriptomics - Model organisms. Genome projects- Human, Arabidopsis, Rice, C. elegans and Zebra fish. Genome or Reference Based Assembly to Study Model Organisms. Whole genome analysis: Preparation of ordered cosmid libraries, bacterial artificial chromosome libraries, short gun libraries. Quantification of Gene, Transcript and isoform Expression. cDNA libraries: Preparation of large scale EST generation and application of EST's in identification and cloning of full length genes. Evolution of Sequencing Methodologies: conventional sequencing (Sangers, Maxam and Gilbert methods), Automated sequencing, Next Generation Sequencing (NGS); denovo assembly to study non-model organisms. RNA-Seq Workflow.

UNIT II (17hrs):
Genome Mapping: Introduction and outlines of Genome mapping. Principles and applications of Molecular markers. DNA polymorphism and different kinds of molecular markers - Morphological markers, Biochemical markers, molecular markers, non PCR based and PCR Based molecular markers- RFLP, RAPD, SCARs, Simple Sequence Repeats, AFLP, ISSRs, CAPs, STMS, SNPs and its applications.. Detection of Common genetic variations. Fingerprinting vs marker assisted selection (MAS). Genetic and physical maps, physical mapping and map-based cloning. **QTL**: Quantitative traits loci (QTL) and its applications. Concept of Comparative Mapping.

UNIT III (17hrs):

Applications of Genomics: Experimental analysis (Gene inactivation by antisense RNA, Gene Overexpression), Yeast two hybrid system, microarray technology. DNA Microarrays: Printing of oligonucleotide and PCR products on glass slides. Gene expression analysis: Global pattern of gene expression using fluorescent labelled cDNA or end labelled RNA probes. Protein Expression Analysis: Protein Biochips and Protein Microarrays (Ab array and Ag array). Real Time PCR and its applications. Applications of DNA and cDNA chips. **Genome Editing Technologies**: CRISPR technology principle, methodology and applications in Agriculture, Medicine and Microbial (Industrial).

UNIT IV (17hrs):

TILLING: Introduction and history of TILLING. Overview of TILLING, principle and mechanism of TILLING. TILLING projects and its applications. Determination of gene function through TILLING technique. Concept of EcoTILLIG,. TILLING vs EcoTILLING. Application of biodiverse lines in EcoTILLING. Application of EcoTILLING in superior gene discovery. **RNA interference (RNAi)**: Introduction to miRNA, siRNA, RNAi. Mechanism of RNAi and its applications. **Proteomics:** The concept of Proteomics, Types of Proteomics: Expression Proteomics, Structural and Functional Proteomics. Applications of Proteomics. **Metabolomics:** Definition, need for these approaches, challenges and potential applications. **Metagenomics:** Introduction to Metagenomics: Concept of metagenomics and its application in novel gene discovery.

COURSE OBJECTIVES:

The entire course is designed to give the thorough knowledge in the latest and upto date developmentsin the area of Life Sciences and Genomics.

COURSE OUTCOMES:

At the formal end of the course student will be able to

I- It will give knowledge on the various model organisms that can be used to ask some of the biological questions as well the latest sequencing technologies available in area of Life Sciences
II: It will give the through knowledge on the basic to advanced molecular markers that have a tremendous applications in the Biological systems.

III: I will give enlitght the students thirst, how the technological developments can solve the ever ending problems of studying thousands of genes at a given point of time in any Biological Systems. As well the wonder in biological genome / systems editing for desired traits.

IV: It will provide the knowledge on the application of the knowledge what they got in the entire course of their two year journey from most primitive cell types to unknown cell types that we may not be able to culture / see with our naked eye even we apply any microscopes available.

REFERENCES

1. DNA replication, 2nd ed. 1991. A. Kornberg and T.A. baker. W.H. Freeman and Company, New York. Ny. PP 931.
2. Gene transfer and expression protocols: Methods in Molecular Biology, Vol.7, 1991. E.J. Murray Ed. Human Press, Clifton, NJ. PP 439.
3. Genes IV, 1990. B. Lewin. Oxford University Press. PP 857.
4. Microbial genetics. 1994. Freifelder, D. Springer.
5. Glossary of Genetics. 5 ed. Classical and molecular, 1994, Reiger. R. et al., Springer.
6. Methods in Enzymology. Vol.152. Guide to molecular cloning techniques. 1987. S.L. Berger and A.R. Kimmel. Eds. Academic Press.
7. Recombinant DNA Laboratory manual. 1989. J.W. Zyskind and S.I. Bernstein. Academic Press.
8. Methods in Molecular Genetics. Vol. 7, Viral Gene Techniques. Ed. By Kenneth W. Adoph, Academic Press, 1995.
9. Gene transfer and expression protocols : Methods in Molecular Biology, Vol.7. 1991. E.J. Murray Ed. Humana Press. Clifton, NJ. PP 439.
10. Bioinformatics and Functional Genomics, Pevsner (3rd edition)
11. Practical Computing for Biologists, Haddock and Dunn
12. Primrose SB, Twyman RM (2006). Principles of gene manipulation and genomics. Blackwell Publishing
13. Simpson R (2002). Proteins and proteomics: A laboratory manual. Cold Spring Harbor Laboratory Press.

Programme: *M. Sc.*, Biotechnology
Type of Course: Internal Elective
Internal Elective: (A) IPR, Bioethics and Management
Course No.: BIOTECH45084-A

Semester: IV

UNIT – I (17hrs):

Introduction to Bioethics, Intellectual property rights – Definition – types of patents, copy rights and trade marks. IPR, Pan-Co-operation treaty (PCT), Positive and negative aspects of Biotechnology. Legal and Ethical aspects of Biotechnology.

UNIT – II (17hrs):–

Prenatal diagnosis – Genetic screening – Surrogate mothers. gene therapy – cloning, Technology transfer. Social impacts and socioeconomic aspects of Biological weapon.Ethics and Biosafety consideration in Bioremediation.

UNIT – III (17hrs): –

Role of Government, Industries and society in promoting, accepting and regulating the rDNA research, Intellectual Property Rights (IPR), WTO, TRIPS, Patenting- ,procedures of filing patents Examples of patents in Biotechnology.

UNIT – IV (16hrs):

Environmental and Health aspects of Biotechnology – Genetically engineered organisms – Introduction of novel species and natural equilibrium – Environmental security and safety – Precautionary measures – health safety. Cartagena Protocol on Biosafety, Biosafety concerned with radioactivity.

Objectives:

This course discusses the principles and procedures of Biosafety and its importance as scientist. Various disciplines, standards, levels and applications of the Biosafety concepts will also be discussed. In second stage the ethical controversies that arise in biology and medicine. This helps to adhere to the ethical practices appropriate to the discipline at all times and to adopt safe working practices relevant to the bioindustries & field of research. It introduces biotechnology applications and concerns that are necessaryfor intellectual property rights (IPR) is the process which protects the, use of information and ideas, the study of typical controversial issues emerging from the use of GMOS and LMOS, roles of institutional biosafety committees Cartagena protocol, new situation and possibilities and life forms is safe to the environment and beneficial to the human beings.

Outcomes:

Students will be able to

1. interpret basics of biosafety and bioethics and its impact on all the biological sciences and the quality of human life
2. recognize importance of biosafety practices and guidelines in research
3. comprehend benefits of GM technology and related issues
4. recognize importance of protection of new knowledge and innovations and its role in business

REFERENCES

1. Gene cloning – Brown
2. Concepts in Biotechnology – Balasubramanyam.D
3. Basic Biotechnolgy – Colin Rotledge and Kristainsen
4. Gene Biotechnology - Jogdand

5. From Genes to Clones , Introduction to Gene Technology- Winnacker, Ernst.L
6. Safety, Moral, Social and Ethical issues related to geneticalls modified foods – Smith J.E.
7. Molecular Biology and Biotechnology – Meyer R A
8. Biotechnology expanding horizons by B.D. Singh, Kalyani Publisher
9. Biological warfare in the 21st century by M.R.Dando
10. Intellectual Property Rights in Agricultural Biotechnology by F.H. Erbisch and K.M. Maredia.

Programme: *M. Sc.*, Biotechnology
Type of Course: Internal Elective
Internal Elective : (B) Medical Biotechnology and Vaccinology
Course No.: BIOTECH45084-B

Semester: IV

UNIT-I

Medical Biotechnology - History, Definition, applications and uses of recombinant DNA technology Products like "Insulin, growth factor, factor- VIII, tissue plasminogen activator, interferons, B-cell, Blood Products, Erythropoietin". Gene controlled diseases – autosomal and X- linked disorders. Pathogenic mutations: Gain of function mutations: oncogenes, Huntingtons disease, Pittsburg variant of alpha 1 antitrypsin. Loss of function -tumour suppressor, genomic, dynamic mutations - Fragile- X syndrome, myotonic dystrophy, mitochondrial diseases.

UNIT – II

Disease Diagnosis - Gene therapy- vector engineering and gene delivery methods, gene replacement, gene augmentation, gene silencing. PCR in molecular diagnostics; multiplex-PCR, quantitative real time PCR (qRT-PCR) and their applications for diagnosis of disease applications, DNA diagnostic system: molecular beacons and its variants for their applications in detection, molecular diagnostics in bacterial detection, rolling circle amplification, application of padlock and selector probes in molecular medicine,

UNIT – III

Vaccinology - Historical background of vaccination, vaccine preventable infectious diseases, human vaccine manufacturers and licensed vaccines. Over view of bacterial and viral vaccines and their importance to public health. Epidemiology and pathophysiology of vaccine preventable diseases with special emphasis on Diphtheria, Tetanus and Pertussis. Overview of the immune system and basic aspects of immune response(s) to vaccines. New vaccines under development and prominent vaccine delivery systems.

UNIT-IV

Current strategies for development of vaccines against HBV, Malaria, Tuberculosis. Genetic recombinant vaccine, live, subunit and their production of Hepatitis-B vaccines, HIV vaccine, pre-clinical, toxicological acute, sub-acute and chronic studies, Clinical Trials: Types of clinical trials Phase-I, Phase-II and Phase III and their implications

Course Objectives

- To study the applications of medically important recombinant DNA products such as Insulin, growth factors etc.
- To understand the vector engineering and gene delivery methods, application of padlock and selector probes in molecular medicine,
- To understand the bacterial and viral vaccines and their importance to public health.
- To study Overview of the immune system and basic aspects of immune response(s) to vaccines
- To study, Current strategies for development of vaccines against HBV, Malaria, Tuberculosis.
- To study, recent developments towards new or improved vaccines and new vaccination strategies

Course outcomes

a. By knowing the upto date information about the achievements in the development of pharmaceutical products by biotechnology, which will provide the basis and scope for production of new potential drugs to cure various diseases and health complications in humans as well as animals.
b. This could be useful for the students in such way to gain more knowledge and to attarct them towards

research in the field of pharmacetical biotechnology.

c. Drug desining techniques are very useful for the students to gain knowledge about how to design and develop potential drug for target deasease or affectd organ in the body.

d. Knowing the effective methods for the development of various types of vaccines such as recombinant, vector based vaccines (Live, subunit) could provide an idea about the scope for development of potential vaccines to prevent various dreadful diseases.

BOOKS RECOMMENDED:

1. Biotechnology by B. D. Singh (Kalyani).
2. Molecular Biology and Biotechnology by Meyers, RA, A comprehensive Desk reference (VCH Publishers).
3. Biotechnology by U. Satyanarayana (Books & Allied (P) Ltd).
4. Biopharmaceuticals-Walsh, John Willey and Sons, New York 1998
5. Physical Methods to characterize Pharmaceutical Protines- James N. Herron, Wim jishkoor and Daan J.A. Crommelin Amazon. Wm
6. From clone to clinic (Developments in Biotherapy) Daan J.A. Crommelin and H. Schellekom Amazon.Wm
7. Hand Book of Pharmaceutical Biotechnology - Jay P.Rho, Star 4 lonie The Haworth press, Alice Sr. Bringhamtoon, NY 13904, US Tramas bartifai, Harold L. Dorn's
8. Human Molecular Genetics (2018) Strachan T and Read A, Garland Science publisher, ISBN: 9780815345893.
9. Medical Biotechnology (2013) Glick BR, Patton CL and Delovitch TL, ASM Press, ISBN: 155581705X.
10. Biotechnology in Medical Sciences (2017) Khan FA, CRC Press; ISBN: 978-1138076792

Programme: *M. Sc.*, Biotechnology
Type of Course: Internal Elective
Internal Elective : (C) Stem Cell Technology and Regenerative Medicine
Course No.: BIOTECH45084-C

Semester: IV

UNIT-I:

STEM CELLS & TISSUE ENGINEERING: Introduction to stem cells & Tissue Engineering, Cell sources and stem cells, media. Embryonic and adult stem cells, Cell isolation and selection; Tissue preservation.

UNIT-II:

STRUCTURE AND ORGANIZATION OF TISSUES: Extracellular matrices; Cell-matrix interactions. Cell synthetics surface interactions and the ensuing effects on cell growth, cell adhesion, cell migration, and cell-cel

UNIT-III

CELL BIOMATERIAL INTERACTIONS & TRANSPLANTATION: Cell-Biomaterial Interactions and Host Integration. Biomaterial processing for TE, Scaffolds and Tissue Engineering. Transplantation of engineered cells and tissues, Immunomodulation and Immunoisolation.

UNIT-lV:

THE DESIGN OF BIOMIMETIC ENVIRONMENTS & REGENERATIVE MEDICINE:

Introduction, Scale

Up/Reactor Design, Artificial skin, Artificial blood vessels, vascular grafts, and cardiac prostheses, Bone repair, Repair of cartilage, tendon and ligaments, Artificial liver, Nerve regeneration.

Course Objective:

- To study the stem cell technology and its applications for betterment of the society.
- To study a broad view of mammalian stem cells, reviewing where they are found in the body, the different types and how they are cultured.
- To study the basic biology of these stem cells as well as Tissue engineering and application of these stem cells to potential treatments of human diseases.

COURSE OUTCOMES:

-At the formal end of the course student will be able to
CO1- Understand I basics of animal cell and its culturing

CO2- Evaluate the preparation of animal cell culture medium and its components and their significanceCO3- Engineer animal cells for the production of recombinant proteins

CO4- Apply the concepts of animal cell culture in research

REFERENCE:

1. Bioengineering of the Skin: Methods and Instrumentation, Volume III [Hardcover] enzo Berardesca (Editor), Peter Elsner (Editor), Klaus P. Wihelm (Editor), Howard I. Maibach

(Editor).
2. Composite Tissue Transplantation (Tissue Engineering Intelligence Unit-II) [Hardcover] Charles W. Hewitt (Editor), Kirby S. Black (Editor).

3. Tissue Engineering: Engineering Principles for the Design of Replacement organs and Tissues by W. Mark Saltzman (Jul 15, 2004).
4. Tissue Engineering by John P. Fisher, Antonios G. Mikos and Joseph D. Bronzino (May 30, 2007).
5. "Future Strategies for Tissue and Organ Replacement" edited by Julia M Polak (Imperial College School of Medicine Hammersmith Hospital, UK) Larry L Hence (Imperial College, UK) & P Kemp (Intercytex, Etherley Dene House, UK).

6. Principles of Tissue Engineering by Robert P. Lanza (Editor), Robert Langer (Editor), William L. Chick (Editor).
7. Tissue Engineering Methods and Protocols (Methods in Molecular Medicine, 18) by Jeffrey Robert Morgan (Editor), Martin L. Yarmush (Editor),
8. Tissue Engineering [Hardcover] Bernhard O. Palsson (Author), Sangeeta N. Bhatia (Author).
9. Tissue Engineering (Academic Press Series in Biomedical Engineering) by Clemens van Blitterswijk, Peter Thomsen, Jeffrey Hubbell and Ranieri Cancedda (Apr 8, 2008)

Programme: *M. Sc.,* Biotechnology

Practical : Plant and Animal Biotechnology LabType of Course: Practical
Course No.: BIOTECH45085

Semester: IV

PRACTICALS

Programme: *M. Sc.,* Biotechnology

Project: Multi-Disciplinary Project
Type of Course: Project

Course No.: BIOTECH45086
Semester: IV

INTER DICIPLINARY PROJECT for 100 Marks

YOGI VEMANA UNIVERSITY

M.Sc. Biochemistry

Syllabus

Programme Code: BCH

YOGI VEMANA UNIVERSITY

Vemanapuram, Kadapa-516 005
Andhra Pradesh, INDIA

(AP State University, Accredited with "B" Grade by NAAC)

M.Sc. Biochemistry syllabus

(With effect from Academic year 2021-22 for first semesters)

Structure of M.Sc. Biochemistry course

A two years M.Sc. programme is formulated for developing competent Biochemists. The course is based on choice based credit system (CBCS) with National Education Policy (NEP) and interdisciplinary nature of Biochemistry, Chemistry, Quantitative Biology, Genetics, Biotechnology, Microbiology and other Applied Life Science. The programme obliges students to read original publications and envisages significant inputs in Laboratory work, communication skills, creativity, planning, execution and critical evaluation of the scientific data. The course titles have been carefully chosen to represent the core courses and the specialization introduced in the two year course of Biochemistry are:- Enzymology, Molecular Biology, Genetic Engineering, Biotechnology, Clinical Biochemistry, Nutritional Biochemistry and Immunology inconsonance with the objectives of the University. The courses formulated have a biochemical slant than biological and are up to date. The course is fine tuned in order to enhance the job opportunities of the students.

Program Educational Objectives (PEOs)

The graduated students of M.Sc. Biochemistry are expected to accomplish-

PEO1: Skill to communicate the biochemical/molecular concepts and results of their laboratory experiments through effective writing and oral communication using discipline standards for reporting and citation.

PEO2: Summer training and project work helps them to know the practical aspects about various fields of Biochemistry.

PEO3: Critical thinking and scientific inquiry in the performance, design, interpretation and documentation of laboratory experiments to the level suitable to succeed at an entry level position in Pharmaceutical/ Biochemical/ Biotech industries.

PEO4: Recognize and demonstrate the structure, chemical properties and reactions of the biomolecules and their derivatives to predict chemical properties and reactivity.

PEO5: Understanding the areas that are widely used with advanced scientific methods through lectures, classes, seminars, debates and a problem-based learning exercise.

PEO6: Provides basic understanding for highly advanced and specialized courses evolve from time to time in future.

PEO7: Understand the theoretical concepts of analytics and perform basic and critical reactions of biological importance, and instruments that are commonly used in most Biochemistry and its applied fields for excel them relevant fields.

PEO8: Participate and report the team work-based investigations of problem-based assignments.

PEO9: Suggest, evaluate and interpret biochemical investigation in a given clinical situation and apply knowledge to solve clinical problems.

PEO10: Contribute their knowledge and experiences gained during the course to professional and/or public activities in developing the community.

Program Outcomes (POs)

Biochemistry, a field of living chemistry creates Knowledge Ocean to the students. The students on successful completion of M. Sc. Biochemistry programme should gain-

PO1: Ability to apply and acquire the knowledge in the core and applied fields of Biochemistry.
PO2: Ability to perform practicals competently in a laboratory setting, design and conduct experiments and simulations, operating and calibrating technical equipment as well as critical analysis.
PO3: Able to identify problems in specific areas of Biochemistry.
PO4: Capability to work effectively as individual and in group (team), and able to lead the team.
PO5: Maintains professional ethics and follows ethical principles.
PO6: Ability to engage in life-long learning
PO7: Discriminate knowledge effectively with the general society.
PO8: Strength to participate and succeed in State, National and International level competitive examinations.
PO9: Capability of linking interdisciplinary research areas.
PO10: Ability to create awareness on biochemical applications among the populations along with providing understanding on global environmental and societal contents.

Program Specific Outcomes (PSOs)

Upon successful completion of M.Sc. Biochemistry program, the graduates are expected to

PSO1: Recognize, demonstrate and understand of structure, chemical properties and reactions of the biomolecules and their biopolymer structure to predict chemical properties and reactivity.
PSO2: Apply the knowledge of metabolism, detect various disorders, identify the defect in the metabolic pathways and evaluate solutions for metabolic disorders.
PSO3: Diagnose the pathogenic microbes in the laboratory by applying the knowledge of microbial culture techniques.
PSO4: Expertise on cell and molecular biology as well as on cell signaling that would help them to plan and carryout research program's in relevant aspects.
PSO5: Obtain the knowledge about the qualitative and quantitative analysis of different molecules using different types of microscopes, centrifuges, radio isotopes, chromatographic and electrophoresis techniques and spectroscopic techniques.
PSO6: Familiarize with molecular aspects of cell and tools of genetic engineering, aspects of immune reactions and applications of statistics in biology.
PSO7: Application of course knowldge in inter-disciplinary approacher/research.
PSO8: Diagnose various clinical parameters, diseases and disorders.

VEMANA UNIVERSITY

Vemanapuram, Kadapa-516 005, A.P., INDIA
(AP State University, Accredited with "B" Grade by NAAC)
M.Sc. Biochemistry Syllabus
(For the students admitted during the academic year 2021-22 onwards)

Semester	Components of Study	Course Code	Title of the Course	No. of credits	No. of hours per week	Practical/ Project	Internal Assessment	Semester End Exams	Total
SEMESTER-I	Core	BCH1201	Biomolecular Chemistry	04	04		25	75	100
		BCH1202	Analytical Biochemistry	04	04		25	75	100
		BCH1203	Intermediary Metabolism I	04	04		25	75	100
	Internal Elective	BCH1204	(A) Cell Biology and Physiology	04	04		25	75	100
			(B) Genetics and Developmental Biology		04				
			(C) Human Physiology		04				
			Tutorial and Seminar	00	04		00	00	000
	Practical	BCH1201P	Qualitative and quantitative Biochemical Analysis (Practical-1) **[>15 students 2-batches]**	04		16		100	100
	Practical	BCH1202P	Biochemical Techniques and Biochemical Preparations (Practical-2) **[>15 students 2-batches]**	04		16		100	100
	Sub-total			24	28	32	100	500	600
SEMESTER-II	Core	BCH2201	Enzymology	04	04		25	75	100
		BCH2202	Microbiology	04	04		25	75	100
		BCH2203	Molecular Biology	04	04		25	75	100
	Open Elective	BCH2204	(A) Fundamentals of Biochemistry	04	04		25	75	100
			(B) Environmental Biochemistry		04				
			(C) SWAYAM /MOOCs/ NPTEL		04				
			Tutorial and Seminar	00	04	00	00	00	000
	Practical	BCH2201P	Enzymology (Practical-1) **[>15 students 2-batches]**	04		16		100	100
	Practical	BCH2202P	Microbiology and Molecular Biology (Practical – 2) **[>15 students 2-batches]**	04		16		100	100
	Sub-total			24	28	32	100	500	600
SEMESTER-III	Core	BCH3201	Intermediary Metabolism II	04	04		25	75	100
		BCH3202	Endocrine Biochemistry	04	04		25	75	100
		BCH3203	Nutritional Biochemistry	04	04		25	75	100
	Open Electives	BCH3204	(A) Nutrition and Clinical Biochemistry	04	04		25	75	100
			(B) Research Methodology		04				
			(C) SWAYAM /MOOCs/ NPTEL		04				
	Practical	BCH3201P	Endocrinology and Nutrition Biochemistry (Practical-1) **[>15 students 2-batches]**	04		16		100	100
	Skill Oriented Course Practical	BCH3205 & 05P	Genetic Engineering (Genetic Engineering Practical-2)	04	04		10	40	100
						08		50	
			Tutorial and Seminar	00	04	00	00	00	000
	Sub-total			24	32	24	110	490	600
SEMESTER-IV	Core	BCH4201	Clinical Biochemistry	04	04		25	75	100
		BCH4202	Immunology	04	04		25	75	100
		BCH4203	Biotechnology	04	04		25	75	100
	Internal Elective	BCH4204	(A) Technical writing, Biostatistics, Computers and Bioinformatics	04	04		25	75	100
			(B) Nerve, Vision and Muscle Biochemistry		04				
			(C) Functional Genomics		04				
	Practical	CHE45035	Clinical Biochemistry, Immunology and Hematology (Practical-1) **[>15 students 2-batches]**	04		16		100	100
	Multi-Disciplinary/ Project	CHE45036	Project	04		16		100	100
	Sub-total			24	28	32	100	500	600
Grand Total				**96**	**116**	**120**	**400**	**2000**	**2400**

- All core papers are Mandatory
- Compulsory Foundation choose one paper.
- Internal/Open Elective – Choose one paper each.Open Electives are for the students of other Departments in the varsity.
- Skill Oriented course is mandatory. Relevant society along with practical (10 marks internal, 40 final theory and 50 for practical's).
- Interested students may register for SWAYAM /MOOCs/ NPTEL with the approval of the concerned DDC for the award of the grade as 'open elective'.
- Choose one from Multi-Disciplinary (Circle formation with other subjects/Dept. of Arts/ Commerce) Course or Project (Collaboration with various firms/companies/societies) work.

M.Sc. BIOCHEMISTRY COURSE (CBCS)
(With effect from the academic year 2021-22 for first semester)

SEMESTER -I

BCH1201: Biomolecular Chemistry

Course Objectives:

The main objectives of this course are to:

1. Emphasizes on various biological macromolecules and its significance in biological systems.
2. Learn the basic functions, structures and biological importance of lifeless chemical compounds in life.
3. Upon successful completion, students should have understood the significance of the complex biomolecules, polysaccharides, lipids, proteins, nucleic acids, vitamins and porphyrins.

Unit I

Molecular logic of Life – Major constituents of cells, Biomolecules.

Carbohydrates: Classification, structure, Chemical properties of carbohydrates, reactions of monosaccharides, formation of glycosidic bond, oligosaccharides, chemistry and biological role of homo and heteropolysaccharides; Structural polysaccharides (Cellulose and Chitin), storage polysaccharides (Starch, Glycogen and Inulin), Mucopolysaccharides, Blood group substances, Peptidoglycons.

Unit II

Amino acids and Proteins: Classification, structure and physico chemical properties of amino acids, Essential and non-essential amino acids, Acid base properties and general reactions of amino acids, Non-protein or unusual amino acids, Peptide bond formation and stability.

Classification of proteins, Purification and isolation of proteins, criteria of purity, structural organization of proteins-Primary, Secondary, Tertiary and Quaternary structure, confirmation of proteins-Ramachandran plot, Denaturation of proteins.

Unit III

Lipids and Porphyrins: Classfication and Structure, properties and classification of lipids, fatty acids, waxes, phospholipids, cerebrosides and gangliosides, lipoproteins, prostaglandins, leukotrienes, thromboxanes, steroids and bile acids.

Structure of Porphyrins, Structure and function of Heme, Cytochromes and Chlorophyll.

Unit IV

Nucleic acids: Purine and Pyrimidine Bases, Nucleosides, Nucleotides, Formation of phosphodiester bond and its stability, Structure of DNA-Watson and Crick model, different forms of DNA, types of RNA, Structure of t-RNA, Denaturation and Renaturation of DNA, melting curves.

Recommended Books:

1. Glycoproteins by Hughes R.C., Chapman & Holl.
2. Biochemistry – Mechanisms of metabolism Cunningham, E.B.., Mc Grew – Hill.
3. Nucleic acid – Chargaff & Davidson Vol. II
4. The Biochemistry of Nucleic acids; Adams et al., Chapman and Hall.
5. Proteins: A guide to study by Physical & Chemical
6. Proteins: Structure, function and evolution. Dickerson Geis,2nd Edn, Benjamin/ Cummings, Menlo Park, California.
7. The proteins: Neurath and Hill, 3rd Ed. Academic New York.
8. Biochemistry – Zubay C, Addison – Wesley.

9. Biochemistry, A Problem Approach, 2nd Ed. Wood, W.B. Addison Wesley.
10. Biochemistry of Lipids and Membranes – Vance D, Addison – Wesley.
11. Biochemistry, Lehninger A.H.
12. Textbook of Biochemistry West, E.S., Todd, Manson & Vanbruggen, Macmillian &co.
13. Principles of Biochemistry white- A. Handler and Smith E.L. Mc Graw Hill.
14. The carbohydrates: Pigman & Hartman Vol. II – A & II- B.
15. Comprehensive Biochemistry – Florkin & stotz, Academic Press.
16. Organic chemistry, I.L. Finar, ELBS.
17. Organic chemistry by J.P. Cohen. Vol. 3 Edward Arnold.
18. Basic Principles of Organic Chemistry by Roberts & Cashino (Benjamin)
19. Fundamentals of Biochemistry by Voet and Voet.
20. Organic chemistry by Morrison and Boyd Prentice Hall.

Expected Course Outcomes:

On the successful completion of the course, students will be able to:

1. Helps to understand about the polysaccharides and its types (K1 & K2).
2. Gives a clear understanding about the lipids and its role (K1 & K2).
3. A Clear Knowledge regarding amino acids and protein characterization (K2 & K3).
4. Provides the structure and properties of Nucleic acids (K2 & K3)
5. Gives an idea about energy level and its synthesis (K1, K2 & K3).

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

BCH1202: Analytical Biochemistry

Course Objectives:

The main objectives of this course are to:

1. The main objective of the course is qualitative and quantitative analysis of different molecules taking place in a biochemical reaction.
2. It includes the development of different tools and methods for identification, analysis and examination of physical properties of different biochemical compositions to provide better chemical information.
3. It helps the biochemistry students in understanding the basic science in a variety of applications.

Unit I

Safety and good lab practices, Solutions –Percentage, Molarity, Molality, Normality, pH, Measurement of pH, pKa of functional group in biopolymers such as proteins and nucleic acids.

Microscopy: basic principles of light microscopy, phase contrast microscopy, electron microscopy and fluorescence microscopy.

Sedimentation methods: principles of centrifugation, analytical and Ultra-centrifugation/Gradient centrifugation.

Unit II

Concept of half – life and decay constant, units of radioactivity, Radioactivity measuring techniques and correction factors. Application of isotopes in biochemical analysis, isotope dilution techniques and autoradiography.

Radioisotopes in biochemistry and medicine.

Measurement of radioactivity - GM counter, Liquid Scintillation Counter, γ-Counter, Radioactive disposal, RIA, Chemiluminescence.

Unit III

Separation methods: principle, methodology and application of counter current distribution, paper, thin layer, ion-exchange, gas chromatography, affinity chromatography, gel filtration, HPLC. Electrophoresis - paper, agar, high voltage electrophoresis, iso - electrophoresis, iso - tachophoresis, Northern blot, southern blot, western blot analyses. *in situ* hybridization.

Unit IV

Spectroscopy methods – Concepts of spectroscopy, electromagnetic spectrum, Beer – Lamberts law, principles and applications of colorimetry, UV-VIS spectrophotometry.
Concepts of fluorimetry, flame photometry, AAS, AES, Infrared, ESR, NMR, CD & ORD and X – ray Diffraction. Flowcytometry and cell sorting and their applications.

Recommended Books:

1. Principles and Techniques of Practical Biochemistry, Ed. Williams and Wilson.
2. Techniques in Molecular Biology Ed. Walker & Gastra, Croom Helm.
3. Principles of Instrumental Analysis, 2nd Ed. Holt-Sanders.
4. An Introduction to Spectroscopy for Biochemistry, Ed. Brown Sn., Academic Press.
5. Analytical Biochemistry, Holmes and Hazel Peck, Longman.
6. An Introduction to Practical Biochemistry. David t. Plummer, Tata Mac grew – Hill.
7. Biophysical Chemistry, Ed. Shall & Wyman, Academic Press Vol II & I.
8. A text book of quantitative inorganic analysis including elementary instrumental analysis, Vogel ELBS.
9. Biochemical Calculations Seigel, IH, 2nd Ed. John Wiley & Sons Inc.
10. Analytical Biochemistry by David Friefelder.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1. Obtain the knowledge about the microscope handling and the basic difference between the ordinary microscope and electron microscope (K2).
2. Learn the chromatographic techniques, for the separation of the individual compound from the mixture of compound (K3 & K5).
3. Study the interaction between matter and electromagnetic radiation and visible light dispersed according to its wavelength, by a prism (K4& K5).
4. Understand the characterization of surfaces using radioisotopes generally involves observing the manner in which the radioactive species interact with the surface (K1, K2 & K3).
5. Obtain knowledge about the separation and analysis of macromolecules and their fragments, based on their size and charge (K2 & K3).

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

BCH1203: Intermediary Metabolism I

Course Objectives:

The main objectives of this course are to:
1. To understand the metabolism of carbohydrates, lipids, proteins and nucleic acids.
2. To impart knowledge of the concepts of regulation of metabolism.
3. To offer basic knowledge about Big Data analytics and its applications in the metabolic pathway analysis

Unit I

Outline of intermediary metabolism, methods of studying metabolism.

Glycolysis – Reactions, energy yield and regulation. Entry of other carbohydrates into glycolytic sequence, fermentation, TCA cycle – Reactions, Energetics and Regulation.
Organization of electron carriers and enzymes in mitochondria, mitochondrial respiratory chain, Classes of electron transferring enzyme, inhibitors of electron transport, oxidative phosphorylation, Mechanism of oxidative phosphorylation.

Unit II
Glyoxylate cycle, pentose phosphate pathway-regulation and significance.
Glucuronic acid cycle, Breakdown of glycogen, starch and disaccharides, glycogenolysis and its regulation, Biosynthesis of glucose (gluconeogenesis), Futile cycle, glycogen synthesis and its regulation, Regulation of blood glucose homeostasis

Unit III
Bioenergetics - Thermodynamic principles: free energy, enthalpy (H), entropy (S), Free energy change in biological transformations in living systems; high energy compounds, exergonic and endergonic reaction, oxidation – reduction reactions.
Microsomal electron transport – utilization of oxygen by oxygenases, superoxide dismutase, and catalase. photosynthesis – dark and light reaction Photophosphorylation, and Photorespiration, cyclic and non – cyclic reactions; photochemical events associated with photo system – I and II. C3 and C4 plants.

Unit IV
Nucleic acid metabolism. Synthesis of nucleotides and its regulation, Biosynthesis and degradation of purines and pyrimidines and its regulation. Salvage pathway, Lesch-Nyhan Syndrome, Synthesis of ribonucleotides, deoxy-ribonucleotides and its regulation.
Inter-conversion of nucleotides. Nucleotides as metabolic regulators.

Recommended Books:

1. Principles of Biochemistry, white. A, Handler, P and Smith
2. Biochemistry, Lehninger A.L.
3. Biochemistry, David E. Metzler.
4. Biochemistry, Lubert Stryer.
5. Review of Physiological chemistry, Harold A. Harper.
6. Text of Biochemistry, West and Tood.
7. Outlines of Biochemistry, Conn and Stump
8. Metabolic pathways – Greenberg.
9. Mitochondria, Munn.
10. Biochemistry, 2nd Edition, G. Zubay.

Expected Course Outcomes:

On the successful completion of the course, students will be able to:

1. Understand the concepts of carbohydrate metabolism and its regulation (K2)
2. Understand the concepts of lipid metabolism and its regulation (K2)
3. Apply the knowledge about Big Data analytics in Metabolic Pathway Analysis (K3)

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

BCH1204: Internal Electives
(The student should opt any one of BCH1204(A) / BCH1204(B) / BCH1204(C))

(A) Cell Biology & Physiology

Course Objectives:

The main objectives of this course are to:

1. Enables the students to learn the basic cytochemical tests.
2. Provide basic knowledge about the cell biology techniques.
3. Learn the physiological parts, structures, organs and their structures of animal systems.
4. Basic knowledge of animal systems and their functions.

Unit I

Structural organization of prokaryotic and eukaryotic cells, Plant and animal cells – variation in structure and function.

Types of tissues – Epithelial tissues, basement membrane, extracellular matrix, Chromatin organization, telomere, centromere, Ultrastructure and functions of nucleus, mitochondria, plastids, endoplasmic reticulum, Golgi complex, lysosomes, microbodies, ribosomes. Cytoskeleton – microtubules and microfilaments.

Unit II

Cell division by mitosis and meiosis, cell cycle and its regulation, cell receptors, endocytosis and exocytosis.

Bio-membranes - composition of Membranes. Membrane lipids, proteins and carbohydrates.

Molecular structure of membranes, fluid mosaic model of biological membranes. Membrane transport: Active transport, Active transport of Na+ K+(sodium potassium ATPase) Ca^{2+} (Ca^{2+} - ATPase).

Unit III

Basic concepts of cell signaling and transduction, different signaling molecules, second messengers, calcium, calmodulin, inositol phosphate, cAMP, cGMP, NO.

Signal cascades. Introduction to physiology. Homeostasis.

Excretory System: Kidneys – Glomerular filtration, tubular function, formation of urine, regulation of water and mineral balance.

Unit IV

Digestive system: Various regions of digestive system. Gastrointestinal secretions-composition, function of saliva, gastric, pancreatic, intestinal and bile secretions. Regulation of gastrointestinal function.

Circulatory System: Blood composition, Heart-Structure. Electrical activity, Heartbeat, Arterial system, micro circulation and lymphatics, cardiac cycle and cardiac output, control of circulation.

Respiratory system: Mechanics of respiration, gas exchange in the lungs, control of breathing.

Recommended Books:

1. Molecular Biology of the cell by Alberts *et al*.
2. Cell and Molecular Biology by EDP de Robertis and EMF de Robertis.
3. Cell and Molecular Biology 2nd Ed. By P.K. Gupta, Rastogi Publ.
4. Molecular Genetics by D Friefelder
5. Cell molecular biology, albert Bruce
6. Gene VII by Lewin
7. Molecular cloning by Maniatis and Co Vol I, II, III
8. Genetics by Gardner
9. Genetics by Suzuki
10. Molecular genetics by klug and Cummings
11. Cell and Molecular Biology 2nd Ed. by P.K. Gupta, Rastogi Publ.

Online Content:

1. https://bio.libretexts.org/Bookshelves/Cell_and_Molecular_Biology/Book%3A_Cells_-_Molecules_and_Mechanisms_(Wong)
2. https://nptel.ac.in/courses/102/106/102106025/#
3. https://www.easybiologyclass.com/molecular-biology-online-tutorials-lecture-notes-study-materials/
4. https://www.mooc-list.com/tags/molecularbiology?title=MOLECULAR+PHYSIOLOGY

Expected Course Outcomes:

On the successful completion of the course, students will be able to:

1. Helps to understand the basic biochemical techniques (K1 &K2).
2. Gives a clear understanding about the estimation and separation of biomolecules (K1 & K2).
3. Perform the basic cell biology techniques and evaluate the biological samples (K3 & K5).
4. Apply basic microbiological culture techniques and to analyze the microbes present in the biological samples (K3 & K4).
5. Apply bacterial Isolation and Identification techniques and evaluate the bacterial sample (K3 & K5).

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

(A) Genetics and Developmental Biology

Course Objectives:

The main objectives of this course are to:

1. The main objective of this course is to introduce concepts in Genetics and Developmental Biology. This course emphasizes learning about the principles involved in Mendelian genetics and Non-Mendelian inheritance and techniques used to diagnose genetic diseases and mutation concepts.
2. The course aims to give exposure to learn the basic concepts involved in developmental biology such as Potency, commitment, specification, induction, competence, determination and differentiations and morphogenetic gradients.
3. This course also provides knowledge about Cell division in cleavage, Rudimental organs, Gametogenesis and Fertilization approaches.

Unit I

Principles of Mendelian inheritance; Mendel‟s experiments-monohybrid, dihybrid trihybrid and multi hybrid crosses.

Concept of gene: Allele, multiple alleles, pseudo allele, complementation tests.

Extensions of mendelian principles: Codominance, Incomplete dominance, Gene interactions, Pleiotropy, Genomic imprinting, Penetrance and expressivity, Phenocopy, Linkage and crossing over. Sex linkage, Sex limited and sex influenced characters.

Extra chromosomal inheritance: Inheritance of Mitochondrial and chloroplast genes, maternal inheritance.

Unit II

Gametogenesis–Origin of germ cells–Significance of gametogenesis.

Oogenesis – Types of eggs– growth, development and maturation of oocyte, Egg envelopes, Polarity and symmetry.

Spermatogenesis–Sperm Structure, Types of sperm, Fertilization – Approach of spermatozoon–Reaction of egg, essence of activation – Changes in egg cytoplasm caused by fertilization.

Unit III

Potency, commitment, specification, induction, competence, determination and differentiation; cell fate and cell lineages.
Stem cells; genomic equivalence and the cytoplasmic determinants; imprinting; mutants and transgenics in analysis of development.

Unit IV
Cell division in cleavage–Chemical changes–Patterns of embryonic cleavage – Morula and Blastula – Role of egg cortex – Morphogenetic gradients – Fate map – Gastrulation – Primary organ, Rudimental organs, Organizer – Morphogenetic movements.
Anterior and posterior axis differentiation in drosophila.

Recommended Books:

1. Molecular Biology of the cell by Alberts *et al*.
2. Cell and Molecular Biology by EDP de Robertis and EMF de Robertis.
3. Cell and Molecular Biology 2nd Ed. By P.K. Gupta, Rastogi Publ.
4. Principles of Genetics 5th Edition by Gardner, M. J. Simmons 2006, D. P. Snustad John Wiley & Sons.
5. Developmental biology, Gilbert, Scott F, Singer, Susan Sunderland, Mass Sinauer Associates, c2000. 6th ed. United States
6. Animal Regeneration, Diwan A.P., Dhakad N.K., 1996, Anmol Publications Ltd
7. Developmental Biology, Browder L.W., Erickson C.A., And Jeffery W.R, 1991 Saunder college Publishing House, Philadelphia.
8. Genetics by Gardner
9. Genetics by Suzuki
10. Molecular genetics by Klug and Cummings
11. Cell and Molecular Biology 2nd Ed. by P.K. Gupta, Rastogi Publ.

Expected Course Outcomes:
On the successful completion of the course, students will be able to:

1. Learn Mendelian genetics, history, Monohybrid, Dihybrid and Trihybrid cross, Mendelian ratio of segregation, interaction of genes, alleles, Extrachromosomal inheritance, Extensions of Mendelian principles (K1, K2 & K4).
2. Understand the concept of determination and differentiation; morphogenetic gradients; cell fate and cell lineages and imprinting (K1, K2 & K4).
3. Understand the process of cell division in cleavage, patterns in embryonic cleavage after fertilization. To know about the development of primary organs and Rudimental organs (K1 & K2).
4. Learn the process involved in spermatogenesis, gametogenesis and fertilization (K1 & K2).

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

(C) Human Physiology

Course Objectives:
The main objectives of this course are to:

1. This course presents an Introduction and provides a comprehensive, balanced introduction to this exciting, evolving and multi-disciplinary field.
2. Learn or know the biological, physiological activities along with the mechanism of action of various organs.

Unit I

Composition, types and functions of blood and plasma. Blood volume, blood volume regulation, immunity, haemostasis, blood groups. Haemopoiesis.

Blood coagulation - mechanism, fibrinolysis, anticoagulants. Hemoglobin - structure, abnormal types, anemia, Blood corpuscles.

Unit II

Comparative anatomy of heart structure, myogenic heart, specialized tissue, ECG – its principle and significance, cardiac cycle, heart as a pump, blood pressure, neural and chemical regulation of all above.

Sense organs – Vision, hearing and tactile response.

Unit III

Digestive secretions - composition, functions and regulation of saliva, gastric, pancreatic, intestinal and bile secretions. Digestions and absorption of carbohydrates, lipids, proteins and nucleic acids.

Comparative physiology of excretion, kidney, urine formation, urine concentration, waste elimination, micturition, regulation of water balance, electrolyte balance, acid-base balance.

Unit IV

Comparison of respiration in different species, anatomical considerations, transport of gases, exchange of gases, waste elimination, neural and chemical regulation of respiration.

Neurons, action potential, gross neuroanatomy of the brain and spinal cord, central and peripheral nervous system, neural control of muscle tone and posture.

Muscle physiology.

Recommended Books:

1. Textbook of Medical Physiology, Guyton and Hall 15th Edition, Publisher: Saunders (2015)
2. Human Physiology by C. C. Chatterjee, CBS Publishers & Distributors; 13th revised edition, volume 2 (2020).
3. Review of Medical Physiology by William. F. Ganong. McGraw-Hill Medical; 22nd editions (2005).
4. Physiology and Mechanisms of Disease by Arthur C. Guyton, John E. Hall. Saunders, 6th Edition (1997).
3. V. Bhuvaneswari, T. Devi, Big Data Analytics, Scitech Publisher, 2018
4. Han Hu, Yonggang Wen, Tat- Seng, Chua, Xuelong Li „Toward Scalable Systems for Big Data Analytics: A Technology Tutorial", IEEE, 2014.

Online content:

1. Introductory Human Physiology Syllabus-revised Feb. 2022.doc
2. Animal Physiology https://nptel.ac.in/courses/102/104/102104042/#
3. NOC: Animal Physiology https://nptel.ac.in/courses/102/104/102104058/

Expected Course Outcomes:

On the successful completion of the course, students will be able to:

1. Obtain a deep knowledge regarding blood (K1 & K2)
2. Gives an idea about heart and its regulation (K1 & K2)
3. Provides Knowledge about digestive secretion and urine formation (K2 & K3)
4. Obtain an insight about respiration and Neurons (K2 & K3)
5. Provides knowledge about Hormone and its regulation (K2, K3 & K4).

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

PRACTICALS

BCH1201P: Qualitative and Quantitative Biochemical Analysis

1. General tests of carbohydrates. Specific reactions of selected sugars – Osazones, sucrose, pentoses.
2. General reactions of amino acids and proteins. Precipitation of proteins.
3. Qualitative tests of lipids and steroids.
4. Titration curve of amino acid and calculation of pKa and pI value.
5. Estimation of amino acids by formal titration.
6. Estimation of tyrosine by Millons – reaction.
7. Estimation of amino acid by Ninhydrin method.
8. Effect of solvent system on the Rf value of two solutes.
9. Estimation of proteins by Lowry methods.
10. Estimation of proteins by Biuret methods.
11. Isolation of mitochondria from Rat liver by Density gradient centrifugation (Demonstration)

BCH1202: Biochemical Techniques and Biochemical Preparations

1. Preparation of buffers and pH measurement.
2. Separation of amino acids by paper chromatography
3. Separation of sugars by TLC
4. Separation of amino acids by paper electrophoresis (Demonstration)
5. Separation of proteins by SDS-PAGE.
6. Standardization of pH meter and measurement of pH of a biological fluid using pH meter
7. Absorption spectra of phenol red, amino acids and nucleic acid.
8. Isolation and Spectrophotometric characterization of plant pigments.
9. Verification of Beer's law and determination of molar extinction coefficient using p-nitro phenol.
10. Separation of plant pigments by paper chromatography.
11. Separation of amino acids by ion-exchange chromatography.
12. Isolation of starch from potatoes.
13. Isolation of cholesterol from brain.

Semester II
BCH2201: Enzymology

Course Objectives:

The main objectives of this course are to:
1. To understand the classification of enzymes and fundamentals of enzyme assay. Also, understanding of kinetics of enzyme catalyzed reactions and derivation of Michaelis Menten equation.
2. To advance the knowledge on mechanism of enzyme action as well as regulation of enzyme action with relevant examples.
3. To study about the techniques of immobilization and application in enzymes in food and pharmaceutical industries.

Unit I
Classification of enzymes, protein confirmation, specificity and active site. Units of enzyme activity, enzyme coupled kinetic assay. Compartmentation of enzymes.
Factors affecting velocity of enzyme catalyzed reactions – effect of pH, temperature, enzyme concentration and substrate concentration. Kinetics of enzyme catalyzed reactions.
Enzyme kinetics of single substrate reactions, study state assumption, Michalis – Menten, Lineweaver Burk, Eadie Hofstee, Hanes plots.

Unit II
Enzyme inhibition: irreversible, reversible, competitive, non-competitive, un – competitive and partial inhibition.
Determination of K_I values, substrate inhibition, feedback inhibition and allosteric inhibition.
Kinetics of enzymatic reactions having two or more substrates – single displacement reactions, double displacement reactions (Ping-Pong).

Unit III
Types of enzyme catalysis mechanisms, acid-base catalysis, electrostatic catalysis, covalent catalysis, metal ion catalysis, proximity and orientation. Effects, preferential transition state binding.
Catalytic mechanisms of chymotrypsin, Trypsin, Carboxypeptidase, Ribonuclease and Lysozyme. Catalytic RNA (Ribozyme), abzymes, synzymes.
Mechanism of catalysis with coenzymes – Pyridoxal phosphate, flavin nucleotides, thiamine pyrophosphate, biotin, tetrahydrofolate, lipoic acid.

Unit IV
Enzyme Regulation: General mechanisms, allosteric enzymes – AT case, cooperativity phenomenon, Sigmoidal kinetics and their physiological significance, Symmetric and sequential models for action of allosteric enzymes and their significance.
Feedback inhibition. Reversible and irreversible covalent modifications of enzymes, cyclic and cascade systems, Zymogens, Isoenzymes, multienzyme systems – pyruvate dehydrogenase, fatty acid synthase complex.

Recommended Books:

1. The enzymes Dixon & Webb, 3rd ed. Longman.
2. Understanding enzymes: Palmer T., Ellis Harwood Ltd.
3. Enzyme Kinetics: Roberts D.V., Cambridge Univ. Press.
4. Enzyme structure and mechanism. Alan Fersht, Freeman & Co.
5. Principles of Enzymology for Food Sciences: Whitaker Marc Dekker.
6. The enzyme Boyer 3rd Ed. Academic Press.
7. Methods in Enzymology Ed. Colowick and Kaplan, Academic Press (continuing series)

8. Text book of Biochemistry with Clinical Correlations (4th edition) – Thomas M. Devlin.
9. Fundamentals of enzymology 3rd edi. Nicholas C. Price and Lewis Stevens.
10. Biological chemistry; H.R. Mehler & E.H Cordes Harper & Rev.
11. Enzymes and Metabolic Inhibitors Vol. I & II J. Webb Acada. Press
12. Enzyme Kinetic Siegel Inter Science – Wiley.
13. Biochemistry Chemical reactions of living cells by David E. Matzler. Vol.I.
14. Enzyme Catalyzed Reactions by G.H. Gray.

Online Content:

1. Introduction to Data Mining, Pang-NingTan (2018) Pearson Education India https://books.google.co.in/books?id=64GVEjpTWIAC
2. https://www.udemy.com/course/enzymology/
3. https://www.classcentral.com/course/swayam-enzymology-19860
4. https://www.mooc-list.com/course/biochemistry-biomolecules-methods-and-mechanisms-edx

Expected Course Outcomes:

On the successful completion of the course, students will be able to:

1. Understanding of detailed mechanism in enzyme regulation with relevant examples (K1,K2 & K3).
2. Course material will help in understanding of nomenclature and classification of enzymes and also the fundamentals of enzyme assay (K2)
3. The course will advance the knowledge of students on the mechanism of enzyme action (K2 &K3).
4. Students will thoroughly understand the Kinetics of enzyme essay and derivation of velocity equations (K2 & K4).
5. Students will gain knowledge in various immobilization techniques and industrial application of enzymes (K2,K3 & K5)

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

BCH2202: Microbiology

Course Objectives:

The main objectives of this course are to:

1. Provide knowledge about microbial culture techniques.
2. Learn the concepts of different energy sources.
3. Understand the basic concepts of food fermentation and its industrial applications.
4. Understand the concepts for diagnosing infectious diseases and assessment of antimicrobial activity in textiles.
5. Provide knowledge about industrial applications of microbes.

Unit I

Brief history of microbiology. Morphology and classification of bacteria. Staining methods (Grams staining, Acid fast and spore staining).

Gram positive and Gram-negative bacteria. Isolation and cultivation of bacteria, bacterial growth curves, culture media and methods.

Unit II

Molds – characteristics, classification and reproduction. General characterization of actinomycetes, rickettsia, Spirochetes and mycoplasmas.

Control of microorganisms: Methods of sterilization, Antibiotics and other chemotherapeutic agents. Food borne diseases – Botulism, Salmonella, E. coli diarrhea, Staphylococcal food poisoning.

Unit III

Viruses: Structure and replication (TMV, T4, SV40 and M13). Methods of culturing of viruses, isolation, purification and characterization. Polio, Rabies Anti-viral agents, viral diseases- Dengue, hepatitis, SARS.

Airborne Diseases – Diphtheria, Pneumonia, Tuberculosis and Streptococcal diseases.

Direct Contact – Conjunctivitis, Gastritis, Syphilis, Tetanus, Leprosy, Candidiasis, Amoebiasis.

Unit IV

Microbial products in pharmaceutical and agriculture industry: Production, harvest, recovery and uses Enzymes, Antibiotics (Penicillins, Tetracycline), vitamins (B2, B12), Amino acids (lysine, glutamic acid, Organic solvents (acetone, ethanol); Organic acids (acetic acid, citric acid).

Formulation of Biofertilizer (Rhizobium) and Biopesticides (Bacillus thruingiensis).

Recommended Books:

1. Microbiology by Pelczar, Chan and Kreig 5th Ed. Mc Grew – Hill
2. General Microbiology: Boyd, R.F., Times Mirror / Mosby College.
3. Review of Medical Microbiology: Jawetz et al., 16th Ed. Maruzen Asian.
4. A text book of Microbiology, R.C. Dubey and D.K. Maheswari, S. Chand Co.
5. Pharmaceutical Microbiology, By Hugo and Russell, Blackwell Scientific
6. An Introduction to Viruses by S.B.Biswas,Vikas Publishing House.
7. Microbial world (5th Ed.) RY. Stainer, Hamshire – Macmillan Press.
8. Microbiology 4th Ed. Prescott, Harley, Klein (Mc Grew Hill)
9. Principles of Microorganisms – Brocks.
10. Diseases of Crop Plants – G. Rangaswamy.
11. Plant Pathology – J.C. Walker.
12. Fundamentals of Microbiology - M. Frebisher.
13. Text book of Microbiology – William Burrows
14. Biology of Microorganisms – Sandes T. Lyles
15. Instant notes in Microbiology – Nicklin et al
16. Microbial Ecology – Atlas
17. Biotechnology: Textbook of Industrial Microbiology 2nd Ed. By Wulf Crueger and Anneliese Crueger.
18. Genetics by Gardner
19. Genetics by Suzuki

Expected Course Outcomes:

On the successful completion of the course, students will be able to:

1. Students will be able to apply culture techniques for isolation of microbes from various sources and preserve the isolates (K3).
2. Students will gain knowledge about different energy sources such as inorganic compounds, organic compounds and visible radiation for organisms (K2).
3. Students will learn about fermentation in food industry (K2).
4. Students will learn about the isolation and identification of microbes from textiles (K3).
5. Students will know the concepts of production, harvest, recovery and uses of industrially beneficial microbial products (K3).

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

BCH2203: Molecular Biology

Course Objectives:

The main objectives of this course are to:

1. Familiarize the students with specific characteristics of a laboratory of clinical biochemistry, know the analytical methods commonly used in the clinical laboratory and know how can the clinical laboratory contribute to assess the health status of individuals.
2. Obtain hands on experience in some of the important molecular biology techniques and to learn the basic principles of recombinant DNA technology.

Unit I

Central dogma in molecular biology and its verification. Conservative, semi conservative and dispersive mode of DNA replication, Uni and bidirectional DNA replication, discontinuous synthesis of DNA, DNA primers, DNA polymerase I, II & III, DNA ligase, AP endonuclease, Topoisomerases and telomerase.

Inhibitors of DNA synthesis, fidelity of replication. Mechanism of replication of *E. coli* DNA. 'θ' and 'σ' replication, Replication of 'ʎ' Phage DNA, Phage T_7 and single stranded DNA. DNA repair and recombination. Bidirectional and unidirectional replication.

Unit II

Structure and functions of prokaryotic and eukaryotic RNA polymerase. Inhibitors of Transcription. DNA binding motifs. Biosynthesis of prokaryotic and Eukaryotic m-RNA, r-RNA, and t-RNA.

Post transcriptional modifications of RNA- capping, adenylation and splicing. Role of *hn* RNA, *sn* RNA and *sn* RNP in processing of RNA.

Unit III

Gene expression models in prokaryotes: operon, operator, promoter, attenuator, repressor, co-repressor, inducer, apoinducer, gratuitous inducer, induction and repression. Lac operon, His- operon, Trp- operon of *E. coli*.

General features of the genetic code, Deciphering of the genetic code - Nirenberg and Khorana's work. Co-linearity of gene and protein. Wobble hypothesis and deviation from wobble hypothesis. Mitochondrial genetic code and evolution of genetic code.

Unit IV

Composition of Prokaryotic and eukaryotic ribosomes. Polysomes and organelles ribosomes.

Amino acid activation, protein chain initiation, elongation, and termination. Mechanism of protein synthesis in relation to gene action.

Inhibitors of protein synthesis. Post translation modification of proteins. Synthesis of secretory and membrane proteins – signal sequence hypothesis. Mi and Si RNA mediated translation control.

Recommended Books:

1. Molecular Biology of the Gene by Watson
2. Genetics by G. Zubay
3. Molecular Biology of the Cell by Albert Bruce *et al.*, 5th Ed.
4. Cell Molecular Biology by Baltimore
5. Molecular Biology by D Friefelder
6. Molecular Genetics by D Friefelder
7. Genes VIII by Benjamin Lewin. Oxford Univ. Press. London.
8. Cell and Molecular Biology 2nd Ed. By P.K. Gupta, Rastogi Publ.
9. Cell and Molecular biology by De Robertis and De Robertis. 8Th Ed.
10. Molecular Genetics by Sambamurty

11. Cell and Molecular Biology 2nd Ed. By S C. Rastogi.

Online Content:

1. https://bio.libretexts.org/Bookshelves/Cell_and_Molecular_Biology/Book%3A_Cells_-_Molecules_and_Mechanisms_(Wong)
2. https://nptel.ac.in/courses/102/106/102106025/#
3. https://www.easybiologyclass.com/molecular-biology-online-tutorials-lecture-notes-study-materials/
4. https://www.mooc-list.com/tags/molecularbiology?title=MOLECULAR+PHYSIOLOGY

Expected Course Outcomes:
On the successful completion of the course, students will be able to:

1. It trains the students to gain the concepts of Central Dogma of Molecular Biology (K2).
2. Helps the students to understand, evaluate and analysis the cellular processes Replication, Transcription and Translation (K2, K3& K5)
3. Aids in the technical understanding of the cellular mechanisms of heredity, gene expression and protein synthesis (K2, K3 & K5).
4. Understand and familiarize in the modern molecular biological techniques and its applications (K2, K3, K4 & K5).

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

BCH2204: Open Elective
(Student from other departments should opt any one of BCH2204(A)/ BCH2204(B)/ BCH2204(C1/2/3))

(A) Fundamental Biochemistry

Course Objectives:
The main objectives of this course are to:

1. This course emphasizes the basics of biomolecules and its significance.
2. Enable the students to learn the basic functions, structures and biological importance of lifeless chemical compounds.
3. On successful completion of the course the students of other desciplines should have understood the significance of the complex bio-molecules, polysaccharides, lipids, proteins, nucleic acids, vitamins and minerals.

Unit I
Biomolecules: Molecular logic of life, major constituents of cells. Classification, structure and functions of carbohydrates (glucose, fructose, lactose, Maltose, sucrose, glycogen, starch).
Lipids (fatty acids, phospholipids, triacylglycerol), proteins (hemoglobin, albumin, myoglobin, collagen and insulin) and nucleic acids (RNA and DNA).

Unit II
Enzymes- Classification, compartmentation of enzymes, enzyme inhibition, use of enzymes, endocrine glands.
Hormones. Polypeptides and steroids. Immunoglobulins and immune action.

Unit III

Metabolism: outline of metabolism, anabolism, catabolism, oxidation of glucose to CO_2 and H_2O, synthesis of glucose.
Protein synthesis, lipid biosynthesis. Inborn errors of metabolism.

Unit IV
Biochemical techniques in biochemistry: safety and good lab practices.
Microscopy, centrifugation, chromatography, immunoassays (ELISA/RIA), UV-VIS spectroscopy.

Expected Course Outcomes:
On the successful completion of the course, students will be able to:

Helps to understand about the polysaccharides and its types (K1 & K2).
Gives a clear understanding about the lipids and its role (K1 & K2).
A Clear Knowledge regarding amino acids and protein characterization (K2 & K3).
Provides the structure and properties of Nucleic acids (K2 & K3).
Gives an idea about energy level and its synthesis (K1, K2 & K3).
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

(B) Environmental Biochemistry

Course Objectives:
The main objectives of this course is to:

1. Educate students about renewable sources and their importance.
2. This course provides basic concepts about causatives of environmental pollution.
3. Provide knowledge on ecological concepts and environtment.
4. This course also provides knowledge about Disaster management and role of Big data in Disaster management.

Unit I
Renewable and non-renewable resources. Definition, scope and importance, need for public awareness
Forest resources: Use and over-exploitation, deforestation, case studies. Water resources, Mineral resources, Food resources, Food resources, Energy resources, Role of an individual in conservation of natural resources.

Unit II
Ecosystems, Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids.
Introduction, types, characteristic features, structure and function of the following ecosystems: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems and Biodiversity and its conservation

Unit III
Environmental Pollution Definition, Cause, effects and control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards.
Solid waste Management: Causes, effects and control measures of urban and industrial wastes, Role of an individual in prevention of pollution, Pollution case studies, Disaster management: floods, earthquake, cyclone and landslides.

Unit IV

Human Population and the Environment, Population growth, variation among nations, Population explosion –Family Welfare Programme.
Environment and human health, Human Rights, Value Education HIV/AIDS, Women and Child Welfare, Role of Information Technology in Environment and human health, Case Studies.

Reference books:

1. Environmental Biochemistry - Neelima Rajvaidya, Dilip Kumar Markandey (2005).
2. Environmental and Ecological Biochemistry -P.W. Hochachka T.P. Mommsen
3. Environmental Biochemistry Hardcover – 2005 by D. K. Markandey, N. Rajvaida

Expected Course Outcomes:

On the successful completion of the course, students will be able to:

1. Understand the concepts of ecology and renewable energy sources (K1 & K2).
2. Learn about types of environmental pollution (K1 & K2).
3. Students will learn about Disaster management and role of Big data in disaster management (K2, K3 & K4).

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

(C) SWAYAM/MOOCs/NPTEL

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. Biochemistry of Biomolecules https://onlinecourses.swayam2.ac.in/cec20_bt12/preview
2. Biomolecules: Structure, Function in Health and Disease http://ugcmoocs.inflibnet.ac.in/ugcmoocs/view_module_ug.php/353
3. Introduction to Carbohydrates https://aklectures.com/lecture/carbohydrates/introduction-to-carbohydrates 4 Introduction to Nucleic Acids https://www.youtube.com/watch?v=1Wc4jTH2v_w&list=PL9jo2wQj1WCNG9mFuNBmJ1m7x1skBNKw-

PRACTICALS

BCH22021P: Enzymology

1. Assay of Amylase from saliva
2. Assay of Urease from Horse – gram
3. Assay of Acid phosphatase from serum
4. Assay of serum alkaline phosphatase
5. Assay of SDH from Liver
6. Assay of Invertase from Yeast
7. Assay of Trypsin
8. Assay of LDH from serum (Isoenzymes)
9. Enzyme purification and Enzyme Kinetics (Determination of V-max, Km and Ki). Effect of pH, Temperature, Activators, Inhibitors, Immobilization of enzymes (demonstration only).
10. Assay of Cholinesterase from blood.

Recommended Books:

1. Hawk's Physiological Chemistry
2. Practical Biochemistry by T Plummer
3. Practical Biochemistry by J Jayaraman
4. Klemir and others: Practical Biological Chemistry

5. Practical Biochemistry - Koch and Hank Dunn and Drell
6. Practical Biochemistry - Sawheny.
7. Varley's Practical Clinical Biochemistry – Ed. Alan W. Gowenlock (Heinemann Medical Books, London).

BCH2202P: Microbiology and Molecular Biology

1. Structure, Handling and calibration of Microscope.
2. Methods of Sterilization: Autoclave (Moistened – heat sterilization), Oven (dry heat sterilization), UV.
3. Preparation of Media for Bacteria and fungi.
4. Methods for isolation and cultivation of pure cultures: serial dilution, pour plate, spread plate and streak plate.
5. Bacterial growth curve: *E. coli/Bacillus*.
6. Methods of staining: Gram, acid fast and bacterial spore, and yeast methylene blue.
7. Determination of antibiotic sensitivity with selected antibiotics.
8. Oligodynamic action of selected metals on bacteria.
9. Starch hydrolysis assay for the identification amylase – producing microorganisms.
10. Fermentation: preparation of wine from grapes, and production alcohol from molasses.
11. Estimation of alcohol by specific gravity method
12. Cultivation of oyster mushroom (*Pleurotus* sps) using the paddy straw.
13. Induction of mutation in bacteria using physical and chemical mutagens.
14. Isolation of DNA and RNA from bacteria.
15. Water analysis for bacteria and determination of B.O.D. of water.
16. Identification of Rhizobium from root nodules of ground nut plant.
17. Isolation and quantification of phages from sewage by plaque assay.
18. Isolation and determination of DNA from bacteria, plant and animal cells.
19. DNA estimation by Diphenylamine method.
20. Determination of DNA and purity by UV absorption method.
21. Isolation and determination of RNA content from yeast.
22. RNA estimation by Orcinol method
23. Determination and analysis of melting curve of DNA (Tm of DNA)
24. Isolation and concentration determination of plasmid DNA from *E. coli*

Books:

1. Microbiology laboratory Manual 4th Ed. By Cappuccino
2. Microbiology laboratory Manual (2001) by Aneja K.M.
3. Laboratory Manual in Microbiology by P. Gunasekaran (1996), New Age Publ.
4. Molecular Cloning by Sam Brook.

SEMESTER - III

BCH3201: Intermediary Metabolism II

Course Objectives:

The main objectives of this course are to:

1. To understand the metabolism of carbohydrates, lipids, proteins and nucleic acids.
2. To impart knowledge of the concepts of regulation of metabolism.
3. To offer basic knowledge about Big Data analytics and its applications in the metabolic pathway analysis.

Unit I

Lipid metabolism: lipids as energy reserves. Oxidation of fatty acids, Oxidation of odd chain fatty acids, Energy yield and regulation.

Ketone bodies, Fatty acid biosynthesis- control of fatty acid synthesis. Formation of monoenoic and polyenoic acids.

Unit II

Biosynthesis of cholesterol, triacyl glycerols, phospholipids, bile acids. Formation of prostaglandins, leukotrienes, prostacyclins.

Metabolism of lipoproteins. Disorders of lipid metabolism – Gauchers disease, Tay-Sachs disease, Hypo and Hyper lipoproteinemia.

Unit III

Nitrogen cycle, Biological Nitrogen fixation. Nitrate and ammonia utilization, ammonia excretion, synthesis of glutamine. Formation of nitrogenous excretion products.

Urea cycle. Amino acids as precursors – formation of Polyamines, Creatine, Histamine.

Unit IV

Amino acid degradation, transamination, oxidative deamination, pathways of degradation of different amino acids, biosynthesis of essential and non-essential amino acids. Regulation of amino acid biosynthesis.

Inborn errors of amino acid metabolism – Phenylketonuria, Alkaptonuria, Maple-Syrup urine disease. Biosynthesis and degradation of Heme, Glutathione, γ- glutamyl cycle, gramicidin.

Recommended Books:

1. Principles of Biochemistry, White. A, Handler, P and Smith
2. Biochemistry, Lehninger A.L.
3. Biochemistry, David E. Metzler.
4. Biochemistry, Lubert Stryer.
5. Review of Physiological chemistry, Harold A. Harper.
6. Text of Biochemistry, West and Todd.
7. Outlines of Biochemistry, Conn and Stump
8. Metabolic Pathways – Greenberg.
9. Mitochondria, Munn.
10. Biochemistry, 2nd Ed, G. Zubay.

Expected Course Outcomes:

On the successful completion of the course, students will be able to:

1. Understand the concepts of metabolism of amino acids and urea cycle (K2)
2. Understand the concepts of nucleotide metabolism and regulation mechanism (K2)
3. Apply the knowledge about Big Data analytics in Metabolic Pathway Analysis (K3)

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

BCH3202: Endocrine Biochemistry

Course Objectives:

The main objectives of this course are to:

1. This course presents an introduction and provides a comprehensive, balanced introduction to Endocrine glands, their secretions and functions.
2. To enable the students to learn or to know the biological, physiological activities along with the mechanism of action of various hormones.

Unit I

Endocrine system – organization of the endocrine system.

General features and classification of hormones, mechanism of action of hormones, hypothalamic hormones, chemistry, biosynthesis, Secretion, physiological functions, regulation and disorders of anterior and posterior pituitary hormones, LH, FSH, Growth hormone, prolactin, oxytocin, Vasopressin. Hormones of the pineal gland – Serotonin and melatonin.

Unit II

Thyroid hormones – chemistry, biosynthesis, secretion, physiological function, regulation and disorders, hypo and hyperthyroidism, tests for thyroid function.

Parathyroid hormones – Parathormone and calcitonin, their role in calcium and phosphate metabolism, disorders of parathyroid hormone.

Unit III

Pancreatic and gastrointestinal hormones – Biosynthesis, secretion, physiological functions and regulation of insulin and glucagon. Role of insulin and glucagon in carbohydrate, lipid and protein metabolism. Disorders of pancreas. Gastrin, secretin, Cholecystokinin.

Adrenal hormones – Chemistry, biosynthesis and functions of adrenal medullary and adrenal cortical hormones. cortisol, corticosterone, aldosterone, adrenaline, nor-adrenaline, Disorders of adrenal hormones, tests for the evaluation of adrenal function.

Unit IV

Hormones of reproduction – Gonadal hormones (testosterone), chemistry, biosynthesis and physiological functions of androgens, estrogens and progesterone, inhibin.

Hormonal regulation of menstrual cycle, placental hormones, contraception, reproductive disorders.

Recommended Books:

1. Text book of Biochemistry and Human Biology by Talwar G.P., Prentice Hall India.
2. Human Physiology and Mechanism of distance. Guyton 3rd Ed. Igkushoen/Seunders.
3. Clinical Biochemistry, Vol. 1 and 2, Williams *et al*., Heinemann Medical, 1978.
4. Lynchs Medical Laboratory Technology by Raphael, S. S., 4th Ed. Igkushoen/Seunders.
5. Text Book of Endocrinology, William.
6. General Endocrinology – Turner.
7. Biochemical Endocrinology of the Vertebrates – E. Fruden and H. Lines.
8. Foundation of Modern Biochemical Series, Prentice Hall Inc., 1971.
9. Metabolic and Endocrine Physiology – Jay Teppermann.
10. Metabolic Pathways – Green Berg.
11. Intermediary Metabolism and its regulation – Larner
12. Principles of Biochemistry – White A., Handler P and Smith.
13. Receptors and Hormone action. Receptors and Recognition series. Text book of medical physiology by A.C. Guytom.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

Obtain a deep knowledge regarding Endocrine glands and their secretions (K1 & K2).
Gives an idea about structure and functions of endocrine glands (K1 & K2)
Provides knowledge about Hormone and its regulation (K2, K3 & K4)
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create

BCH3204: Nutritional Biochemistry

Course Objectives:

The main objectives of this course are to:

1. The main objective of this course is to introduce about Dietary requirements and energy content in foods needed for human body
2. The course aims to give exposure to learn about malnutrition, starvation, protein metabolism in prolonged fasting and diseases that occur due to malnutrition.
3. This course teaches about inherited metabolic disorders and naturally borne food toxicants and allergy causing foods.

Unit I

Principle food components, Balanced diet, Nutritional Requirement, recommended daily requirements, Recommended dietary allowances (RDA), Body composition and energy requirements, Measurement of energy expenditure, direct and indirect calorimetry, BMR

Unit II

Nitrogen balance and muscle protein turnover, essential and non-essential amino acids, Protein requirement, Biological value of proteins, Protein calorie deficiency state, Kwashiorkor and Marasmus.
Essential fatty acids, energy value of fats, phospholipids in nutrition, Starvation, Obesity.

Unit III

Mineral Nutrients, Micro nutrients and Macro nutrients, dietary sources, deficiency symptoms and recommended dietary allowances of trace elements and macro minerals (Calcium, Phosphorus, Magnesium, Iron, Sodium, Potassium, Iodine, Zinc).
Nutrition for infants, children, pregnant and lactating women and in old age. Importance of nutrition under stress conditions.

Unit IV

Vitamins: Fat soluble vitamins- Structure, Biological sources, requirement, functions and deficiency symptoms of vitamins A, D, E and K
Water soluble vitamins- structure, classification, properties, dietary sources, requirement, chemistry and physiological significance of thiamine, riboflavin, niacin, pantothenic acid, vitamin B_6, folic acid, biotin, vitamin B_{12} and Vitamin C.

Recommended Books:

1. Harper's Biochemistry
2. Trace Elements by Underwood
3. The Book of Human Nutrition by MS. Bamji N. Prahlad Rao and V. Reddy.
4. Essentials of food and nutrition, Vol. 1 and 2, by M.S.Swaminathan
5. Nutritional Biochemistry by Truemen.
6. Casarett and Doull's Toxicology. The Basic Science of Prisons 5th Ed. By Klaasen.

Online Content:

1. https://nptel.ac.in/content/storage2/courses/126104004/LectureNotes/Week-5_03-Balanced%20diet%20and%20food%20groups.pdf
2. https://nptel.ac.in/content/storage2/courses/126104004/LectureNotes/Week-1_01-Relationship%20between%20Food,%20Nutrition%20and%20Health%201-A.pdf

Expected Course Outcomes:

On the successful completion of the course, students will be able to:

1. To learn energy content in foods. The techniques involved in the measurement of energy expenditure, Dietary requirements of carbohydrates, dietary fiber and dietary lipids (K1 & K2).
2. To learn essential and non-essential amino acids, protein reserves in human body, Protein malnutrition, techniques for the study of starvation, concepts for weight reduction diets (K1, K2 & K4).
3. To know about nutritional requirement during pregnancy, lactation, infants and children, Nutritional significance of dietary calcium, phosphorus, magnesium, iron, iodine, zinc and copper (K1, K2 & K4).
4. To learn about the role of diet and nutrition in the prevention and treatment of diseases, learn about inherited metabolic disorders (K1, K2 & K4).
5. To learn naturally occurring food borne toxicants, Allergy causing foods and management (K1, K2).

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

BCH3204: Open Electives
(Student from other departments should opt any one of BCH3204(A)/ BCH3204(B)/ BCH3204(C1/2/3))

(A) Nutrition and Clinical Biochemistry

Course Objectives:

The main objectives of this course are to:

1. The main objective of this course is to introduce about Dietary requirements and energy content in foods needed for human body
2. The course aims to give exposure to learn about malnutrition, starvation, protein metabolism in prolonged fasting and diseases that occur due to malnutrition.
3. Provide knowledge about carbohydrate, lipid and nucleic acid metabolic disorders
4. Offer knowledge about hemoglobin metabolism and associated diseases
5. Give knowledge about functional tests of organs and clinical diagnosis of diseases by enzymatic assays
6. Provide awareness about application of Artificial Intelligence in health and medicine.

Unit I

Diet, Balanced diet, calorific value of foods, nutritional requirements, RDA, BMR, biological value of proteins, energy value of fats, protein calorie deficiency (Kwashiorkor and Marasmus), malnutrition (under nutrition and over nutrition), Obesity, dietary guidelines for Indians.

Unit II

Micronutrients: water soluble and fat-soluble vitamins- structure, sources, requirements, functions and deficiency symptoms.
Microminerals – calcium, phosphorus, magnesium, sodium, potassium, chloride.
Micro Minerals – Iron, zinc, copper, selenium.

Unit III

Use of clinical biochemistry in Medicine. Use of biochemical tests, specimen collection and sample analysis. Tests for diabetes, thyroid, jaundice, lipid profile, anemia and tumor markers.

Unit IV

Organ function tests – Liver function tests, kidney function tests.

Plasma enzymes in diagnosis and prognosis – Transaminases, CK, LDH, Alkaline phosphatase, α-amylase, molecular diagnostics.

Expected Course Outcomes:

On the successful completion of the course, students will be able to:

1. Learn energy content in foods. The techniques involved in the measurement of energy expenditure, Dietary requirements of carbohydrates, dietary fiber and dietary lipids (K1 & K2).
2. Learn essential and non-essential amino acids, protein reserves in human body, Protein malnutrition, techniques for the study of starvation, concepts for weight reduction diets (K1, K2 & K4).
3. Know about nutritional requirement during pregnancy, lactation, infants and children, Nutritional significance of dietary calcium, phosphorus, magnesium, iron, iodine, zinc and copper (K1, K2 & K4).
4. Learn about the role of diet and nutrition in the prevention and treatment of diseases, learn about inherited metabolic disorders (K1, K2 & K4).
5. Students will acquire insight into disorders of carbohydrates, lipids and nucleic acid (K2).
6. Students will learn about functional tests and enzymatic assays to diagnose the function of liver, kidney, thyroid, gastrointestinal and pancreas (K4).
7. Students will gain knowledge about disorders of nitrogen metabolism (K3).
8. Students will learn about the disorders of hemoglobin metabolism (K3).

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

(C) Research Methodology

Course Objectives:

The main objectives of this course are to:

1. Understand the statistical tools commonly used in biological research
2. Assimilate the concepts of hypothesis testing and its importance in research
3. Know the aspects fundamental to research and to understand the methods of research
4. Know the nuances of technical writing of scientific documents like thesis and journal articles.

Unit I

Technical writing: Sentence writing, paragraph writing, story writing, review writing, various types of letters writing, critical comments writing. Project proposal preparation: Preparation of informal proposal, modified proposal and formal proposal.

Experimental design and Collection of results, submission of progress report (year wise) and submission of technical report (Format: Title page, Introduction, Aims of the proposal/research, methodology, results, references, acknowledgments, budgetary preparation). Submission of final technical Report.

Patenting and intellectual property rights.

Unit II

Introduction of computation: Computer components, storage devices, graphic devises, concepts of hardware and software, methods and types of networks. Basics of operating systems and types python, cython, Information and communication technology (ICT).

Unit III

Bio-Statistics: Data - Data types, collection of data, classification and tabulation. Measures of central tendencies. Mean, median and mode. Measures of variation - Range, quartile deviation, mean deviation and standard deviation.

Coefficient of variation. Probability. Addition and multiplication theories, conditional probability and probability distributors. Binomial, poission and normal distribution. Correlation and linear regression. Regression: Regression coefficients and properties. Small sample tests- t, F and chi square tests. ANOVA - one way and two way classifications.

Unit IV

Research Aptitude: Meaning and scope of research, steps of Research, Article and thesis writing. Funding agencies.

Project proposal preparation, Preparation of proposal, Experimental design and implementation of project, submission of progress report (year wise), statement of expenditure (SE), Utilization certificate (UC). Research ethics, Plagiarism.

Recommended Books:

1. Statistical methods. S.P.Gupta
2. Fundamentals of mathematical statistics. S.C Gupta &Kapoor
3. Statistical methods in biological and Health Science. J. S. Milton & J.O.Tsokan.

Expected Course Outcomes:

On the successful completion of the course, students will be able to:

1. Helps to collect data and organize the data (K1 & K2).
2. Gives a clear understanding about the basic statistical analysis (K1 & K2).
3. A Clear Knowledge on probability and its application (K2 & K3).
4. Provides the sampling distribution techniques and its analysis (K2 & K3).
5. Gives an idea about thesis writing, funding agencies and patenting (K3 & K4).

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

(C) SWAYAM/MOOCs/NPTEL

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. Biochemistry of Biomolecules https://onlinecourses.swayam2.ac.in/cec20_bt12/preview
2. Biomolecules: Structure, Function in Health and Disease http://ugcmoocs.inflibnet.ac.in/ugcmoocs/view_module_ug.php/353
3. Introduction to Carbohydrates https://aklectures.com/lecture/carbohydrates/introduction-to-carbohydrates 4 Introduction to Nucleic Acids https://www.youtube.com/watch?v=1Wc4jTH2v_w&list=PL9jo2wQj1WCNG9mFuNBmJ1m7x1skBNKw-

PRACTICALS

BCH3201P: Endocrinology and Nutritional Biochemistry

1. Isolation of casein from milk and estimation.
2. Determination of moisture content of foods/food grain powders
3. Isolation of lactose from skimmed milk and its estimation.
4. Determination of reduced Ascorbic acid by DCPIP method.
5. Determination of calcium in food.
6. Determination of Iodine value of edible oil by Titrimetry.

7. Estimation of fructose in the fruit juice and honey.
8. Measurement of inversion of sucrose by polarimetry.
9. Determination of acid value by Titrimetry.
10. Determination of available lysine in food.
11. Estimation of copper in food.
12. Estimation of Iron content of apple juice.
13. Determination of ash content of foods.
14. Determination of free amino acids of germinating seedlings.
15. Determination of pyridoxine of fruits/leaves.
16. Estimation of magnesium in food.

Skill Oriented Course and Practical
BCH3205: Genetic Engineering

Course Objectives:

The main objectives of this course are to:

1. To study about the DNA modifying enzymes and Vectors used in recombinant DNA technology
2. Understanding the cloning strategies and preparation of probes. In addition, acquiring thorough knowledge about confirmation of rDNA expression by various techniques, including blotting and immunological screening.
3. Upon completion of the course, students might also be thorough about various types of sequencing techniques as well as on biotechnological applications of rDNA technology.

Unit I

Introduction to genetic engineering, cloning, cloning vectors - plasmids, phage vectors, shuttle vectors and cosmids.

Enzymes in genetic engineering: Restriction endonucleases, types, property and applications, RNA and DNA polymerases, nucleases, kinases, phosphatases, ligases, topoisomerases, methylases and gyrases. Linkers and adaptors.

Unit II

RNA isolation, preparation and use of cDNAs. Screening and determination of nucleotide sequences. Construction of cDNA and genomic library, site-directed mutagenesis.

Polymerase chain reaction (PCR) in recombinant DNA technology, Chromosome walking

Unit III

Maxim and Gilbert chemical degradation and Sanger's dideoxy chain termination methods of nucleotide sequencing, Restriction mapping, restriction fragment length polymorphisms (RFLP) linkage and recombination between molecular and phenotypic markers, Random amplified polymorphic DNA (RAPDs) Using PCR. Human genome project, Microarray.

Unit IV

Cloning of specific genes and their expression in bacteria and eukaryotic system. Genetic Engineering- Applications in Medicine, Agriculture and Industry, RNAi technology for gene knock out studies, Social and moral implications, national and international guidelines/regulations. RNA technology for gene knockout mechanism.

3205P: Genetic Engineering Practical

1. Agarose gel electrophoresis for isolation of various forms of plasmid.
2. Determination of restriction activity on DNA.
3. Amp^r plasmid transformation in *E. coli.*
4. Isolation of phage M_{13}.
5. Isolation of single and double standard M_{13} DNA.
6. Transfection of M_{13} DNA into *E. coli* JM 103.

Recommended Books:

1. Genes and probes, A Practical Approach series (1995) by BD. Hames and SJ Higgins, Oxford Univ. Press.
2. Gel Electrophoresis of Nucleic acids, A Practical Approach (1990) by D Rickwood and BD Hames. Oxford Univ. Press. Refer the books already mentioned for other Molecular Biology course.
3. Recombinant DNA – James D Watson et al.
4. Gene Cloning – T. A. Brown.
5. From Genes to Genomes – J.W. Dala and Schantz
6. Gene Biotechnology – S.N. Jogdand
7. Medical Biotechnology - S.N. Jogdand
8. Principles of gene manipulations – R. W. Old and S.B. Primerose
9. Genes – Lewin B.
10. PCR-Technology: Principles and application of DNA amplification – H.A. Erlich.

Expected Course Outcomes:

On the successful completion of the course, students will be able to:

1. The course material will provide a clear understanding about DNA modifying enzymes and their uses in RDNA technology (K1 & K2).
2. Students will advance their knowledge of host cells and vectors that are highly suitable for rDNA-based expression of desirable genes (K1 & K2).
3. The course will provide a detailed understanding of cloning strategies and various methods adopted for confirmation of rDNA expression (K1 & K2).
4. Students will learn about advances in sequencing techniques and their advantages (K1 & K2).
5. Course material provides detailed understanding of Biotechnological applications of rDNA technology (K1, K3 & K4).

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

SEMESTER – IV

BCH4201: Clinical Biochemistry

Course Objectives:

The main objectives of this course are to:

1. Provide knowledge about carbohydrate, lipid and nucleic acid metabolic disorders.
2. Offer knowledge about hemoglobin metabolism and associated diseases.
3. Give knowledge about functional tests of organs and clinical diagnosis of diseases by enzymatic assays.
4. Give basic knowledge about free radicals and diseases.
5. Provide awareness about application of Artificial Intelligence in health and medicine.

Unit I

The place of clinical Biochemistry in medicine, the use of Biochemical tests and the clinical biochemistry laboratory, Specimen collection, reference values, Automation and autoanalyzers, quality assurance in clinical laboratory – internal and external quality control.

Investigation of disorders of carbohydrate metabolism: Hypoglycemia, Hyperglycemia. Diabetes mellitus – classification, clinical and metabolic features and management. laboratory diagnosis of diabetes mellitus – glucose tolerance test (GTT), Random, Fasting, post prandial (PP) blood glucose levels, glycosuria, ketones, glycosylated hemoglobin (GHb), metabolic complications of diabetes – Diabetic keto acidosis (DKA), glycogen storage diseases,

Plasma proteins – functions and their alterations in disease, paraproteinemias.

Unit II

Kidney function: Formation of urine, Normal and abnormal constituents of urine, Glomerular and tubular function, renal function tests, nephrotic syndrome and CRF.

Liver function: structure and function of liver, liver function tests, Bilirubin metabolism and Jaundice, kernicterus, liver diseases - hepatitis, gall stones, cirrhosis.

Gastric and pancreatic function: Gastric function tests - Penta gastrin test, insulin stimulation test, hyper chlorhydria, achlorhydria, pancreatic diseases – acute pancreatitis, Malabsorption syndrome.

Unit III

Fluid and electrolyte balance – hyponatremia and hypernatremia, hyperkalemia, acid-base balance in the body fluids - Blood buffers, role of kidney and lungs, metabolic acidosis and alkalosis.

Plasma Lipids and lipoproteins and their functions – lipid profile, clinical disorder of lipid metabolism - hyperlipidemias and management, Atherosclerosis.

Molecular diagnosis – HIV, thalassemia, tumor markers. Cerebrospinal fluid analysis (CSF)

Unit IV

Plasma enzymes in diagnosis and prognosis: Transaminases (SGOT & SGPT), alkaline and acid phosphatase, lactate dehydrogenase (LDH), creatine kinase (CK), α-amylase, acid phosphatase, γ – glutamyl transferase, acetyl Cholinesterase, Isoenzymes of clinical importance, Plasma enzyme pattern in myocardial infarction, liver disease and muscle disease.

Inborn errors of amino acid metabolism - Phenylketonuria, alkaptonuria and Maple-Syrup urine disease. Hemoglobinopathies.

Recommended Books

1. Text book of Biochemistry with Clinical Correlations. Thomas M. Devlin (John Wily).
2. Harper's Review of Biochemistry, Murray *et al* (Longman) Investigation of lipoproteinemias and lipidemias. Renal function: Glomerular and tubular functions.

3. Biochemical Aspects of Human Disease – R.S. Elkeles and A.S. Tavil. (Blackwell Scientific Publications, 1993)
4. Clinical Chemistry in Diagnosis and Treatment – Joan F. Zilva and P.R. Pannall (Lloyd – Luke medical Books, London, (1988).
5. Varley's Practical Clinical Biochemistry – Ed. Alan W. Gowen Lock (Heinemann Medical Books, London (1988)
6. Clinical diagnosis and management by Laboratory Methods (John Bernard Henry, W.B Saunders Company, 1984)
7. Clinical Biochemistry – S. Ramakrishnan and Rajiswami.
8. Chemical Biochemistry (Metabolic and Clinical Aspects) by W.J. Marshall & S.K. Bangert.
9. Text book of Clinical Biochemistry by Tietz et al.

Expected Course Outcomes:

On the successful completion of the course, students will be able to:

Students will acquire insight into disorders of carbohydrates, lipids and nucleic acid (K2).
Students will learn about functional tests and enzymatic assays to diagnose the function of liver, kidney, thyroid, gastrointestinal and pancreas (K4).
Students will gain knowledge about disorders of nitrogen metabolism (K3).
Students will learn about the disorders of hemoglobin metabolism (K3).
Students will learn about the applications of Artificial Intelligence in health and medicine (K3).
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

BCH4202: Immunology

Course Objectives:

The main objectives of this course are to:

1. The study of immunology helps the students in understanding the immune system in all organisms, especially the physiological functioning of the immune system in states of both health and disease.
2. To understand the malfunctions of the immune system in immunological disorders such as autoimmune disease, hypersensitive, immune deficiency and transplant rejection.
3. To understand the physical, chemical and physiological characteristics of the components of the immune system in *in vitro, in situ* and *in vivo*.

Unit I

Lymphoid organs (primary and secondary), organization of the immune system, Types of immunity – Natural and acquired, specific and non-specific immune response. Cells and organs of the immune system, antigenic determinants/Epitopes.
Haptens, adjuvants, classification, structure and biological functions of immunoglobulins, Isotypes, allotypes and idiotypes. Theories of antibody formation.

Unit II

Active and passive immunity, Humoral and cell mediated immune response, T-Cell and B-Cell activation. Antigen processing and presentation.
T-Cell and B-Cell receptors, Complement system, Alternate and classical pathways of complement activation. Complement fixation tests. Cytokines. Major histocompatibility complex (MHC).

Unit III

Antigen-antibody interactions, precipitation reactions – immune diffusion, radial immunodiffusion, immunoelectrophoresis, immunofluorescence, Western blotting, Hybridoma Technology, Production of polyclonal and monoclonal antibodies and their application, RIA and ELISA.

Unit IV

Disorders of immune response – Hypersensitivity, Basic concepts, types of hypersensitivity, Autoimmune diseases – Hashimoto's thyroiditis, RA, Immunodeficiencies – SCID, AIDS. Cancer immune therapy.
Graft rejection, HLA typing, Immunosuppressive drugs (cyclosporine, methotrexate, steroids).

Recommended Books:

1. Essential immunology – Ivan M. Roitt.
2. Immunology – a short course elibezamini and Sidney Leskowitz, Alan R. Lisi Inc. New York, 1988.
3. Immunology III, Joseph A. Bellanti Igaku – Shein Saunders International Ed. 1985.
4. Immunology at a glance J.H. L. Playfeir 4th Ed. Blackwell Scientific Publication 1987.
5. Acids to Immunology D.M. Wier Churchill, Livingtons 1986.
6. Fundamentals of Immunology, Myrvik and Weiser, 1984.
7. Fundamentals of Immunology, Bier *et al*, Springer 1986
8. Textbook of Biochemistry and Human Biology, Talwar G.P. Prentice Hall, 1980.
9. Basic and Clinical Immunology – Stites et al., 4th Ed. Lange 1982.
10. The Immuno-system, Mc Connell et al., Blackwell Scientific 1981.
11. Fundamentals of Immunology – William C. Boyed (Wiley Toppan)
12. Introduction to Immunology – John W. Kinball.
13. Fundamentals of Immunology – Otto S. View and others.
14. Immunology – D.M. Weir.
15. Immunology – Janis Kuby,
16. Cellular and Molecular Immunology 3rd, Abul K. Abbas, Andrew K. Kich Amn Jordan S. Pober.

Expected Course Outcomes:

On the successful completion of the course, students will be able to:

1. Obtain the knowledge about the immune system, as a host defense system comprising many biological structures and processes within an organism that protects against disease (K1 & K2).
2. Concentrate on the antigen and antibody reactions and immunological techniques (K1 & K2).
3. Understanding about the two branches of the immune system such as humoral immunity and cellular immunity, cytokines and complement system (K1 & K2).
4. Clear about the hypersensitivity reaction or intolerance undesirable reactions produced by the normal immune system, including allergies and autoimmunity (K1 & K2).
5. Obtain the knowledge about the hybridoma technology is to produce large numbers of identical antibodies (monoclonal antibodies) and a recombinant DNA technology that involves inserting the DNA encoding an antigen that stimulates an immune response (K1, K3 & K4).

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

BCH4203: Applied Biotechnology

Course Objectives:

The main objectives of this course are to:

1. Emphasizes to learn about the principles involved in fermentation technology, fermentors.
2. Exposure to learn the concepts involved in making immobilized enzymes and their use in various product synthesis.
3. Provides basic concepts about vaccines and in vitro culturing.
4. Provides knowledge about transgenic plants and animals and their applications.

Unit I

Immobilized enzymes and their applications. Protein engineering. Production of glucose from starch, use of glucose isomerase in confectionary industry, use of lactase in diary industry, production of invert sugar from Glucose and sucrose.
Use of protease in food, detergent and leather Industries, Biosensors (glucose oxidase in enzyme electrodes).

Unit II
Isolation, preservation and maintenance of industrial microorganisms, batch, continuous culture techniques, Types of fermenters.
Industrial production of chemicals, alcohols, acids (citric and acetic), solvents (acetone and Butanol), antibiotics (penicillin, streptomycin, tetracycline), Vitamins (Riboflavin and Vitamin B 12), amino acids (lysine and glutamic acid and single cell protein (SCP).

Unit III
Therapeutic proteins (urokinase/ etheepidtes/Mabs/ plasminogen). Acting prozgi ADA gene activation.
Vaccines-types, Subunit vaccines – against Herpes simplex virus, foot and Mouth disease, Live recombinant vaccines – attenuated (cholera, salmonella), Vector vaccines directed against viruses and bacteria.

Unit IV
Animal and plant cell /tissue culture techniques: Micro propagation, somatic cell culture, soma clonal variations, somatic cell hybridization, protoplast fusion, genetic transformation.
Methods of gene transfer, vector and vector less methods, production of transgenic plants and animals and their applications.

Recommended Books:

1. Fermentation Technology (2nd Ed.) Standury (Pergman Press).
2. Biotechnology: Textbook of Industrial Microbiology 2nd Ed. by Wulf Crueger and Anneliese Crueger (2000).
3. Molecular Biotechnology: Principles and Applications of Recombination DNA (1996) Bernard R. Glick and Jack. J. Pasternak (Panima Publishing Corporation)
4. Principles of Gene Manipulation: An Introduction to Genetic Engineering (5th Ed.)
5. Principles of Biotechnology (1985) Alen Weisman (Surrey University Press)
6. Concepts in Biotechnology (1996) Ed. D. Balasubramanian, K. Dharmalingam, J. Green and K. Jayaraman (University Press)
7. Industrial Microbiology, Miller and Litsky, Mc Graw – Hill, 1976.
8. Industrial Microbiology, L.E. Casida, JR New Age International (1995)
9. Industrial Microbiology (Prescott & Dunn), Ed by G. Reed,CBS Publishers.
10. Immobilized Enzymes (1978) by Ichiro Chibata, Halsted Press Book.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1. Learn the immobilization process of cells and enzymes, and types (K1 & K2).
2. Understand about industrial production of various products used for human welfare (K1 & K2).
3. Understand about plant tissue culture, plant secondary metabolites, elicitation and methods involved in gene transfer of plants and machine learning in the analysis of plant (K2, K3 & K4).
4. Learn about various types of vaccines (K1 & K2).
5. Students will learn about transgenic animals and plants (K2, K3 & K4).

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

BCH4204: Internal Electives
(Students should opt any one of BCH4204(A)/ BCH4204(B)/ BCH4204(C))

(A) Technical writing, Biostatistics, Computers and Bioinformatics

Course Objectives:
The main objectives of this course are to:

1. Know the nuances of technical writing of scientific documents like thesis, project praposals and journal articles.
2. Understand the statistical tools commonly used in biological research.
3. Know the aspects fundamental to research and to understand the methods of research
4. Assimilate the concepts of hypothesis testing and its importance in research
5. Improve computer based skills for analyzing biological data.

Unit I
Technical Writing: Sentence writing, paragraph writing, story writing, review writing, various types of letters writing.
Preparation of a research project proposal: Selection of appropriate funding agency, Informal proposal, formal proposal, submission of technical report (format: title page, introduction, aims of the proposal/research, methodology, results, interpretation of results, references, acknowledgments, budgetary allocations), execution of results, submission of progress report (year wise), scientific communications (Articles, papers, reviews etc.,) and critical comments writing.

Unit II
Scope of statistical methods in life sciences. Variables, Measure of central tendency: Mean, median and mode, Measuring Dispersion: Standard deviation, co-efficient of variation, probability, probability distributions, test of significance and estimation, Linear regression and correlation, the chi-square test, ANOVA, t-Test and F-Test.

Unit III
Organization of computers: components, storage devices, graphic devices, concepts of hardware and software, methods and types of networks, basics of operating systems and types. I
ntranet and Internet.

Unit IV
Bioinformatics: Branches of Bioinformatics, scope of bioinformatics, useful sites on the internet: Data bases and search tools: NCBI (http://www.ncbi.nlm.nih.gov/), EMBL serve: (http://www2.ebi.ac.uk/services.html), sequence alignment: gene bee multiple sequence alignment (http://www.genebee.msu.su.), Tree view (http://taxnomy.zoology.gla.ac.uk/rod/treeview.html), Gene doc (http://www.cris.com/ketchup/genedoc.shtml).
Sequence analysis, repetitive elements, Image analysis, office applications, logic development. Introduction to Proteomics and genomics.

Recommended Books:

1. Bio-statistics, A foundation for analysis in the Health (7th Ed. 1999) by WWW Daniel and Sons Inc., New York.
2. Introduction to Bio-statistics and Research Methods by P.S.S. Sundar Rao and Richard.
3. Bio-statistics by Sokal and Rolf.
4. Bioinformatics, Sequence, Structure and Databanks by Des Higgins Willie Taylor (2000).

5. Introduction to Bioinformatics by T.K. Altwood and D.J Parry- Smith (Oearson Education Asia 1999).
6. UGC-MRP guidelines and format, DST and DBT guidelines and formats for project praposals.
7. Authour guidelines of any UGC recognized journals.
8. English grammar books for formal and informal letter writing.

Expected Course Outcomes:

On the successful completion of the course, students will be able to:

1. Gives an idea about thesis writing, funding agencies and patenting (K3 & K4).
2. Helps to collect data and organize the data (K1 & K2).
3. Gives a clear understanding about the basic statistical analysis (K1 & K2).
4. A Clear Knowledge of probability and its application (K2 & K3).
5. Provides the sampling distribution techniques and its analysis (K2 & K3).
6. Expertise in computer based analysis of biological data (bioinformatics) (K4, K5 & K6).

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

(B) Nerve, Vision and Muscle Biochemistry

Course Objectives:

The main objectives of this course are to:

1. Know the various aspects of brain and neurotransmitters.
2. Understand the functioning of neurotransmitters and drugs on brain.
3. Know the aspects related to biochemistry of aging and vision.
4. Assimilate the concepts of muscle contraction and muscle functioning.

Unit 1

Appearance of brain – Gross appearance, fluid compartments, blood brain barrier, Neuronal cell types – Neurons, Glial cells, synapses. Action potential generation and propagation, cerebro spinal fluid.
Presynaptic events at the neuromuscular junction: cholinergic and non-cholinergic synapses.
Chemical composition of brain, formation, structure and biochemistry of myelin, chemistry of major brain lipids, lipid composition, Special nervous system proteins.

Unit II

Neurotransmitter: Definition and classification of neurotransmitters.
Neurotransmitters - chemistry, synthesis, storage and release of neurotransmitters, transmitter action, chemical events at synapses, post synaptic events.
Various classes of neurotransmitters-Glutamate, GABA, catecholamines (Epinephrine, norepinephrine and dopamine), serotonin, acetyl choline.
Drugs acting on brain - antidepressants and benzodiazepines.

Unit III

Biochemistry of aging, Neurodegenerative disorders, Parkinsons disease, Alzheimers disease, stroke, epilepsy.
Biochemistry of vision: Structure, Composition, Metabolism and blood supply to the eye, lens and retina, rods and cones. Photochemistry of vision. Role of vitamin A in vision. Processing of visual information.

Unit IV

Structure and function of muscle – skeletal muscle structure, Biochemical characterization and extracellular matrix.
Plasmalemma, sarcoplasmic reticulum and myofibrils, actin, myosin, streptomycin, troponin, muscular contraction, sliding filament mechanism, oxidative and anaerobic metabolism.

Recommended Books:

1. Basic Neurochemistry 5th Ed. By Siegel.
2. Essentials of Neural Science and Behavior by Kandel.
3. Neurobiology molecules, Cells and Systems by Mathews.

Expected Course Outcomes:

On the successful completion of the course, students will be able to:

1. Gives an idea about the brain and its organization (K1 & K2).
2. Helps to collect information about neurotransmitters and drugs, and their role in brain (K1 & K2).
3. Gives a clear understanding about the biochemistry of vision and aging related problems (K1 & K2).
4. A Clear Knowledge on disorders of brain, eye and muscle (K2 & K3).
5. Provides clear understanding of muscle types and muscular disorders (K2 & K3).

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

(C) Functional Genomics

Course Objectives:

The main objectives of this course are to:

1. Know the various aspects of functional genomics.
2. Understand the functioning of genes and silencing of genes.
3. Know the aspects related to protein characterization using mass spectrometry and microarray methods.
4. Assimilate the concepts gene characterization using different modern methods.

Unit I

Basics of functional genomics: Concepts and applications, Forward genetics and Reverse genetics approaches, Loss of function, Gain of function.

Tools of functional genomics: T-DNA insertional mutagenesis, Transposon based mutagenesis (Ac/Ds), Activation tagging, Enhancer trapping, GAL4 mediated overexpression, Floxing, Viral mediated transfection.

Genome screening: TILLING (Targeted Induced Local Lesion IN Genome) - principle and experimental approach, ECO-TILLING; DEALING (Detecting Adducts Local Lesion IN Genome) - principle, experimental approach; Site directed Mutagenesis.

Unit II

RNA silencing: Antisense RNA technology, RNAi and Si RNA; SAGE for transcript profiling principle, methodology and applications; Molecular analysis of gene expression (RTPCR)., CRISPR (CRISPR/Cas9)- Mechanism and applications.

Unit III

Gene functions: Identification of Protein–Ligand Interactions.

Yeast Two-Hybrid Selection System: Analysis of genome wide protein–protein interactions in organisms, Use of M13, T7 Phage to Detect Protein– Ligand Interactions, Combining yeast two-hybrid and phage display data, Detecting Interactions with Protein Fragment Complementation Assays.

Mass Spectrometry for Protein–Protein Interaction Mapping: Overview, Identification of substrates for E. coli GroEL, Studying the transcriptome and proteome of Escherichia coli and *Saccharomyces cerevisiae*.

Unit IV

Protein microarrays: overview, principle, limitations; Protein microarray Manufacturing technology, solid supports, different formats, experimental approach and detection, peptidomics.

Microarray for protein-carbohydrate interaction (phage display technology); protein domain microarray; protein biochips; Antibody microarray; protein microarray for drug discovery.

References:

1.Protein Microarrays, edited by Mark schena, Jones and Bartlet pblisher, 2005.
2.Microbial Functional Genomics, Jizhong Zhou, Dorothea K. Thompson, Ying Xu, James M. Tiedje, A John Wiley & Sons, Inc., Publication, 2004.
3.Microarrays for an Integratiul J. But. Kho and Atte, Published in India by Ane Books, 2003.
4.Gene Cloning and DNA analysis An Introduction, Sixth Edition, T. A. Brown, WileyBlackwell publications, A John Wiley & Sons, Inc., Publication, 2010.

Expected Course Outcomes:

On the successful completion of the course, students will be able to:

1. Gives an idea about concepts and functional of genes and their applications (K3 & K4).
2. Helps to improve the biological functions of the gene through gene knockout mechanisms (K3, K5 & K6).
3. Gives a clear understanding about mass spectrometry (K1 & K2).
4. A Clear Knowledge protein microarrays (K2 & K3).
5. Expertise in CRSPR/Cas mechanism and its applications (K4, K5 & K6).

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create

PRACTICAL

BCH 23: Clinical Biochemistry, Immunology and hematology

1. Determination of glucose in plasma by GOD-POD.
2. Estimation of blood urea
3. Estimation of serum creatinine
4. Determination of creatinine clearance.
5. Estimation of serum uric acid.
6. Estimation of serum total proteins.
7. Estimation of serum albumin.
8. Estimation of total serum Cholesterol.
9. Determination of SGOT activity
10. Determination of SGPT activity
11. Estimation of serum calcium
12. Estimation of serum phosphate
13. Determination of serum bilirubin
14. Determination of thymol turbidity
15. Determination of urine ascorbic acid
16. Tests for abnormal constituents in urine.
17. Estimation of alcohol by specific gravity method.
18. Separation of serum proteins by Paper electrophoresis.

19. Determination of antigen and antibody reaction: Ouchterlony Technique.
20. Determination of human blood group antigens.
21. Raising of antibodies to specific antigen in rabbits.
22. Rocket Immunoelectrophoresis.
23. Detection of HCG by latex agglutination inhibition test.
24. ELISA: Antibody capture assay.
25. Complete blood picture: RBC count.
26. Complete blood picture: TLC.
27. WBC differential count.
28. Erythrocyte sedimentation Rate (ESR).
29. Packed cell volume (PCV)
30. Determination of Haemoglobin (Hb).
31. Mean cell Haemoglobin and Mean cell RBC volume.
32. Osmotic fragility of RBC.

Recommended Books:

1. Hawk's Physiological chemistry
2. Practical Biochemistry by T Plummer
3. Practical Biochemistry by J Jayaraman
4. Klemir and others: Practical Biological chemistry
5. Practical Biochemistry – Koch and Hank Dunn and Drell
6. Practical Biochemistry – Sawhney
7. Varley's practical clinical Biochemistry – Ed. Alan W. Gowenlock (Heinemann Medical Books, London, 1988.
8. Hawk's Physiological Chemistry.
9. Practical Biochemistry by T Plummer
10. Practical Biochemistry by J Jayaraman
11. Klemir and others: Practical Biological Chemistry.
12. Practical Biochemistry – Koch and Hank Dunn and Drell
13. Practical Biochemistry - Sawhney(2000)
14. Varley's Practical Clinical Biochemistry – Ed. Alan W. Gowenlock (Heinemann Medical Books, London,1988).

BCH 24: Project

Yogi Vemana University, Kadapa

M.Sc. Degree Examinations, February 2022
Department of Biochemistry
I/II/III/IV Semester
Model Question Paper
Course: XXXXXXXXX

Duration: 3 hours Max. Marks : 75

Section A
Answer any **five** of the following
(Each question carries 3 marks)

Unit I 5x3 = 15 Marks

1. ----------
2. ----------

Unit II

3. ----------
4. ----------

Unit III

5. ----------
6. ----------

Unit IV

7. ----------
8. ----------

Section B
Answer **all** the questions
(Each question carries 15 marks)

4x15 = 60 Marks

Unit I

9. a. ----------
   (Or)
   b. ----------

Unit II

10. a. ----------
    (Or)
    b. ----------

Unit III

11. a. ----------
    (Or)
    b. ----------

Unit IV

12. a. ----------
    (Or)
    b. ----------

Yogi Vemana University, Kadapa

M.Sc. Degree Examinations, February 2022
Department of Biochemistry
I/II/III/IV Semester
Model Question Paper for Skill Oriented Course
Course: Genetic Engineering

Duration: 2 hours Max. Marks: 40

Section A
Answer any **Four** of the following
(Each question carries 3 marks)

Unit I 4x3 = 12 Marks

13. ----------
14. ----------

Unit II

15. ----------
16. ----------

Unit III

17. ----------
18. ----------

Unit IV

19. ----------
20. ----------

Section B
Answer **all** the questions
(Each question carries 7 marks)

4x7 = 28 Marks

Unit I

21. a. ----------

(Or)

c. ----------

Unit II

22. a. ----------

(Or)

c. ----------

Unit III

23. a. ----------

(Or)

c. ----------

Unit IV

24. a. ----------

(Or)

c. ----------

YOGI VEMANA UNIVERSITY COLLEGE: KADAPA

DEPARTMENT OF BIOCHEMISTRY

Practical Question Paper Model: Total Marks: 100

1. Major Experiment - 40 Marks
2. Minor Experiment - 20 Marks
3. Spotters - 10 Marks
4. Record - 10 Marks
5. Viva - 20 Marks

Papers for Examination **pre-Ph.D.**

S. **No.**	Course	Total Marks
Paper - I	Research Methodology	100
Paper - II	Research Specialization (Syllabus will be framed by the research supervisor based on a research topic of the research student)	100
	Total	**200**

Department of Biochemistry

Syllabus for Research Methodology

Unit I

Technical Writing: Preparation of research proposal – informal proposal, modification of informal proposal, submission of formal proposal.

Experimental design and collection of results, submission of progress report (Year wise) and submission of technical report (format: title page, introduction, aims of the proposal/Research, hypothesis, methodology, results, interpretation of results, references, acknowledgements, budgetary preparation.

Unit II

Literature Search: Search Engines: Selection of research topic, Collection and review of literature, databases, data mining, how to write a research paper.

Plagiarism: Copying and its acceptance, anti-plagiarism softwares, Turnitin and Urkund. Social and Ethical issues in research.

Unit III

Techniques in Biochemistry: I Separation Techniques:

1. Chromatography – Counter current distribution, Paper, Thin Layer, Reverse phase, absorption, ion exchange, Affinity, gel filtration, gas chromatography and HPLC.
2. Centrifugation – RCF, Gradient and analytical Ultra centrifuge in characterizing biomolecules.
3. Electrophoresis – paper, agar, immune electrophoresis, High voltage electrophoresis, capillary electrophoresis, iso-tachophoresis, Northern blot and Southern blot analyses. *in situ* hybridization, PCR, RT-PCR, Microarray.

Unit VI

Techniques in Biochemistry: II

i. Radioactive Tracer techniques – Radioactivity, units of radioactivity, half-life, Decay constant, Radioactivity measuring techniques, biological effects of radiation, isotope dilution techniques, safety measurements from radioactivity and radioisotopes in biochemical and medical research, Autoradiography.
ii. Spectroscopy – Electromagnetic spectrum, Beer-Lamberts Law, Principles and applications of UV-VIS, Fluorescence, Flame, FT-IR, flow cytometry, ESR, NMR and MALDI, CD & ORD, Principles and applications of X-ray diffraction, iii. Immunological Techniques – ELISA, Chemiluminescence, RIA. Western blot, introduction to animal cell culture techniques.

Unit V

Biostatistics and Computers in biology:

i. Biostatistics – Measures of Dispersion, Probability and distribution, Correlation Co-efficient, Test of hypothesis – chi square test, F-Test, t-Test, simple linear regression, one way and two ways ANOVA.
ii. Use of computers in Biology – Basics. Fundamentals of Bioinformatics: Biological database sequence alignment, functional genomics, genome mapping, proteomics.

Yogi Vemana University, Kadapa
Pre - Ph.D. Examinations
Dept. of Biochemistry

Model Question Paper
Paper I: Research Methodology

Answer any five of the following **5x20 = 100 Marks**

a. ----------.

(Or)

e. ----------

f. ----------

(Or)

g. ----------

h. ----------

(Or)

i. ----------

j. ----------

(Or)

k. ----------

l. ----------

(Or)

m. ----------

Syllabus for 5 Year Integrated M.Sc. Biotechnology and Bioinformatics

Vemanapuram,Kadapa-516 005, A.P.,INDIA

Based on
National Education Policy (NEP)-2020

Preamble:

Biotechnology deals with the application of biological knowledge and techniques pertaining to molecular, cellular and genetic processes to develop significantly improved products and services. Biotechnology products and processes have ensured ease of living, improved health care, agriculture output and created livelihood opportunities, etc. Similarly, bioinformatics is the science of storing, retrieving and analysing large amounts of biological information. It is a highly interdisciplinary field involving many different types of specialists, including biologists, molecular life scientists, computer scientists and mathematicians. Biotechnology and bioinformatics are intertwined if students learn both disciplines together and directly encourage the progress in science and their endeavour. In this connection, 5 Year integrated M. Sc. in Biotechnology and Bioinformatics course was established in Yogi Vemana University, Kadapa in the academic year 2007-08. Biotechnology and Bioinformatics course is designed to help the students not only gain enough knowledge but also gain adequate practical understanding of contemporary Biology and Biotechnology such that they can pursue research in frontier areas in biotechnology and bioinformatics. The duration of this course is 5 years (10 semesters) and as per the New Education Policy 2020, the course has been designed with multiple exits or entry options with appropriate certificates (certificate after completing 1 year, or a diploma after 2 years of study, or a Bachelor's degree after a 3-year programme, or Bachelor's degree with honours/Research after a 4-year programme, and finally Master's degree after completion of 5 years).

Program Educational Objectives (PEOs)	
PEO1	To create opportunities for multi-disciplinary education, training and research in biotechnology and bioinformatics.
PEO2	To stand-in ethically strong biotechnologists who effectively contribute towards the growth of the nation.
PEO3	The graduates will be practitioners and leaders in their chosen fields.
PEO4	Students will interact with nobles of other disciplines in their workplace and society and contribute to the economic growth of the country

PEO5	Develop confidence and competence in individuals, able to adapt to the changing fabric of society through their professional expertise and personal traits
PEO6	Students will be successful in pursuing higher studies in their chosen Biotechnology and Bioinformatics field and pursue career paths in teaching or research.

Program Specific Outcomes (PSOs)	
PSO1	Gain and apply knowledge to plan, analyze and find innovative solutions in the field of biological sciences.
PSO2	Explore problems and provide valid solutions through the industry-academia interactions.
PSO3	Acquire interdisciplinary knowledge in the areas of biological, chemical, environmental and technical sciences for the benefit of society
PSO4	Acquire life skills, innovative thinking, planning and setting of small scale biotech industry.

Program Outcomes (POs)	
PO1	Students have a clear understanding of the concept of subjects and contemporary issues, and apply them to identify, analyse and understanding of complex biological problems.
PO2	Students can able to design and conduct experiments, as well in analysis and interpretation.
PO3	Students enable to use the skills, resources and modern tools of biotechnology and bioinformatics along with IT tools in solving complex biological problems.
PO4	Having problem solving ability- to assess social issues (societal, health, safety, legal and cultural) and other biological problems
PO5	Students can have adaptive thinking and adaptability in relation to environmental context and sustainable development
PO6	Students have a clear understanding of professional and ethical responsibility
PO7	Students have a great working knowledge of communicating in English – communication with the biotechnology community and society
PO8	Graduates have a good cognitive load management skill in project management and finance
PO9	Graduates have a computational thinking (Ability to translate vast data in to abstract concepts and to understand database reasoning.
PO10	Graduates having life skills, critical thinking and innovative skills

YOGI VEMANA UNIVERSITY, KADAPA

5 Year Integrated Biotechnology & Bioinformatics Syllabus

(For the students admitted during the academic year 2022 – 23 onwards)

Semester	Components ofstudy	Course code	Title of the Course	No. of credits	No. of hours per week	Practical/ Project	Internal Assessment	Semester End Exams	Total
SEMESTER-I	Core	16011	Diversity of life forms	04	04		25	75	100
	Inter discipline	16012	Physical sciences - I	04	04		30	70	100
	Inter discipline	16013	Fundamentals of mathematics	04	04		25	75	100
	Inter discipline	16014	General English	04	04		25	75	100
	EVS	16015	Environmental studies	04	04		25	75	100
	Practical	16011P	Diversity of life form lab	02		4		50	50
	Practical	16012P	Physics lab I	02		4		50	50
	Practical	16013P	Chemistry lab I	02		4		50	50
	Practical	16014P	English lab	02		4		50	50
	Sub-total			28	20	16	130	570	700
SEMESTER-II	Core	26011	Cell biology	04	04		25	75	100
	Core	26012	Biodiversity and ecological principles	04	04		25	75	100
	Inter discipline	26013	Physical sciences - II	04	04		30	70	100
	Inter discipline	26014	Computer science – I	04	04		25	75	100
	LSC	26015	Language Skill and Communication - I	04	04		25	75	100
	Practical	26011P	Cell biology lab	02		4		50	50
	Practical	26012P	Physics lab II	02		4		50	50
	Practical	26013P	Chemistry lab II	02		4		50	50
	Practical	26014P	Computer science lab I	02		4		50	50
	Sub-total			28	20	16	130	570	700
	Exit option with Undergraduate Certificate after the first year or two semesters (LEVEL 5) with the completion of courses equivalent to 56 credits along with entry option to third semester (LEVEL 6) after exit								
SEMESTER-III	Core	36011	Principles of microbiology	04	04		25	75	100
	Inter discipline	36012	Biostatistics	04	04		25	75	100
	Inter discipline	36013	Physical sciences - III	04	04		30	70	100
	Inter discipline	36014	Computer science – II	04	04		25	75	100
	LSC	36015	Language Skill and Communication - II	04	04		25	75	100
	Practical	36011P	Microbiology lab	02		4		50	50
	Practical	36012P	Physics lab III	02		4		50	50
	Practical	36013P	Chemistry lab III	02		4		50	50
	Practical	36014P	Computer science lab II	02		4		50	50
	Sub-total			28	20	16	130	570	700
SEMESTER-IV	Core	46011	Biomolecules	04	04		25	75	100
	Core	46012	Enzymology & bioenergetics	04	04		25	75	100
	Core	46013	Genetics	04	04		25	75	100
	Inter discipline	46014	Principles of management and entrepreneurship	04	04		25	75	100
	VSBC	46015	Value/Skill based course (Skills for biotechnology industry)	04	04		25	75	100
	Practical	46011P	Biomolecules lab	02		4		50	50
	Practical	46012P	Enzymology lab	02		4		50	50
	Practical	46013P	Genetics lab	02		4		50	50
	Practical	46014P	Skill based lab - Skills for Biotech industry lab	02		4		50	50
	Sub-total			28	20	16	125	575	700
	Exit option with Undergraduate Diploma after two years or four semesters (LEVEL 6) with the completion of courses equivalent to 112 credits along with entry option to fifth semester (LEVEL 7) after exit								
SEMESTER-V	Core	56011	Biochemical and biophysical tools	04	04		25	75	100
	Core	56012	Molecular biology	04	04		25	75	100
	Core	56013	Immunology	04	04		25	75	100
	Inter discipline	56014	Unix, HTML & BIOPERL	04	04		25	75	100
	GCE	56015	Global Citizenship Education	04	04		25	75	100
			Seminars and tutorials		04				

	Practical	56011P	Biochemical and biophysical tools lab	02		4		50	50
	Practical	56012P	Molecular biology lab	02		4		50	50
	Practical	56013P	Immunology lab	02		4		50	50
	Practical	56014P	Unix, HTML & BIOPERL lab	02		4		50	50
	Sub-total			28	20	16	125	575	700
SEMESTER-VI	Core	66011	Intermediary metabolism	04	04		25	75	100
	Core	66012	Introduction to bioinformatics	04	04		25	75	100
	Core	66013	Genetic engineering	04	04		25	75	100
	Core	66014	Plant biotechnology	04	04		25	75	100
	VSBC	66015	Value/skill based course (R-Programming)	04	04		25	75	100
			Seminars and tutorials		04				
	Practical	66011P	Bioinformatics lab	02		4		50	50
	Practical	66012P	Genetic engineering lab	02		4		50	50
	Practical	66013P	Plant biotechnology lab	02		4		50	50
	Practical	66014P	Skill based lab - R-Programming lab	02		4		50	50
	Sub-total			28	20	16	125	575	700
	Exit option with Bachelor's Degree (B.Sc., Bachelor of Science) after three years or six semesters (LEVEL 7) with the completion of courses equivalent to 168 credits. Entry option to the fourth year or seventh semester (B.Sc. Hons., Bachelor's degree Honours/Research (LEVEL 8) or 2 Year Master degree course (LEVEL 9)) for those students meeting a minimum CGPA of 7.5 in Bachelor's Degree examination								
	Course and Credit Distribution for B.Sc. Honours (LEVEL 8)								
SEMESTER-VII	Core	76011	Genomics, proteomics, and metabolomics	04	04		25	75	100
	Core	76012	Animal biotechnology	04	04		25	75	100
	Core	76013	Data mining in bioinformatics	04	04		25	75	100
	Internal elective	76014	A) Plant system physiology	04	04		25	75	100
			B) Animal system physiology	04	04		25	75	
			C) System biology	04	04		25	75	
			Seminars and tutorials		04				
	Practical	76011P	Genomics and proteomics lab	02		4		50	50
	Practical	76012P	Animal biotechnology lab	02		4		50	50
	Practical	76013P	Data mining lab	02		4		50	50
	Practical	76014P	76014 A or B or C lab	02		4		50	50
	Sub-total			24	20	16	100	500	600
SEMESTER-VIII	Core	86011	Microbial biotechnology	04	o4		25	75	100
	Core	86012	Developmental biology	04	04		25	75	100
	Core	86013	Molecular modelling and structural bioinformatics	04	04		25	75	100
	Open elective	86014	(A) Introduction to bioinformatics	04	04		25	75	100
			(B) Biotechnology for human welfare	04	04		25	75	
			(C) SWAYAM /MOOCs/ NPTEL	04	04		25	75	
			Seminars and tutorials		04				
	Practical	86011P	Microbial biotechnology lab	02		4		50	50
	Practical	86012P	Molecular modelling lab	02		4		50	50
	Research project	86013RP	Minor research project	04		8		100	100
	Sub-total			24	20	16	100	500	600
	Award of Bachelor's Degree (Honours/Research) or Bachelor of Arts/Science/Commerce (Hons) in Discipline with Research after four years or eight semesters (LEVEL 8) with the completion of courses equivalent to **216 credits.** Entry into a One-Year (Two-Semester) Master's Degree Programme (Level 9) shall be for those students who obtained a Bachelor's Degree (Honours/Research) i.e. Level 8).								
	Course and Credit Distribution for One-Year PG/Master's Degree Programme for B.Sc. Honours (LEVEL 9)								
SEMESTER-IX	Core	96011	Environmental biotechnology	04	o4		25	75	100
	Core	96012	Bioethics, Biosafety, and IPR	04	04		25	75	100
	Core	96013	Cell signalling, communications, and cancer biology	04	04		25	75	100
	Open elective	96014	(A) Natural products in industrial applications	04	04		25	75	100
			(B) Greenhouse technology	04	04		25	75	
			(C) SWAYAM /MOOCs/ NPTEL	04	04		25	75	
			Seminars and tutorials		04				
	Practical	96011P	Environmental biotechnology lab	02		4		50	50
	Practical	96012P	Cell signalling and cancer biology lab	02		4		50	50
	Skill oriented course	96013 SOC	Drug design and development (Theory + Practical)	04	04		10	40	100
						8		50	
	Sub-total			24	20	16	110	490	600

SEMESTER-X	Core	06011	Research methodology	04	04		25	75	100
	Internal elective	06012	A) Stem cell biology and regenerative medicine	04	04		25	75	100
			B) Nanobiotechnology	04	04		25	75	
			C) Agricultural biotechnology	04	04		25	75	
	Major Project/Dissertation	06011 MPD	Major project/Dissertation	16		24	100	300	400
	Sub-total			24	8	24	150	450	600
	GRAND TOTAL			264	284	168	1200	5300	6500
	A student, on completion of 5 years (ten semesters) which is equivalent to 264 credits shall be awarded a 5 Year Integrated Master Degree or on completion of the One-Year (Two-Semester) Master's Degree Programme (level 9) equivalent to 48 credits shall be awarded a Master's Degree.								

Course and Credit Distribution for Two-Year PG/Master's Degree Programme in Biotechnology & Bioinformatics for 3 Year B.Sc Degree holders (LEVEL 9)

Semester	Components ofstudy	Course code	Title of the Course	No. of credits	No. of hours per week	Practical/ Project	Internal Assessment	Semester End Exams	Total
SEMESTER-I	Core	BTBI2101	Genomics, proteomics and metabolomics	04	04		25	75	100
		BTBI2102	Animal biotechnology	04	04		25	75	100
		BTBI2103	Data mining in bioinformatics	04	04		25	75	100
	Internal Elective	BTBI2104	A) Plant system physiology	04	04		25	75	100
			B) Animal system physiology	04	04		25	75	
			C) System biology	04	04		25	75	
			Seminars and tutorials		04				
	Practical	BTBI2105	Genomics and proteomics lab	02		4		50	50
	Practical	BTBI2106	Animal biotechnology lab	02		4		50	50
	Practical	BTBI2107	Data mining lab	02		4		50	50
	Practical	BTBI2108	76014 A or B or C lab	02		4		50	50
	Sub-total			24	20	16	100	500	600
SEMESTER-II	Core	BTBI2201	Microbial biotechnology	04	04		25	75	100
		BTBI2202	Developmental biology	04	04		25	75	100
		BTBI2203	Molecular modelling and structural bioinformatics	04	04		25	75	100
	Open Elective	BTBI2204	(A) Introduction to bioinformatics	04	04		25	75	100
			(B) Biotechnology for human welfare	04	04		25	75	
			(C)SWAYAM /MOOCs/ NPTEL	04	04		25	75	
			Seminars and tutorials		04				
	Practical	BTBI2205	Microbial biotechnology lab	02		4		50	50
	Practical	BTBI2206	Molecular modelling lab	02		4		50	50
	Minor Project	BTBI2207	Minor research project	04		8		100	100
	Sub-total			24	20	26	100	500	600
SEMESTER-III	Core	BTBI2301	Environmental biotechnology	04	04		25	75	100
		BTBI2302	Bioethics, Biosafety, and IPR	04	04		25	75	100
		BTBI2303	Cell signalling, communications, and cancer biology	04	04		25	75	100
	Open Elective	BTBI2304	(A) Natural products in industrial applications	04	04		25	75	100
			(B) Greenhouse technology	04	04		25	75	
			(C) SWAYAM /MOOCs/ NPTEL	04	04		25	75	
			Seminars and tutorials		04				
	Practical	BTBI2305	Environmental biotechnology lab	02		4		50	50
	Practical	BTBI2306	Cell signalling and cancer biology lab	02		4		50	50
	Skill Oriented Course Practical	BTBI2307 SOC	Drug design and development (Theory + Practical)	04	04	08	10	40 50	100
	Sub-total			24	32	24	110	490	600

SEMESTER-IV	Core	BTBI2401	Research methodology	04	04		25	75	100
	Internal elective	BTBI2402	A) Stem cell biology and regenerative medicine	04	04		25	75	100
			B) Nanobiotechnology	04	04		25	75	
			C) Agricultural biotechnology	04	04		25	75	
	Dissertation/Major Project	BTBI2403 MPD	Major project/Dissertation	16		24	100	300	400
	Sub-total			24	28	32	150	450	600
Grand Total				**96**			**460**	**1840**	**2400**

- All core papers are Mandatory
- The compulsory foundation choose one paper.
- Internal/Open Elective – Choose one paper each. Open Electives are for the students of other Departments in the varsity.
- Skill Oriented course is mandatory. Relevant society along with practical (10 marks internal, 40 final theory and 50 for practical's).
- Interested students may register for SWAYAM /MOOCs/ NPTEL with the approval of the concerned DDC for the award of the grade as 'open elective'.
- Choose one from Multi-Disciplinary (Circle formation with other subjects/Dept. of Arts/ Commerce) Course or Project (Collaboration with various firms/companies/societies) work.

Category wise credits distribution

Category	No. of papers	Credits
Programme major core	24	96
Internal core electives of programme	06	08
Practical	32	64
Value/skill added courses	03	12
Research Projects	02	20
Interdisciplinary subjects	10	40
University core subjects on environment, language and communication skills, and global citizenship education	04	16
University open elective subjects	06	08
Bridge course in Bioinformatics basics	01	0
Total credits	**88 Papers**	**264 credits**

YOGI VEMANA UNIVERSITY

5 year Integrated *M. Sc.*, Biotechnology and Bioinformatics
Semester I

Paper 16011: DIVERSITY OF LIFE FORMS

Course Objectives: ➢ Recall the basic concepts central to the study of principles and methods of systematic of plant, animal and microbial organisms and their levels of organization. ➢ Apply a comprehensive exposure to the various diseases of plants and animals and also conservation of animals and also known about the commercial plants. ➢ To know the natural history of Indian subcontinent.
Course Outcomes: The students will come know to ➢ Demonstrate the basics of diversity of living organisms and their classification and levels of organization. ➢ Explain the importance of economically and medicinally important plants and animals, and their significance. ➢ They know about the natural history of Indian subcontinent.

Unit-I: Principles & methods of taxonomy, and outlines of plants, animals, andmicrobes

. Concepts of species and hierarchical taxa, biological nomenclature, classical & quantitativemethods of taxonomy of plants, animals and microorganisms.
. Important criteria used for classification in each taxon. Classification of plants, animals and microorganisms. Evolutionary relationships among taxa.

Levels of structural organization Unit-II:

Unicellular, colonial and multicellular forms. Levels of organization of tissues, organs & systems. Comparative anatomy, adaptive radiation, adaptive modifications.

Unit-III: Organisms of health & agricultural importance and organisms of conservation

Common parasites and pathogens of humans, domestic animals and crops. Agricultural or economic importance containing crops
Organisms of conservation concern - Rare, endangered species. Conservation strategies.

Unit-IV: Natural history of Indian subcontinent and life diversity

Major habitat types of the subcontinent, geographic origins and migrations of species.
Common Indian mammals, birds. Seasonality and phenology of the subcontinent.

References:

1. Plant pathology-Pathogens & Plant Diseases, S. Chand & Co., New Delhi-492.
2. Sharma, P.D. 2000. Plant Pathology. Narosa Publishing House, India. 13. Singh, R.S. (2000): Introduction to Principles of Plant pathology (3rd Edition), Oxford & IBH Publishers, New Delhi.
3. O.P. Sharma, 2016. Plant Taxonomy
4. Gamble & Fischer 1915-1935. Flora of Presidency of Madras. 3 vols.BSMS, Dehradun.
5. Judd, W.S, Christopher S. and Michael J. Donoghue. 2007. Plant Systematics: A Phylogenetic Approach, 3rd ed. Sinauer.

YOGI VEMANA UNIVERSITY

5 year Integrated *M. Sc.*, Biotechnology and BioinformaticsSemester I

Paper 16012: PHYSICAL SCIENCES-I

PART-A: PHYSICS

Course Objectives: ➢ Develop better understanding of key concepts concerning scalar and vector fields learned previously in multivariable calculus courses. ➢ To learn the concepts of rocket engines and its applications in mission. ➢ To know about concepts of aerodynamic forces on rocket and missiles, staging of rocket and also equation of motions. ➢ Define and identify a particle and a rigid body and be able to state and derive the moment of inertia of various rigid bodies which arise in practice.
Course Outcomes: ➢ Students are prepared for further study in the relevant technological disciplines and more advanced mathematic courses. ➢ Design a preliminary chemical rocket engine. ➢ Compute various types of aerodynamic forces acting on the rocket and missile during the flight. ➢ Define the basic terms and concepts in dynamics of rigid bodies.

Unit-I: Vector analysis 7 hours

Scalar and Vector fields – Gradient of a scalar field and physical significance. Divergenceand Curl of a vector field. Integration of vectors - Line, Surface and Volume integrals. Stock's, Guas's and Green's theorems.

Unit-II: Mechanics of particles and a rigid body 18 hours

Laws of motion - Motion of variable mass system - motion of a rocket – Collisions in two and three dimensions – Concepts of impact parameter and scattering cross-section - Rutherford's scattering. Definition of a rigid body – Rotational motion – rotational kinematics relations – equation of motion of a rigid rotating body –angular momentum andinertia tensor- Euler's equation.

Reference Books:

1. Fundamentals of Physics by David Haliday, Robert Resnick and
2. Mechanics by Hans and Puri, Tata McGraw Hill Pub.
3. Introduction to Physics for Scientists and Engineers by F.J. Ruche(Mc Graw Hill).
4. Mechanics by Upadhyaya.
5. A text book of Engineering Mechanics by R.K. Rajput (Dhanpat Rai and sons).
6. B.Sc. Physics Vol.-1 by C. Murali Mohan Sastry, K. Shankar Rao, P. Babu Rao.
7. B.Sc. Physics Vol.-1 – Unified Physics.

PART - B: INORGANIC CHEMISTRY

Course Objectives:
➢ To give a thorough introduction to the study of coordination chemistry, bioinorganic chemistry
Course Outcomes:
➢ Recall the concepts on Metal ligand chemistry and their complexes. ➢ Explain the properties of metals and their biological importance.

Unit – I: Inorganic metals in biological system **11 hours**

Introduction, essential and trace elements, biological significance of sodium, potassium and chlorine, iron, zinc, cobalt, toxic metals and their toxicity of As, Hg, and Pb;metallophorphyrins with emphasis on hemoglobin – structure and fusion, chlorophyll –structure and fusion, functions of nitrogenase.

Unit – II: Coordination compounds **1**

3 hours

Introduction, nomenclature of inorganic molecules and complex compounds, Werner's theory – postulates, experimental evidences. Sidwick's theory – calculation of EAN,limitations. Metal – ligand bonding in transition metal complexes – valence bond theory – postulates, geometrics of coordination number 4 – tetrahedral and square planner, and coordination number 6 – octahedral complexes, and crystal field stabilization energy. (Elementary treatment – diagrams only).

Reference books:

1. Concise Inorganic Chemistry by J.D. Lee
2. Basic Inorganic Chemistry by Cotton & Wilkinson
3. Inorganic Chemistry by J.E. Huheey
4. Selected Topics in Inorganic Chemistry by Wahid U.Malik
5. Vogel's Text book of Qualitative inorganic Analysis
6. Unified course in Chemistry by O.P. Agarwal, Vol. I, II, and III

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester I

Paper 16013: FUNDAMENTALS OF MATHEMATICS

Course Objectives:
➢ To make aware of various methods in matrices. ➢ To know about determinants and inverse of a matrix. ➢ Understands the idea of Differentiation and Integration ➢ Provides an introduction to vector calculus ➢ To provide basic knowledge for the non-Mathematics students to learn and apply the topics in solving real world problems.
Course Outcomes:
➢ Applications of Matrices and determinants play a major role in solving linear equations. ➢ Recognize and use the appropriate tools of calculus to solve applied problems in a variety of settings ranging from physics and biology to business and economics. ➢ Vector Calculus plays an important role in differential geometry and in the study

of partial differential equations.
- Students have a clear understanding of the subject related concepts and problemsolving ability in Solving social and contemporary issues.
- Extensively use the concepts in physics and other Engineering fields.

Unit-I: **(20 Hours)**

Matrices: Introduction – Definition- Special matrices- Matrix operations – Related matrices.
Determinants– Ad joint and inverse of matrix –Solution of a system of lean equations by inversion method.
Sections 5.1 to 5.5 of chapter 5 of Elementary Engineering Mathematics by Dr. B. S. Grewal.

Unit- II:

(2 5 Hours)

Differentiation: Definition - General rules of differentiation (product and quotient rule) – Derivatives of standard functions
Sections 12.1 to 12.2of chapter12 of Elementary Engineering Mathematics by Dr.B.S.Grewal.

Unit – III:

(2 5 Hours)

Integration: Definition: Standard results – Integration by substitution – Integration by Parts.
Sections 16.1 to 16.3 and 16.8of Chapter 16ofElementary Engineering Mathematics by B.S.Grewal.

Unit – IV:

(2 0 Hours)

Vector Calculus: Definitions and Properties of theDot or Scalar products and Crossor Vector products – Gradient – Divergence – Curl.
Chapter 4 of "Vector Analysis" by Schaum's Outline Series.

Note: No theory questions. Only direct problems

from the above said topics.Reference Books:

1. "Intermediate Mathematics" –Volume I & II by S.Chand Publications.

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and BioinformaticsSemester I

Paper 16014: GENREAL ENGLISH

Course Objectives:

- To enable the learners to read appreciates different discourses like Poems, Prosepieces and Plays
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing
- Facilitate effective Listening skills for better comprehension of academic lectures
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Focus on appropriate reading strategies for comprehension of various academictexts and authentic materials
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information

➢ To improve familiarity with a variety of technical writings. ➢ To develop confidence in the students to use English in everyday situations ➢ To enable the learners to acquire structure and written expression required for their profession.
Course Outcomes: ➢ Understand the context, topic, and pieces of specific information. ➢ Applies grammatical structures to formulate sentences and correct word forms. ➢ Evaluates reading/listening texts and to write summaries based on global comprehension of these texts ➢ Creates a coherent paragraph interpreting a figure/graph/chart/table ➢ Listener improves Listening, Speaking, Reading and Writing skills in general. ➢ Develops their Oral Communication and Fluency. ➢ Improves awareness of English. ➢ Acquires a proper level of competence for employability.

SECTION	SELECTIONS	AUTHOR
Poetry- 25 Marks	1.Pied Beauty 2. Still I Rise	G.M. Hopkins Maya Angelou
Prose- 15 Marks	3.True and Rare Genius (Vemana) 4. The Power of Prayer	V Rao. Narla Abdul Kalam
One Act Play – 15 Marks	5.Thirst	M.V.Madasu

Grammar	45 marks
1. Parts of Speech 2. Tenses 3. Concord (5 Sentences out of ten) 4. Transformation of Sentences 5. Synonyms and Antonyms	20 Marks 25 Marks

Books Suggested:

1. Selections from English Prose (Common Core Syllabus), Oxford Press
2. Poetry for Pleasure (Common Core for Under Graduate)
3. True and Rare Genius – Narla's writings Vol-11.
4. Finesse, Selections from Poetry and Prose. ISBN: 9878-93-5138-119-8.
5. Non detail (Common Core for Under Graduate)
6. Murphy's English Grammar, Cambridge University Press
7. Oxford English Grammar by John Eastwood, Oxford University Press.

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester I

Paper 16015: ENVIRONMENTAL SCIENCES

Course Objectives: ➢ To make students understand and appreciate the unity of life in all its forms and the implications of lifestyle on the environment. ➢ To broaden the understanding of global climate changes and the importance of renewable sources of energy. ➢ To inspire students to find ways in which they can contribute personally and professionally to prevent and rectify environmental problems.
Course Outcomes: At the end of the course, the student should be able to ➢ Know the importance of environment and awareness on natural resources to find the causes, effects, and consequences if not protected. ➢ Identify the numerous causes for environmental pollutions, hazards, their management, and control methods ➢ Enriching the understanding of the need for eco-balance and the importance of biodiversity conservation. ➢ Find ways to protect the environment on global climatic changes and their mitigation. ➢ Recognise some of the social issues and gaining knowledge on the protection of the environment.

Unit – I: Environment and Natural Resources

Definition, scope, importance, the need for public awareness on natural resources.
Forest resources – use, exploitation, causes, and consequences of deforestation.
Water resources – use of surface and subsurface water; dams - effect of drought, water conflicts. Land resources – Land degradation, soil erosion, and desertification. Indian Case studies. Food resources – Definition, world food problems, Traditional and modern agriculture,and its impacts and remedies.

Energy sources – Unit – II:

Definition of renewable and non-renewable energy resources. Non-renewable energy resources - oil, Natural gas, Coal, Nuclear energy. Renewable energy - Solar energy, hydroelectric power, Ocean thermal energy, wind, and geothermal energy. Biomass energy and Bio Gas.

Unit –III: Environmental changes and Remediation

Air, water, soil, Thermal Pollution: Causes, effects and control measures; Nuclear hazard. Solid waste Management- Causes, Effects and control measures. Floods, earthquakes, cyclones, tsunami and landslides, Case studies.

Unit-IV: Global Climatic Change and Mitigation, and Social Issues

Global climate change and the greenhouse effect – Kyoto Protocol, Carbon sequestration, Acid rain, Ozone depletion problem – Montreal Protocol. Urban problems related to energy and sustainable development, Water conservation, Rainwater harvesting, Wasteland Reclamation. Environment Protection Act - Prevention and control of Pollution of Air and Water. Wildlife protection and Forest Conservation Acts.

References

1.Prithipal Sigh (2006) Perspectives in Plant Ecology and environmental biology. Scientific Publishers Jodhpur
2. Subramanian V (2002) Text book of environmental science. Narosa Pub House, Delhi
3. Sharma PD. (2006) Ecology and environment Rastogi Publications, Meerut.
4.Biswarrop Mukharjee (1997) Environmental biology. Tata Mc Graw hill publishing Company Limited.
5. Kumar H.D. (1994) Environmental ecology, Vikas Publishing House Pvt. Ltd. New Delhi
6.A.B. Choudary and sarkar D.D (2006) Biodiversity Endangered. Scientific Pub. Jodhpur.
7.A text book of environmental studies (2014). Asthana and Meera Asthana.

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester I

16011P: DIVERSITY OF LIFE FORMS LAB

Course Objectives: Students acquire practical knowledge on ➢ A comprehensive introduction to the biodiversity of plants, animals and fungi. ➢ Students are given a solid grounding in the vast diversity of multicellular organisms and their evolutionary lineages.
Course Outcomes: ➢ Gain skills necessary to recognise taxonomically distinct lineages of living organisms. ➢ Be able to identify relationships between structure and function. ➢ Be able to describe the diversity of living animals and plants.

List of practicals

1. Study of the parts of a compound microscope.
2. Study and description of three locally available common flowering plants, one from each of the families Solanaceae, Fabacceae and Liliaceae including dissection and display of floral whorls, anther and ovary to show number of chambers (floral formulae and floral diagrams). Types of root (Tap and adventitious); stem (herbaceous and woody); leaf (arrangement, shape, venation, simple and compound).
3. Study of the specimens/slides/models and identification with reasons - Bacteria, Coleacheate, Vaucheria, Polysiphonia, Fucus; Rhizopus, Penicillium and Agaricus; Riccia, Anthoceros, Funaria; Psilotum, Selaginella, Pteris; Cycas, Pinus, Gnetum.
4. Study of virtual specimens/slides/models and identification with reasons - Amoeba,Hydra, liverfluke, Ascaris, leech, earthworm, prawn, silkworm, honeybee, snail, starfish, shark, rohu, frog, lizard, pigeon and rabbit.
5. Study of tissues and diversity in shapes and sizes of plant and animal cells (palisade cells, guard cells, parenchyma, collenchyma, sclerenchyma, xylem, phloem, squamous epithelium, muscle fibers and mammalian blood smear) through temporary/permanent slides.
6. Study through specimens/photographs/slides of a. Key stones species (b) Ecads, Ecotypes, Ecophenes (c) Source of Immunosuppresive and other therapeutic agents (d) Botanicals for biocontrol (e) Sacred flora (havan materials etc.

7. Study the adaptive features of xerophytic plants.

8. Study of a few endangered species of amphibians, reptiles, birds and mammals of India
9. To study the faunal composition (insects and mites) of soil samples. (Berley's funnel)
10. To study faunal composition of water samples (Lucky drop method)
11. Report on visit to National Park/Wild life sanctuary/Botanical garden.

16012P: PHYSICS LAB

Course Objectives:
➢ To measure the viscosity of a sample liquid. ➢ To study the relation between length of a given wire and tension for a constant frequency using sonometer.
Course Outcomes:
➢ Students develop the idea about standing waves. ➢ Students understand the sonometer apparatus and its working

List of practicals

i. Determine the acceleration due to gravity using compound pendulum.
ii. Determine the frequency of given tuning fork using Volume resonator.
iii. Determine the viscosity of water.
iv. Verify the laws of transverse vibrations of a given stretched string.
v. Study the oscillations of mass under series and parallel combinations of two different springs.

16013P: CHEMISTRY LAB

Course Objectives:
➢ To give a thorough introduction to the study of coordination chemistry, bioinorganic chemistry
Course Outcomes:
➢ Recall the concepts on Metal ligand chemistry and their complexes. ➢ Explain the properties of metals and their biological importance.

List of practicals

Inorganic chemistry

Acid base titrations **i.**

Determination weight of carbonate in given Sodium Carbonate solution – by usingacid base titration method.

ii. EDTA titrations

Determination of weight of Zinc in given ZnSO4 solution by using standard EDTA solution. Determination of weight of copper in given CuSO4 solution by using standard EDTA solution.

16014P: ENGLISH LAB

Course Objectives:

- To enhance LSRW Skills.
- To improve the fluency in Spoken English
- To familiarize students with the use of English in everyday situations.
- To maintain good linguistic competency and accuracy in grammar, pronunciation and vocabulary.

Course Outcomes:

- Develops communication skills through various language learning activities
- Enriches Vocabulary knowledge
- Builds the LSRW skills of the students in English
- Enhances the ability to converse.
- Improves fluency in spoken English.

List of practicals

1. Enhancement of the Vocabulary
2. English structured grammar rules and regulations
3. Listening and Speaking Skills
4. Pronunciation of Phonetic Drill
5. Rhyme, Rhythm and Intonation
6. Reading and Writing Skills
7. Mock Interviews
8. Developing Presentation Skills
9. Conducting Group Discussions
10. Debates.

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics
Semester II

Paper 26011: CELL BIOLOGY

Course Objectives: ➢ Develop a basic understanding of the unit of life that is cell ➢ Relate the organization and function of different cell organelles ➢ Extend the knowledge earned from the course
Course Outcomes: ➢ Recall critical concepts, facts, and theories relevant to biological sciences ➢ Correlate the functions of different organelles of the cell ➢ Examine contemporary issues in related fields ➢ Able to apply scientific knowledge to address the nature problems.

Unit-I:

Cell Theory and the Cell: Discovery of cell and the cell theory, exceptions to the cell theory. Evolutionary relationships between organisms. Cell structure – bacteria, plant and animal cell. Structural differences between prokaryote and eukaryotic cells and plant and animal cells.

Unit-II:

Membrane structure and function – Structure of model membrane, lipid bilayer and membrane protein diffusion, osmosis, ion channels, active transport, ion pumps, mechanism of sorting and regulation of intracellular transport, electrical properties of membranes.

Unit-III:

Structural organization and function of intracellular organelles: Cell wall, nucleus, mitochondria, Golgi bodies, lysosomes, endoplasmic reticulum, peroxisomes, plastids, vacuoles, chloroplast, structure & function of cytoskeleton. Cell motility and integration.

Unit-IV:

Organization of chromosomes: Structure of chromatin and chromosomes, organization of chromosomes in eukaryotes and prokaryotes, unique and repetitive DNA, heterochromatin, euchromatin, transposons.

Cell division and Cell cycle: Mitosis and meiosis, their regulation, steps in cell cycle, and control of cell cycle.

References:

1. De Robertis and De Robertis. Cell and Molecular Biology, P.K.Gupta. Cell and Molecular Biology. Narosa Publisher.
2. Verma PS, Agarwal V.K. Cell Biology, Genetics, Evolution and Ecology. S.chand& Co.
3. Bruce Alberts. Essential cell biology an introduction to Molecular Biology of the Cell. Garland
4. Cooper – Introduction to the Cell.

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester II

PAPER 26012: BIODIVERSITY AND ECOLOGICAL PRINCIPLES

Course Objectives: ➢ Demonstrate the concepts and values of biodiversity and ecology principles ➢ Analyse the ways to protect the habitat ➢ Formulate scientific intervention tools for conservation
Course Outcomes: ➢ Illustrate the values of biodiversity, summarize the genetic diversity and factors causing loss of genetic diversity ➢ Demonstrate methods involved in species inventory and its richness. ➢ Classify ecosystem types of the world and how to manage biodiversity. ➢ Build possible measures to overcome species extension and loss of ecosystem.

Unit-I: Biodiversity

Introduction, definition, levels of biodiversity, magnitude and distribution of biodiversity, methods for biodiversity monitoring, mega diversity zones and hot spots. Biodiversity act. Biodiversity at global, National and local levels.

Unit II: Biodiversity conservation

Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. IUCN threat categories, Red data book. Strategies for biodiversity conservation: Principles of biodiversity conservation, in-situ and ex-situ conservation strategies.

Unit III: Ecology

Environment – physical, biotic and abiotic environments and interactions, concept of habitat and niche. Population ecology - Characteristics of a population; population growth curves; population regulation; life history strategies (*r* and *K* selection); concept of metapopulation. Species interactions – types and interspecific competition. Community ecology - Nature of communities; community structure and attributes; levels of species diversity and its measurement; edges and ecotones,

Unit IV: Ecosystem and Biogeography

Ecological Succession: Types; mechanisms; changes involved in succession; concept of climax. **Ecosystem Ecology:** Ecosystem structure; ecosystem function; energy flow and mineral cycling (C,N,P); primary production and decomposition; structure and function of some Indian ecosystems: terrestrial (forest, grassland) and aquatic (fresh water, marine, eustarine). **Biogeography:** Major terrestrial biomes; theory of island biogeography;biogeographical zones of India.

References:

1. Raven P.H.et al. (2006) Biology 7th edition Tata Mc Graw Hill Publishers, New Delhi.
2. Mauseth, James.D (2003) Botany: An introduction to plant biology. 3rd edition Jones and Bartlett Publishers.
3. Sharma PD. (2006) Ecology and environment Rastogi Publications, Meerut.
4. Kumar H.D. (1994) Environmental ecology, Vikas Publishing House Pvt. Ltd Delhi

5. A.B. Choudary and sarkar D.D (2006) Biodiversity Endangered. Scientific Pub.

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester II

Paper 26013: PHYSICAL SCIENCES-II

Part A: Physics of Thermodynamics and Optics

Course Objectives: ➢ State the first law of thermodynamics and understand its implications. Explain cyclic processes and apply this to heat engines. ➢ State the second law of thermodynamics and understand its implications. Develop an appreciation of the concepts of order, disorder and entropy. ➢ Define diffraction and gain an understanding of its occurrences. ➢ State the speed of light and describe how it can be measured.
Course Outcomes: ➢ Students will be able to determine the reversibility or irreversibility of a thermodynamic process. ➢ Student should understand importance gas refrigeration cycle. ➢ Analyse the intensity variation of light due to Polarization, interference, and diffraction.

Unit-I: Thermodynamics (15 hours)

The zeroth law and first law of thermodynamics – Internal energy – work done in isothermal and adiabatic processes – reversible and irreversible processes – Carnot's theorem – Carnot's engine – efficiency – Clausius – Clapeyron equation. Second law of thermodynamics – entropy – concept – entropy and disorder measurement of entropy changes in reversible and irreversible processes – entropy of universe. Joule – Kelvin effect – expression for Joule - Kelvin coefficient – Liquefaction of gases – Principle of Refrigeration.

Unit-II: Interference Diffraction & Polarization (13 hours)

Interference of light – the principle of superposition – Young's double slit theory andexperiment - Diffraction – Fraunhofer diffraction – Fraunhofer diffraction at a single slit anddouble slit. Diffraction grating – Grating spectrum – Fresnel half period zones – zone plate.Polarization – Nicol prism – theory of circular and elliptical polarized light – Quarter and Halfwave plates – Polarimeter experiment.

Reference Books:

1. B.Sc. Phyics Vol.-II by Sastry and Babu Rao (S. Chand and Co.)
2. Optics by Brijlal and Subrahmanyam (S. Chand and Co.)
3. Heat and Thermodynamics by Brijlal and Subrahmanyam (S. Chand and Co.)
4. B.Sc. Physics Unified Physics- II by Gupta and Gupta (Jai Prakashnath& Co.)

Part-B: Physical Chemistry

Course Objectives: ➢ To give a thorough introduction to study chemical dynamics, and thermodynamics
Course Outcomes: ➢ Recall the concepts on adsorption isotherms, kinetics of surface reactions and thermodynamics of surfaces. ➢ Explain the properties of rate of reaction and phase reactions.

Unit–I: Chemical kinetics

Rate of a reaction, factors of influencing the rate of a reaction-concentration, temperature, pressure, solvent, catalyst and light. Concentration dependence of rates, mathematical characteristics of simple chemical reaction-zero order, first order second order, pseudo first order, Half-life. Determination of order of a reaction-deferential method, method of integration, half-life method and isolation method. Methods of determining order of a reaction.

Unit–II: Phase Equilibria

Homogeneous and heterogeneous system, statement and meaning of the terms-Phase, Component and degrees of freedom, Gibb's Phase rule, phase equlibria of one component system-water system. Phase equlibria of two-component system-solid-liquid equlibria, simple eutectic. Pb-Ag system, desilverization of lead. Solid solutions-definition of compound with congruent melting point system and incongruent melting point system. NaC1-H2O system.

Reference books

1. Thermodynamics for Chemists by S. Glasstone
2. Chemical Thermodynamics by R.P. Rastogi & S.S. Misra
3. Advanced Physical Chemistry by Gurdeep Raj
4. Principles of Physical chemistry by Puri, Sharma and Pathania

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester II

Paper 26014: COMPUTER SCIENCE - I

Course Objectives:

- To familiarize students with Microsoft Word, Excel and PowerPoint.
- To learn the fundamental programming concepts and methodologies which are essential to building good C/C++ programs.
- To practice the fundamental programming methodologies in the C/C++ programming language via laboratory experiences.

Course Outcomes:

- Students will be able to open, edit and save the document in formats that are compatible with other word processing applications.
- Student can create documents with MS word which can easily be accompanied into MS PowerPoint, Excel or any other MS office applications.
- It helps them to prepare presentation for their academic purpose as well as official purpose.
- Knowledge of programming languages and aware of OOP's concepts

Unit-I:

Creating new document; opening existing document; file, edit, insert format, tools, table, and window menu commands. Working with excel; spread sheet features; file, edit, insert format and tools, using different types of charts. MS power point: auto content wizard; master slides; fines with other presentations

Unit-II:

Introduction to C-programming language: History of C-program, structure of C-program, identifiers' and keywords, data types, constants, variables, arrays and pointers. Operators and Expressions: Arithmetic operators, unary operators, relational and logical operators, assignment operators, conditional operators and library functions

Unit-III:

Control statement: Branching: if-else statement; Looping: while-loop, do-while and For-loop statement; Jumping: break, continue, go to; switch statement and comma statement, I/O statements
Function: defining a function, accessing a function, function prototype, passing arguments to a function, recursion; Arrays-one dimensional, Two-dimensional, pointers, structures and unions.

Unit-IV:

Algorithm and its characteristics, pseudo code / flow chart, program. Object Oriented Programming: Introduction, Generation of programming Languages, Programming Paradigms, Features of Object Oriented Programming, Merits and Demerits of Object Oriented Programming Language. Basics of C++ Programming: Introduction, History, Structure, Writing the First C++ Program, Files used in a C++ Program, Compiling and Executing,

References

1. MS office book 2007
2. Let us C by Yashavant Kanethkar
3. ANSI-C by Balaguruswamy
4. Reema Thareja "Object Oriented Programming with C++" Oxford university Press, 2015

Recommended Books :

1. E. Balagurusamy "Object Oriented Programming with C++" TMH, 6th edition, 2013.

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester II

Paper 26015: LANGUAGE SKILLS AND COMMUNICATION - I

Course Objectives:

- To enable the learners to read appreciates different discourses like Poems, Prosepieces and Plays
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing
- Facilitate effective Listening skills for better comprehension of academic lectures
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Focus on appropriate reading strategies for comprehension of various academictexts and authentic materials
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- To improve familiarity with a variety of technical writings.
- To develop confidence in the students to use English in everyday situations

➢ To enable the learners to acquire structure and written expression required for their profession.
Course Outcomes: ➢ Understand the context, topic, and pieces of specific information. ➢ Applies grammatical structures to formulate sentences and correct word forms. ➢ Evaluates reading/listening texts and to write summaries based on global comprehension of these texts ➢ Creates a coherent paragraph interpreting a figure/graph/chart/table ➢ Listener improves Listening, Speaking, Reading and Writing skills in general. ➢ Develops their Oral Communication and Fluency. ➢ Improves awareness of English. ➢ Acquires a proper level of competence for employability.

*****75 Marks

I. Communication 20 Marks

1. Objectives of Communication
2. Types of Communication
3. Verbal and Non-verbal Communication
4. Characteristics of Successful Communication
5 Principles and Barriers of Communication

II. Listening 15 Marks

1. The Listening Process 2. Types of Listening
3. Principles of Good Listening 4. Listening with a purpose
5. Barriers to Listening

III. Speaking 20 Marks

1. Phonetics 2. The Syllable 3. Word Stress
4. Accent and Rhythm in Connected Speech 5. Intonation
6. American and British Accents

IV. Writing 20 Marks

1. Principles of Effective writing 2. Formal and Informal Letter Writing
3. E-mail 4. Resume 5. Job application

Reference books suggested:

1. Essentials of Business Communication by Rajendra Rao
2. A Course in Listening and Speaking II
3. Business Correspondence and Report Writing R.C. Sharma Krishna Mohan
4. The Oxford Guide to Writing and Speaking by John Seely, (Oxford)
5. Developing Communication Skills by Krishna Mohan & Meera Benerji, Macmillan.
6. Effective Technical Communication – M. Ashraf Rizvi (Tata Mc Grew Hill)
7. Communication – C.S. Rayudu, Himalaya Publishing House
8. Business Communication – D.D. Chaturvedi, Mukesh Chaturvedi (Pearson Edu.)
9. Communication Skills – Dr. Nageshwara Rao, Dr. Rajendra P. Das (Himalaya Publication House)

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester II

26011P: CELL BIOLOGY LAB

Course Objectives: ➢ To provide basic knowledge on buffers preparation, cell divisions, simple staining, genetics and various types of cells and organisms.
Course Outcomes: Students will be able to prepare different types of buffer solutions. ➢ Preparation of buffer by using pH meter. ➢ Students know the morphology of various types of cells by performing simple staining. ➢ Students understand basics of inheritance of characters by solving genetics problems. ➢ Study of cell division in various organisms.

List of practicals

1. Study of different stages of meiosis by temporary preparation/ permanent slides of onion flower buds.
2. Study of different stages of mitosis by temporary preparation/ permanent slides of onion root tips.
3. Preparation of temporary stained squash of onion root tip to study various stages of mitosis
4. Preparation of temporary slides of the following (Onion epidermal peel/ root tips or any other suitable available material like Crinum, Wheat caryopsis etc.):
    a. Cytochemical staining of DNA by Fuelgen
    b. Cytochemical staining of RNA by Methyl Green Pyronin
    c. Cytochemical staining of polysaccharides by PAS
    d. Cytochemical staining of proteins by Bromophenol blue
    e. Cytochemical staining of histones by fast green
    f. Vital staining of mitochondria by Janus green B in cheek epithelial cells
5. Identification and study of types of cancer, cancer cells by permanent slides/ photographs.
6. Study of the following microscopic techniques by photographs: Fluorescence microscopy, autoradiography, positive staining, negative staining, freeze fracture, freeze etching, shadow casting
7. Study of ultrastructure of cell (Cell wall, Primary and secondary pits, Plasodesmata, Gap junctions, Tight junctions, Plasma membrane, Nucleus, Nuclear Pore Complex, Chloroplast, Mitochondrion, Golgi bodies, Lysosomes, SER and RER), Prokaryotic and Eukaryotic cell, Plant and Animal Cell, Phages: TMV and Bacteriophage, Viroids and Prions (Mad Cow's / Kuri/ PSV disease), Mycoplasmas through electron micrographs/photographs
8. Preparation of permanent slide to show the presence of Barr body in human female blood cells/cheek cells.

26012P: PHYSICS LAB-II

Course Objectives:

- Recognize that the shorter the wavelength of light, the grater its deviation by a prism.
- The students are made to determine the width of a single slit by observing the diffraction pattern of monochromatic light.

Course Outcomes: Students will have practical knowledge on following at end of course

- They would also learn optical phenomena such as interference, diffraction and dispersion and do experiments related to optical devices: Prism, grating, spectrometers.
- Understand how to use a spectrometer.
- Obtain a practical understanding of the refraction of light by a prism.
- Interference by Fresnel biprism, newton rings, etc are studied.

List of practicals

1. To form a wedge shaped air film between two glass plates with a given wire and determine the thickness of the given wire.
2. To determine the Radius of curvature of the given plano-convex lens by forming Newton's Rings?
3. To determine the dispersive power of the material of a given quartz prism using a spectrometer?
4. To determine the wavelengths of a given white light using a plane transition grating placed in normal incidence position.
5. To determine the refractive index (M) of a given liquid and glass using boy's method

26013P: CHEMISTRY LAB-II

Course Objectives:

- To give a thorough introduction to the study of chemical dynamics, thermodynamics

Course Outcomes:

- Recall the concepts on adsorption isotherms, kinetics of surface reactions and thermodynamics of surfaces.
- Explain the properties of rate of reaction and phase reactions.

List of practicals

Physical chemistry

1. Chemical kinetics: Determination of specific rate of the hydrolysis of methyl/ethyl acetate catalyzed by hydrogen ion at room temperature.
2. Electrochemistry: Determination of HCl strength conductometrically using standard NaOH
3. Critical solution temperature (CST): Determination of CST of phenol-water system.
4. Determination of adsorption isotherm of acetic acid on activated charcoal.

26014P: COMPUTER SCIENCE LAB – I

Course Objectives: ➢ To familiarize students with Microsoft Word, Excel and PowerPoint ➢ To learn problem solving techniques ➢ To teach students to write programs in C and C++ to solve the problems.
Course Outcomes: After the completion of this course the student would be able to ➢ Student can create documents with MS word which can easily be accompanied into MS PowerPoint, Excel or any other MS office applications. ➢ Ability to trace the execution of programs written in C and C++ language.

List of programmes

1. To create a resume using MS Word
2. Procedures to create a worksheet with 4 columns enter 10 records and find the sum of all columns
3. Procedures to create a simple bar chart to high light the sales of a company for 3 different periods
4. Write a C program to find the largest two numbers using if and conditional operator.
5. Write a C program to calculate arithmetic operations of two numbers using switch.
6. Write a C program to print the reverse of a given number.
7. Write a C program to print whether the given number is a prime or not.
8. Write a C program to find the sum of two matrices
9. Write a OPP program that will ask for a temperature in Fahrenheit and display in Celsius.
10. Write a OPP program which accepts marks of three subjects. Calculate total & average marks and also check student is pass or fail. (If average above or equal to 50 the „Pass").

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester III

Paper 36011: PRINCIPLES OF MICROBIOLOGY

Course Objectives: ➢ To provide basic knowledge on different types of micro-organisms characteristics, classifications and their growth kinetics.
Course Outcomes: After completion of course, the students will ➢ Appreciate the historical background and development of microbiology. ➢ Students understand the general, distinctive characteristics and classification systems of microorganisms. ➢ Student develop knowledge on isolation, culture and identification of different microorganisms

Unit-I: Historical introduction - Discovering the Microbial world and developments in Microbiology, origin and evaluation of microbes, Scope of Microbiology and Importance of microorganisms to human welfare. Principles of physical, chemical, and mechanical sterilization methods, antimicrobial compounds. Microbes infecting humans, and plants.

Unit-II: Classification – Basics of microorganisms classification (Hackle and Whittakar Kingdom concepts, Bergey's manual), General and distinctive characteristics of the major groups of Microorganisms – Bacteria, mycoplasma, actinomycetes, fungi and protozoa. Ultra-structure of bacteria. Cell wall structure and staining techniques, Microscopy – light and electron microscopy

Unit-III: Isolation and characterization of common microorganisms – bacteria, cyanobacteria, fungi. Direct and indirect methods of maintenance and of cultures. Preservation of microbial cultures (glycerol stocks, oil overlay, drying and freeze- drying). **Viruses:** Nature, properties and classification of Viruses. Viruses of Plants, animals and microorganisms. Morphology, size, ultra-structure and and life cycles of some representative viruses - TMV, T4, Lambda, HIV SV40, Prions, Viroids.

Unit-IV: Nutritional requirements – mode of nutrition – Phototrophy, chemotrophy, symbiotic and parasite microorganisms. Saprophytes; symbiotic and parasitic modes of nutrition. Types of media – basal, defined complex, enrichment, selective, differential, maintenance and transport media. Cell growth and kinetics of bacterial growth, Normal and biphasic growth curve, batch and continuous cultures. Microbial communication system; bacterial quorum sensing; microbial fuel cells; prebiotics and probiotics; strategies of cell division, stress response.

References:

1. Microbiology: concepts and Applications. Michael J. Pelczar, Jr., E.C.S., Chan, Noel R. Krieg, 1993. Mc. Graw Hill, Inc.
2. Fundamentals of Microbiology. 4th ed. 1994. I.E. Alcamo. Scientific Publication.
3. Microbiology Prescott et al., Wm. C. Brown Publications

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester III

Paper 36012: BIOSTATISTICS

Course Objectives:

- Basic knowledge and to provide students with an introduction to the theory of ordinary Differential Equations of first order.
- To learn about separable, homogeneous and first order differential equations
- Provides the meaning and scope of Statistical Applications.
- Enables the students to understand and use of Statistics in real-life problems.
- Imparts comprehensive knowledge on data collection, presentation of data, pie-chart, graphical representation, measures of central tendency and dispersion, linear trend and correlation.

Course Outcomes:

- Have a clear understanding of the topics, computational thinking, and ability to convert vast data into abstract data.
- The study of Differential equations of first order and first degree will develop the ability to apply the knowledge of the differential equation in solving Orthogonal Trajectories; to find growth and decay at molecular level; electrical circuits; Newton's Law of cooling; to solve dilution and falling body problems.
- The practice of statistics involves analyzing data to help define and determine the organizational needs.

Unit-I: (25 Hours)

Differential Equation of First order and First degree: Introduction- Separation of variables – Homogeneous equations, **Sections 2.1 to 2.6** of Chapter -**2** of Ordinaryand Partial Differential Equations by M.D.Raisinghania.

Unit-II: (21 Hours)

Definition – Scope – Limitations- Primary and Secondary data -collection and Sources of data – Classification and Tabulation – PieChart – Histogram- Frequency Polygon- Frequency Curve- Ogive.

Scope and standard as in Scope and standard as in **"Fundamentals of Statistics" –** by SC Gupta, Himalaya Publishing House

Sections 1.1 to 1.4 of chapter 1,
Sections 2.1.3, 2.1.4 of 2.1; 2.2, 2.3, 2.5 of chapter 2
Sections 3.1 to 3.5 of chapter 3
Sections 4.1 to 4.4 of chapter 4

Unit-III: (21 Hours)

Measures of Central Tendencies: Mean –Median – Mode.

Measures of Dispersion: Range- Quartile Deviation

Scope and standard as in Scope and standard as in **"Fundamentals of Statistics" –** by SC Gupta, Himalaya Publishing House

Sections 5.3, 5.4, 5.6, 5.7 of Chapter 5.
Sections 6.1, 6.4, 6.5, 6.6 of Chapter 6.

Unit-IV: (23 Hours)

Measures of Dispersion: Mean Deviation – Standard derivation – coefficient of variation.

Sections 6.8, 6.9 of Chapter 6
Correlation: Curve fitting-Fitting of a straight line - Karl Pearson's Correlation Coefficient – Probable Error
Sections 11.5.3 of chapter 11: Sections 8.1.1, 8.2, 8.3, 8. 4 and 8.5 of chapter 8. Scope and standard as in **"Fundamentals of Statistics" –** by SC Gupta, HimalayaPublishing House.

Note: No theory questions. Only direct problems

from the above said topics.Reference Books:

1. Intermediate Mathematics by S.Chand Publications.
2. Higher Engineering Mathematics by Dr.B.S.Grewal
3. S.P.Gupta : Statiscal Methods by S.Chand.
4. S.C.Gupta : and V.K.Kapur – Fundamentals of Mathematical Statistics by S.Chand.
5. Probability and Statistics by SCHAUM'S OUT LINE SERIES

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.,* Biotechnology and Bioinformatics

Semester III

Paper 36013: PHYSICAL SCIENCES-III

Part A: Physics of Semiconductor devices and Lasers

Course Objectives: ➢ To introduce the operation of semiconductor devices. ➢ Characteristics and biasing of diodes and transistors, design and analysis of circuits. ➢ Understand basic laser physics. Describe the concept of stimulated emission and what an active medium is.
Course Outcomes: ➢ Classify solids on the basis of band theory and to calculate conductivity of semiconductors. ➢ Explain the working of p-n junction and zener diode. ➢ Apply concepts of semiconductor devices to design and analyze circuits. ➢ Describe the different types of lasers, its principle, properties of laser beam.

Unit-I: Semiconductor devices (15 hours)

Intrinsic and extrinsic semiconductors –p-n junction diodes –energy band diagram - Zener diode – applications of Zener diode – tunnel diode – transistors - Bipolar junction transistor- p-n-p transistors - CB, CE, CC configurations - transistor hybrid parameters - determination of hybrid parameters from transistor characteristics.

Unit-II: Lasers (10 hours)

Introduction – Characteristics of Laser – Spontaneous and Stimulated emission of radiation –Einstein's

coefficients – Population inversion – Ruby Laser – Helium- Neon Laser –

Applications of Lasers In Industry, Scientific and Medical Fields.

Reference Books

1. B.Sc. Physics: Unified Physics Vol. III
2. Engineering Physics by M. R. Srinivasan, New Age Publications

Part B - Organic Chemistry

Course Objectives: ➢ To give a thorough introduction to the study of Structural theory in Organic Chemistry, Stereochemistry of carbon compounds
Course Outcomes: ➢ Recall the concepts on organic chemistry of carbon compounds. ➢ Explain the geometry of organic molecule and their orientation.

Unit–I: Structural theory in Organic Chemistry (12 hours)

Bond polarization: Factors influencing the polarization of covalent bonds, electro negativity – electromeric effect, inductive effect, mesomeric effect or resonance and hyperconjugation, and their applications. Concept of aromaticity-definition, Huckel's rule-application to Benzenoid and Non-benzenoid compounds. Reactions-General mechanism of electrophilic substitution, mechanism of nitration and sulfonation. Mechanism of halogination, FriedelCraft's alkylation and acylation. Orientation of aromatic substitution-definition of *ortho*, *para* and *meta* directinggroups

Unit–II: Stereochemistry of carbon compounds (12 hours)

Molecular representations: Wedge, Fischer, Newman and Saw-horse formulae, stereoisomers: enantiomers and diastereomers, conformational and configurational isomerism. Enantiomers: Optical activity: wave nature of light, plane polarized light, interaction with molecules, optical rotation and specific rotation. Chiral centers: definition-molecules with similar chiral carbons- definition of mesomers. Molecules with dissimilar chiral carbons. Number of enantiomers and mesomers-alculation. D, L & R, S configuration for symmetric and dissymmetric molecules. Cahn-Ingold-Prelog rules. Racemic mixture, racemization and resolution techniques.

Reference Books *Organic Chemistry*

1) Advanced Organic chemistry- Reactions, Mechanism and Structure, Jerry March, Wiley.
2) Organic Chemistry, R.T. Morrison & R.N. Boyd, Prentice-Hall.
3) Text book of Organic Chemistry, T.W. Solomon.
4) Stereo Chemistry, P.S. Kalsi
5) Reaction mechanisms by P.S. Kalsi
6) A guide book to Mechanisms in Organic Chemistry by Mukherji & S.P. Singh

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester III

Paper 36014: COMPUTER SCIENCE - II

Course Objectives:

➢ The concepts of operator overloading and function overloading, files, exceptions are discussed to expose students to the advantages of object oriented programming.
Course Outcomes: An understanding of the principles behind the object oriented development process. ➢ Competence in use of object oriented programming language in the development of small to medium sized application programs.

Unit-I

INTRODUCTION TO PROGRAMMING LANGUAGES: The Evolution of Java, Object-Oriented Programming Concepts and Java, The Primary Characteristics of Java, The Architecture, Simple Java Program, More of Java, An Application with Two Classes Java Program structure, Java Tokens, Java Statements, Implementing a Java Program, Java Virtual Machine, Programming Style. Branching: Constants, Variables, and Using Data Types, Operators and Expressions, Type conversion and Associativity, Mathematical Functions.

Unit-II

DECISION MAKING AND INTRODUCTION: Decision Making with if Statement, Simple if Statement, The if …… else Statement, Nesting of if …… else Statements, The else if Ladder, The Switch Statement, The?: Operator. Decision Making and Looping: Introduction. The while Statement, The do Statement, the for Statement, Jumps in Loops Labeled Loops

Unit-III

INTRODUCTION TO PYTHON: Getting Started with Python, Essentials of Python Programming, Integers, Floating point Numbers, Strings, Variables and its Scope: Variables, Modifying values, Type Conversion, Selection Control Statements, Collections: Lists, Tuples, Sets, Ranges, Dictionaries, Two Dimensional Sequences, Loop Control Statements.

Unit-IV

INTRODUCTION TO OBJECT ORIENTED PROGRAMMING IN PYTHON: Programming Paradigms, Objects, Classes, Python Classes, Specifying Attributes and Behaviours, Abstraction, Encapsulation, Polymorphism, Inheritance, Composition.

Text books:

1. “Introduction to Java Programming” by Daniel Liang.
2. E. Balaguruswamy, Programming with JAVA, A Primer, TMH (1999) Chun, J Wesley, Core Python Programming, Second Edition, Pearson, 2007 Reprint 2010
3. Barry, Paul, Head First Python, 2nd Edition, O Rielly, 2010
4. Lutz, Mark, Learning Python, 4th Edition, O Rielly, 2009

References

1. Darrel Ince & Adam Freeman, Programming the Internet with Java, Addison – Wesley, (1997).
2. KenArnold & James Gosling, The Java Programming Language, Addison – Wesley, (1998)
3. Patrick Naughton & Herbert Schildt, JAVA 2: The Complete Reference, 3rd Edition, TMH, (1999).
4. Dusky Phillips, Python 3 Object-oriented Programming - Second Edition

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester III

Paper 36015: LANGUAGE SKILLS AND COMMUNICATION - II

Course Objectives:

- To enable the learners to read appreciates different discourses like Poems, Prose pieces and Plays
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing
- Facilitate effective Listening skills for better comprehension of academic lectures
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- To improve familiarity with a variety of technical writings.
- To develop confidence in the students to use English in everyday situations
- To enable the learners to acquire structure and written expression required for their profession.

Course Outcomes:

- Understand the context, topic, and pieces of specific information.
- Applies grammatical structures to formulate sentences and correct word forms.
- Evaluates reading/listening texts and to write summaries based on global comprehension of these texts
- Creates a coherent paragraph interpreting a figure/graph/chart/table
- Listener improves Listening, Speaking, Reading and Writing skills in general.
- Develops their Oral Communication and Fluency.
- Improves awareness of English.
- Acquires a proper level of competence for employability.

7 5 MARKS

I. Listening (20 Marks)

1. Listening Comprehension
2. Effective Listening Strategies
3. Listening to Structured Talks
4. Intensive Listening
5. Team Listening (Listening & Note Taking)

II. Speaking (20 Marks)

1. Oral Communication
2. Presentation Skills
3. Use of Visual Aids
4. Group Discussion
5. Facing Interviews

III. Reading (15 Marks)

1. Types of Reading
2. Understanding the gist of an argument

3. Identifying the topic sentence

IV. Writing (20 Marks)

1. Paragraph Writing 2. Report Writing

3. Minutes Drafting 4. Information Transfer 5. Interpreting Data Editing a Passage

Books suggested:

1. Essentials of Business Communication by Rajendra Rao
2. A Course in Listening and Speaking II
3. The Oxford Guide to Writing and Speaking by John Seely, Oxford
4. Developing Communication Skills by Krishna Mohan and Meera Benerji (Macmilan)
5. Speaking English Effectively by Krishna Mohan and N.P. Singh (Macmilan)
6. Effective Technical Communication – M. Ashraf Rizvi (Tata Mc Grew Hill)
7. Communication – C.S. Rayudu, Himalaya Publishing House
8. Business Communication – D.D. Chaturvedi, Mukesh Chaturvedi (Pearson Edu.)
9. Communication Skills – Dr. Nageshwara Rao, Dr. Rajendra P. Das (Himalaya Pub House)

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester III

36011P: MICROBIOLOGY LAB

Course Objectives: ➢ To know different staining methods and different microscopic techniques ➢ To know isolation, preservation and characterization of different microorganisms ➢ To acquire knowledge on nutritional media and growth of bacteria
Course Outcomes: After completion of course, the students will ➢ Able to describe different physical, chemical and mechanical agents for sterilization ➢ Able to distinguish different microorganisms based on their characteristics and staining procedures ➢ Develop skills to isolate, preserve and characterize the microorganisms ➢ Understand preparation of different culture media and growth of microbes

List of practicals

1. Basic rules of microbiology Lab
2. To study disinfectants and sterilization techniques.
3. To study types of Media and perform media preparation.
4. To perform slants and sub culturing (T-streaking)
5. To perform simple staining
6. To perform Gram's staining.
7. To perform Negative staining
8. To perform Antibiotic resistance assay.
9. Enumeration of CFU of E.coli by serial dilution and spread plate method.
10. To study Growth Curve of bacteria.
11. To study the effect of pH/temperature/UV light on bacterial growth.
12. Conjugation experiment
13. Isolation of bacteria and fungi from soil , water and air
14. Milk quality testing by Methylene Blue dye reductase test.
15. Slides: Ameoba , Bacillus, Yeast, Aspergillus, Penicillium, Anabena.

36012P: PHYSICS LAB

Course Objectives: ➢ To provide practical knowledge about the DC & AC circuits, different wiring circuits, battery, semiconductor diodes.
Course Outcomes: ➢ Understand the operation of diode circuits.

List of practicals

1. Draw the junction characteristic curve of the given P-N junction diode.
2. Study the V-I characteristics of the given zener diode.
3. Study the characteristics of P-N-P Transistor in the Common Emitter Configuration and to determine the Transistor parameters.

36013P: CHEMISTRY LAB III

Course Objectives: ➢ To give a thorough introduction to the study of Structural theory in Organic Chemistry, Stereochemistry of carbon compounds
Course Outcomes: ➢ Recall the concepts on organic chemistry of carbon compounds. ➢ Explain the geometry of organic molecule and their orientation

List of practical

Organic chemistry:

1. Qualitative analysis: identification of an organic compound through the functional groupanalysis and preparation of suitable derivatives

2. Preparations

a) Preparation of *p*-bromo acetanilide
b) Preparation of *p*-nitro acetanilide

36014P: COMPUTER SCIENCE LAB - II

Course Objectives: ➢ To understand the basic concepts and fundamentals of platform independent object oriented language. ➢ To introduce the fundamentals of Python Programming language. ➢ To impart knowledge of Object – Oriented Programming using Python
Course Outcomes: After successful completion of course, the students are able to ➢ Use the syntax and semantics of java programming language and basic concepts of OOP. ➢ Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages. ➢ Discuss the fundamentals of Python programming language.

- Explain Object Oriented programming features of Python and process tuples and sets.
- Write programs to manipulate dictionaries and files.

Programs List:

1. Write a java program that swaps two numbers
2. Write a java program to find the given number is palindrome or not
3. Write a java program to perform quadratic equation
4. Write a java program to perform the factorial value
5. Write a java program to print the below pattern
   a) ******
      ******
      ******
   b) ******
       *****
        ***
         **
6. Write a python program to print prim numbers less than 20:
7. Write Python program to Take **N** float numbers as an input from the user, the find the average.
8. Write a python program to create, append and remove lists in python.
9. Write a program to demonstrate working with dictionaries in python
10. Write a python program to find largest of three numbers

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester IV

Paper 46011: BIOMOLECULES

Course Objectives: ➢ To provide knowledge on classifications, structures and functions of various biomolecules of living organisms
Course Outcomes: After completion of course, the students ➢ Able to know basic structures of various biomolecules of living organisms ➢ Able to understand the different functions of biomolecules in organisms.

Unit I:

Chemical foundation of biology – pH, pK, acids, bases, chemical bonding, properties of water. **Carbohydrates** – Classification, structure and properties of carbohydrates, mono (glucose, galactose, fructose) di (lactose, maltose, sucrose), polysaccharides (starch, glycogen, cellulose). Mucopolysaccharides. Glycoconjugates. **Lipids** –Classification. Structure and biological functions of fatty acids, triacylglycerols, phospholipids, steroids. Physico-chemical properties and analysis of fats and oils. Structure and functions of prostaglandins, leukotrienes,thromboxanes.

Unit II

Amino acids – Classification, structures and physicochemical properties. Peptides – Peptide bonds, naturally occurring peptides. **Proteins** – Classification, properties, functions, Isolation and purification of protein, criteria of homogeneity. Primary structure of proteins and its sequence determination.

Unit III

Secondary (alpha, beta, random coils, Ramachandran plot), tertiary and quaternary structural features of proteins, Forces responsible for protein stability. Structural organization of globular (myoglobin, haemoglobin), fibrous proteins (collagen, keratins, silk fibroin).Denaturation and renaturation of proteins, chaotropic agents. Structure and functions of glycoproteins and lipoproteins.Classification and functions of vitamins.

Unit IV

Nucleic Acids – Structure of purines, pyrimidine, nucleosides, and nucleotides. Structure, Properties and functions of nucleic acids (DNA, RNA). Different forms of DNA and RNA. Denaturation and renaturation of nucleic acids, cot curves. The law of DNA constancy and C value paradox. Ribozymes and riboswitches. **Vitamins** – classification structures and functions.

References:

1. Principles of Biochemistry. A.L. Lehninger, Nelson and Cox. (C.B.S., India).
3. Principles of Biochemistry General Aspects. 1983 by Smith *et al*., (McGraw Hill).
4. Biochemistry (2nd edition) by Donald Voet and Judith Voet.
5. Biochemistry (4th edition) by L. Stryer (Free man).
6. Textbook of Biochemistry with Clinical Correlation by Thomas M. Devlin.
7. Biochemistry by Zubay.

8. Nucleic acid Biochemistry and Molecular Biology by Main Waring *et al*., (Blackwell).

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester IV

Paper 46012: ENZYMOLOGY AND BIOENERGETICS

Course Objectives: ➢ To acquire knowledge of enzymology and bioenergetics ➢ To know the structure and functions of enzymes, and mechanisms of energy production in cells.
Course Outcomes: After completion of course, the students will ➢ Summarize structure, function, and properties of enzymes ➢ Knowledge on regulation of enzyme activity ➢ Basics of energy, mitochondrial energy formation, and photosynthesis energy.

Unit I: Enzyme Definition, general properties, IUB nomenclature and classification of enzymes. Nature of enzymes, active site, coenzymes, cofactors, assay of enzyme, units of enzyme activity. Kinetics of enzyme catalyzed reaction - Michaelis-Menten equation Determination of Vmax, Km, Kcat, and their significance. Factors affecting on enzyme activity. Mechanism of enzyme catalysis.

Unit II: Enzyme inhibition – Reversible and irreversible. Competitive, non-competitive and feed-back enzyme inhibition, enzyme poisoning. Enzyme regulation – Allosteric modification, covalent modification, zymogens activation. Isoenzymes (LDH), Multienzyme complexes, Multifunctional enzymes, Modern concepts of evolution of catalysis – ribozymes, Abzymes

Unit III: Bioenergetics: Concept of free energy, thermodynamic principles in biology. Free energy changes in biological transformations in living systems. High energy compounds, Biological Oxidation-Reduction Reactions, Components and organization of mitochondrial electron transport system (experimental approach). Classes of electron-transferring enzymes, inhibitors of electron transport. Oxidative phosphorylation and ATP synthesis. Uncouplers, Regulation of Oxidative Phosphorylation,

Unit IV: Photosynthesis: Light harvesting complexes; mechanisms of electron transport; Mechanism of photosynthesis. Plant mitochondrial electron transport and ATP synthesis, alternate oxidase.

Secondary metabolites of bacteria, fungi and plants – Types, structures, properties and functions.

References:

1. Lehninger's Biochemistry2008 Nelson and Cox CBS India.
2. Harpers Illustrated Biochemistry 28th Edition. Longman
3. T B Biochemistry Clinical relations – Thomas Devlin 2005
4. Outlines of Biochemistry By Cohn and Stumf
5. Biochemistry by Zubay.
6. Principles of Biochemistry General Aspects. 1983 by Smith *et al*., (McGraw Hill).
7. Biochemistry (2nd edition) by Donald Voet and Judith Voet.

8. Biochemistry (4th edition) by L. Stryer (Free man).

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and BioinformaticsSemester IV

Paper 46013: GENETICS

Course Objectives: ➢ To acquire knowledge on classical and modern genetic concepts along with microbial genetics and population genetics.
Course Outcomes: After completion of course, the students will ➢ Explain genetic inheritance through historical experiments ➢ Able to know the concept of gene, and its mapping methods ➢ Able to understand the gene transfer in microbes, ➢ Able to understand the diseases due to mutations or chromosomal aberrations.

Unit I:

Mendelian principles: Dominance, segregation, independent assortment, deviation from Mendelian inheritance. **Concept of gene:** Allele, multiple alleles, pseudoallele, complementation tests. **Extensions of Mendelian principles:** Codominance, incomplete dominance, gene interactions, pleiotropy, genomic imprinting, penetrance and expressivity, phenocopy, linkage and crossing over, sex linkage, sex determination, sex limited and sex influenced characters. Non-Mendelian inheritance.

Unit II:

Gene mapping methods: Linkage maps, tetrad analysis, mapping with molecular markers, mapping by using somatic cell hybrids, development of mapping population in plants. **Extra chromosomal inheritance:** Inheritance of mitochondrial and chloroplast genes, maternal inheritance.

Unit III:

Microbial genetics: Methods of genetic transfers – transformation, conjugation, transduction and sexduction, mapping genes by interrupted mating, rII locus (Benzersexpt), fine structure analysis of genes. **Human genetics:** Pedigree analysis, lod score for linkage testing, karyotypes, genetic disorders. **Quantitative genetics:** Polygenic inheritance, heritability and its measurements, QTL mapping, Genome wide association studies.

Unit IV:

Population Genetics - Gene pool and gene frequencies: Hardy-Weinvberg principle. Forces that changes gene frequencies in population - Mutation, genetic drift, migration. **Mutation:** Types, causes and detection, mutant types – lethal, conditional, biochemical, loss of function, gain of function, germinal verses somatic mutants, insertional mutagenesis. Molecular basis of spontaneous and induced mutations **Structural and numerical alterations of chromosomes:** Deletion, duplication, inversion, translocation, ploidy and their genetic implications. **Recombination** – Homologous, site-specific and transposition.

References

1. Genetics ; From Genes to Genomes by Hartwell I.H. etal (2000) McGraw Hill
2. Human Molecular Genetics by Sudbery P (1998). Addison – Wesley Longman Harbor.

3. Gene VIII & IX by Benjamin Lewin, Oxford University press, Oxford.
4. Genetics and Analysis of Quantitative traits by Lynch. M and B. Walsh (1997).
5. Evolutionary Genetics by Maynard Smith J (1989), Oxford University press.

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester IV

PAPER 46014: PRINCIPLES OF MANAGEMENT AND ENTREPRENEURSHIP

Course Objectives: To understand the ➢ Concept and functions of management ➢ role and importance of entrepreneurship in economic development ➢ financial and institutional assistance to entrepreneurs ➢ various Government schemes for Entrepreneurs ➢ basic idea behind the success of an entrepreneur
Course Outcomes: After successful completion of this paper, the students are able to ➢ gain knowledge on smooth functioning of enterprise management ➢ aware the opportunities and problems in Entrepreneurship ➢ understand and utilise the finance and institutional support for starting Entrepreneurship ➢ get awareness on the Govt. schemes and its utilization ➢ start new ventures and provide employment

Unit-I: Introduction to Management: Definition - Concept – Significance - Principles - Functions of Management: Planning – organizing - staffing – directing – Coordination - Leadership – Controlling

Unit-II: Entrepreneurship: Entrepreneur – Entrepreneurship - Entrepreneurship development - Factors Affecting Entrepreneurial Growth – Opportunities and Problems in Entrepreneurship Development - Role of Entrepreneurship in Economic Development - Entrepreneurship Development Programmes (EDPs)

Unit-III: Financial and Institutional Support for Entrepreneurship – Need – Financial institutions: Commercial banks - IDBI, IFCI, ICICI – SFCs – IRBI – SIDC – SIDBI - Exim Bank; Institutional support : NSIC – SIDO – SSIB – SSID – SISIs – DICs – TCOs – Industrial estates – Specialized institutions

Unit-IV: Government schemes for Entrepreneurs: Importance - Entrepreneurship Development Schemes: Gram Udyog Vikas Yojna - National SC-ST Hub - Ambedkar Social Innovation & Incubation Mission - Work-Shed Scheme for Khadi Artisans - Honey Mission Programme / Beekeeping - Pottery Activity under Gramodyog Vikas Yojana Scheme - Pradhan Mantri Mudra Yojana (PMMY) - PM SVANidhi

Reference Books:

1. Subba Rao P., Management & Organisational Behaviour, Himalaya Public, New Delhi.
2. Koontz and Weichrich; Essential of management, Text and cases, Tata Mcgraw.
3. S.S. Khanka, Entrepreneurship Development, S. Chand Publications, New Delhi
4. Vasanth Desai, Dynamics of Entrepreneurship Development and Management, Himalaya Publications, New Delhi.
5. BEVL Naidu, Entrepreneurship, Himalaya Publications, New Delhi

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester IV

Paper 46015: VALUE/SKILL BASED COURSE (SKILLS FOR BIOTECHNOLOGYINDUSTRY)

Course Objectives: ➢ Demonstrate skills and enhancement as per National Occupational Standards (NOS) of "Lab technician/Assistant" qualification pack issued by Life Science Sector Skill Development Council. ➢ Knowledge about major activities of biotechnology industry, regulations and compliance, health and safety, good laboratory/manufacture practices (GLP) & (GMP), and standard operating procedures (SOP), as per the industry standards. ➢ Demonstrate soft skills like planning, decision making, organizing, problem solving, analytical thinking, and documentation. ➢ Acquire knowledge to prepare all analytical solutions for biotech industry
Course Outcomes: At the end of course, the students should able to ➢ Use all learned skills in biotechnology industry or in laboratory as per "National Occupational Standards" qualification pack issued by Life Sciences Sector Skill Development Council. ➢ Use all soft skills in biotechnology industry with trained talent. ➢ Use knowledge in preparation all analytical reagents required for biotech industry

Unit-I: Insights into biotech industry

Biotechnology industry in Indian and Global context – organization in context of large/ medium/small enterprises, their structures and benefits. Major activities of biotechnology industry, regulations and compliance, environment, health and safety (EHS), good laboratory practices (GLP), standard operating procedures (SOP), and good manufacturing practice(GMP) as per the industry standards.

Unit-II: Industry orientated professional skills

Planning and organizing skills, decision making, problem solving skills, analytical thinking,critical thinking, team management, and risk management. Skills issued by National Occupational Standards of lab technician.

Unit-III: Interpersonal skills and digital skills

Writing skills, reading skills, oral communication, conflict-resolution techniques, interpretation of research data, trouble shooting in work place. Digital skills – basic computerskills (MS office, excel, power point, internet) for work place. Professional E-mail drafting skills and power point presentation skills.

Unit-IV: Analytical skills in laboratory/industry

Solutions – molarity, molality, normality, mass percent (%w/w), percent by volume (%v/v),parts per million (ppm), parts per billion (ppb), dilution of concentrated solutions, standard solutions, stock solution, solution of acid or base, reagent bottle label reading and precautions.

Reference books

1. National Occupational Standards (NOS) of "Lab technician/Assistant" qualification pack issued by Life Science Sector Skill Development Council.

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester IV

46011P: BIOMOLECULES LAB

Course Objectives: ➢ To provide knowledge on identification, isolation and estimation methods for biomolecules.
Course Outcomes: ➢ Students will be able to identify different biomolecules using qualitative analysis. ➢ Students able to do the estimations of glucose, amino acids and proteins by different quantitative methods. ➢ Students learn the isolation and estimations of glycogen, lecithin and cholesterol. ➢ Students able to do the preparation of different buffers. ➢ Students know the calculations of PK and PI values of aminoacids using titration curves.

List of practicals

1. Qualitative general reactions of amino acids to identify the unknown solutions.
2. Qualitative general reactions of sugars to identify unknown solutions.
3. Preparation of buffers
4. Isolation and estimation of glycogen from liver
5. Isolation and estimation of Cholesterol from brain.
6. Preparation of lecithin.
7. Isolation of casein from milk.
8. Estimation of proteins by Biuret, modified Lowry, UV methods and Bradford method.
9. Estimation of amino acids by ninhydrin method.
10. Estimation of glucose by glucose oxidase/Nelson-Somagyi method
11. Titration curve of an amino acid and calculation of pK and pI values.

46012P: ENZYMOLOGY AND BIOENERGETICS LAB

Course Objectives: ➢ To understand the measurement of enzyme activity and energy production in cells.
Course Outcomes: At the end of course, the students will perform ➢ Enzyme assays with initial velocity, Michalis-Mention reaction, inhibitors study ➢ Isolation and measurement of enzyme activity ➢ Mitochondrial respiration

List of practicals

1. Assay of trypsin

2. Assay of alpha-amylase from saliva
3. Assay of LDH from serum
4. Assay of acid and alkaline phosphatase
5. Assay of the enzyme acid phosphatase from germinated mungdal or β-amylase from Sweet potato beams
6. Effect of pH on the activity of an enzyme
7. Progress curve of an enzyme
8. A preparation of urease crystals from horse gram seeds and assay
9. Purification of an enzyme and effect of time pH, temperature, substrate concentration, enzyme concentration, inhibition on enzyme activity.
10. Molecular weight determination of enzyme by SDS - PAGE
11. Mitochondrial respiration by oxygraph (O_2 electrode)
12. Warburg Manometer

46013P: GENETICS LAB

Course Objectives:

- To develop an understanding of fundamental and applied aspects of genetics with the ability to use that knowledge in a wide range of modern science.

Course Outcomes: At the end of course, the students will perform

- Mendelian and non-Mendelian inheritance pattern in plants and animals
- Modern techniques in understanding of genetics, and Hardy-Weinberg principle to explain the changes in population genetics.

List of practicals

1. Genetics problems from theory
2. Estimation of gene frequencies and testing equilibria at loci with two alleles – multiple and sex linked genes
3. Testing Hardy-Weinberg equilibrium for two linked loci
4. Calculation of inbreeding coefficient from pedigree data
5. Effects of mutation and selection on gene frequency
6. Problems on genetic drift and effective population size.
7. Study of Linkage, recombination, gene mapping using marker based data from Drosophila.
8. Study of Phlox/ Allium Karyotype (normal and abnormal).
9. PTC testing in a population and calculation of allele and genotype frequencies.
10. Study of abnormal human karyotype and pedigrees (dry lab)

46014P: VALUE/SKILL BASED COURSE LAB (SKILLS FOR BIOTECHNOLOGYINDUSTRY)

Course Objectives:

- To demonstrate skills and their enhancement as per National Occupational Standards (NOS) of "Lab technician/Assistant" qualification pack issued by LifeScience Sector Skill Development Council.
- To know the major activities of biotechnology industry, regulations and compliance, health and safety, good laboratory/manufacture practices (GLP) & (GMP), and standard operating procedures (SOP), as per the industry standards

➢ To demonstrate soft skills like planning, decision making, organizing, problem solving, analytical thinking, and documentation. ➢ To acquire knowledge to prepare all analytical solutions for biotech industry
Course Outcomes: At the end of course, the students should able to ➢ Use all learned skills in biotechnology industry or in laboratory as per "National Occupational Standards" qualification pack issued by Life Sciences Sector Skill Development Council. ➢ Use all soft skills in biotechnology industry with trained talent. ➢ Use knowledge in preparation all analytical reagents required for biotech industry

List of programmes

1. Methods and practices of cleaning and management of laboratory – Learning and practice of integrated clean-in-place (CIP), and sterilize-in-place (SIP) as per industry standards, material requirements for cleaning specific area, equipment, ventilation area, personal protective requirements
2. Procedure for cleaning and storage of lab ware – Methodology for storage area, cleaning procedure and materials to be used for various surfaces. Signboards, labelling do's and don'ts. Knowledge about standard procedures for cleaning of glass ware, plastic ware. Maintenance of inventor.
3. Principles and practices of lab safety – Knowledge about safety symbols and hazard signs. Personal safety gears, utility and disposal. Equipment safety protocols, chemical safety protocols. Documentation of chemical and equipment usage records. Handling hazardous chemicals.
4. Best practices of usage and storage of chemicals – Knowledge and practice in handling of chemicals, labelling and stock maintenance. SOP (standard operating procedures) and material handling. Procedures to maintain chemicals, labelling, storage and disposal.
5. Record maintenance as per SOP's – Labelling of samples and reagents as per SOP's. Recording details of work done for research experiments. Importance of study of manuals, health and safety instructions.
6. Usage and maintenance of basic equipment of biotechnology lab – Principles, calibrations and SOP's of weighing balances, pH meters, autoclaves, laminar airflows, and biosafety cabinets, basic microscopes, homogenizers, stirrers, colorimeters, UV-Visible spectrophotometers, and centrifuges.
7. Preparation of solutions and standards – Properties and sues of chemicals commonly used in life science laboratories. Maintaining safety standards for handling various solutions and chemicals. Preparation of test reagents and buffers. Protocols for proper mixing of chemicals. Safety precautions while preparation and storage of incompatible chemicals and reagents.
8. Preparation of media – Maintenance and storage of purified water for media (plant tissue culture media, microbiological media and animal cell culture media) preparation. Preparatio and storage of concentrated stock solutions. Documentation and disposal of expired stocks. Collectio fo indents of media requirements, preparation and storage. Media coding, and documentation and purpose of usage.
9. Practical methods for decontamination and disposal – Decontamination methods, safe disposal practices of decontaminated media or materials.
10. Laboratory record writing – Method of record writing, data collection and recording, reporting result, discussion of results, summary writing, effective PowerPoint presentation taking any experiment as an example.

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester V

Paper 56011: BIOCHEMICAL AND BIOPHYSICAL TOOLS

Course Objectives: ➢ To impart the knowledge on the biochemical and biophysical tools used in the study of biochemical and molecular reactions observing within the organisms.
Course Outcomes: At the end of course, the student able to ➢ Use the appropriate cell disruption tools to break the cells ➢ Isolate and purify the biomolecules from the cells by using centrifuges, and chromatography tools. ➢ Purity of proteins, and nucleic acids will assessed with electrophoresis tools ➢ Have the knowledge on separation of chromosomal DNA through PFGE, proteomics studies through 2D-PAGE, Automatic sequencing through capillary electrophoresis. ➢ Have knowledge on to use the spectroscopic tools appropriately for biophysical characterization like structure, conformation, etc for molecules. ➢ Finally student is well versed with all instruments used in the biology for research.

Unit – I: Measurement of pH, oxygen electrode and biosensors. Cell disruption methods: French press, sonication, freeze-thaw techniques, enzymatic method, use of liquid nitrogen in cell disruption. Centrifugation. Basic principles of sedimentation, types of centrifuges and rotors. Preparative ultracentrifugation - differential centrifugation, density-gradient. Analytical ultracentrifugation and applications.

Unit – II: Separation methods - General principles and definitions. Methods based on polarity - partition chromatography (Paper chromatography), adsorption chromatography (thin-layer chromatography), gas-liquid chromatography, reverse phase liquid chromatography. Methods based on size - Principle of Gel filtration, methodology and applications. Methods based on affinity - Principle of Affinity chromatography, methodology and applications. High-performance liquid chromatography - Principle, instrumentation, practical procedure and applications. FPLC, HPTLC, Ion-exchange chromatography - Principle, ion exchangers, methodology, applications. Amino acid analyzer.

Unit – III: Electrophoresis. General principles and definitions. PAGE. Native-PAGE, SDS- PAGE, Isoelectrofocussing (IEF), 2D electrophoresis, capillary electrophoresis. Agarose gel electrophoresis - Preparation, separation and determination of molecular size of DNA, Pulse- field gel electrophoresis - Principle, methodology and applications.

Unit – IV: Biophysical methods: Principles, laws of light absorption, Instrumentation and applications of UV-Vis spectrophotometer, fluorescence spectroscopy, ESR, NMR, Mass spectroscopy, Radioisotope Techniques - Types of isotopes, radioactive decay. Detection and measurement of radioactivity - GM counter, scintillation counter, autoradiography. Incorporation of radioisotopes in biological tissues and cells, CD and ORD. Principles and applications of X-Ray diffraction.

References:

1. Biochemical methods - Pingoud
2. Biochemical research technique. Ed. John M. Wriggles worth
3. Analytical biochemistry by David J. Holmes and Hazel peck
4. Biophysical chemistry Upadyay and Nath
5. Practical experimental Biochemistry – Rodney Boyer.
6. Practical biochemistry: Principles & Techniques. Wilson & Walker,

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester V

Paper 56012: MOLECULAR BIOLOGY

Course Objectives: ➢ To understand the central dogma of life at the level of molecules through replication, transcription, translation and gene regulation.
Course Outcomes: At the end of course, the students able to ➢ Know the central dogma of life, how life is maintained and how genetic information is flow from DNA to RNA to Protein these are functional horses ➢ Know the molecular events of gene regulation, protein formation, sorting and transport. ➢ Know about the operon concept to understand the gene expression and its regulation

Unit I:

DNA replication, repair and recombination: Evidence of DNA as genetic material, Evidence of semi conservative mode of replication, Unit of replication, enzymes involved, Replication origin and replication fork, fidelity of the replication, Replication mechanism in E.coli, extrachromosomal replicons, Replication apparatus and mechanism of DNA replication in eukaryotes, DNA damage and repair mechanisms - NER,BER,MMR, RR. Recombination – Homologous, site-specific and transposition.

Unit II:

Transcription: RNA synthesis and processing: RNA synthesis in prokaryotes -Transcription factors and machinery, formation of Initiation complex, transcription activators and repressors, RNA polymerases, capping, elongation and termination, RNA synthesis in eukaryotic cell – RNA polymerases, RNA synthesis, RNA processing, RNA editing, splicing, polyadenylation, structure and function of different types of RNA, RNA transport.

Unit III:

Translation: Protein synthesis and processing: Ribosome, formation of initiation complex, initiation factors and their regulation, elongation and elongation factors, termination, genetic code, aminoacylation of tRNA, tRNA-identity, aminoacyl tRNA synthetase, translational proof reading, Mechanism of protein biosynthesis in E.coli, translational inhibitors, post- translational modification of proteins. Protein sorting and transport, Protein localization and compartmentalization.

Unit IV:

Gene regulation: Principles of gene regulation, Operon concept, structure, function and expression of lac, trp, ara in E.coli and gal operon in yeast. Induction of transcriptional activity by environmental and biological factors in regulation of eukaryotic gene expression (hsp), light (Rubisco), signal molecules. Molecular control of transcription -DNA sequence and protein involved in the control of transcription in eukaryotes. Role of chromatin in regulating gene expression and gene silencing.

Reference books:

1 Molecular Biology of the Gene (4th Edn) JD Watson, NH Hopkins, JW Roberts,
2 Molecular Cell Biology (2nd Edn) J. Darnell, H.Lodish and D. Baltimore, Scientific American Books, Inc. USA 1994
3. Genetics – Conceptual approach, Benjimin Pierce
5. Molecular Biology, TA Brown (Ed) Bios Scientific Publishers Ltd.,Oxford, 1991

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester V

Paper 56013: IMMUNOLOGY

Course Objectives: ➢ To make students learn about the structural features of the components of the immune system as well as their function ➢ To learn production of monoclonal antibodies through hybridoma technology ➢ To learn MHC mechanism, vaccination and development of vaccine ➢ To study the immunological techniques for diagnosis of diseases through Ag-Ab reactions.
Course Outcomes: At the end of course, the student will ➢ Apply their knowledge and design immunological experiments to demonstrate immune responses and figure out kind of immune response in setting of infection. ➢ Attain deep foundation in the immunology ➢ Identify their interested research in the field of immunology

Unit-I

History and scope of immunology, structure, composition and function of cells and organs involved in immune system. Types of immunity, innate immunity, acquired immunity; immunohematology, blood groups, blood transfusion and Rh – incompatibility, phagocytes, inflammation. **Antigens – Antibodies:** Antigens – structure and properties – types (Iso and allo) haptens, adjuvants, antigenic specificity; Immunoglobulins, structure – heterogeneity – types and sub types properties (physico chemical and biological); theories of antibody – production, polyclonal, and monoclonal antibodies and their applications.

Unit-II

Antigen and Antibody interactions: Affinity and avidity, Immunodiffusion, Immuno-electrophoresis, Immuno-florescence, ELISA, western blot, FACS. ELISPOT assay, RIA, immunoelectron microscopy; Complement system; complement components, complement activation, regulation of complement system, biological consequences and pathways of complement activation, and complement deficiencies.

Unit-III

Structure and functions of MHC and HLA system; gene regulation and r – genes; HLA and tissue transplantation – tissue typing, methods for organ and tissue transplantations in humans; graft versus host reaction and rejection. Auto immunity, autoimmune diseases and their treatment, tumor immunology–tumor specific antigens, immune response to tumor, Immunotherapy of tumors. General concepts of receptors and signaling in immune system

Unit-IV

Hypersensitivity reactions: Classification, Antibody–mediated–type I. Anaphylaxis; type II Antibody dependent cell cytotoxicity; Type III Immune complex mediated reactions; type IV cell mediated hypersensitivity reactions (the respective diseases, immunological methods of their diagnosis, lymphokines and cytokinins, their Assay methods. **Immunization:** Active and passive immunization**;** objectives of immunization, types of vaccines: whole organism vaccines, recombinant vector vaccines, DNA vaccines, synthetic peptide vaccines, subunit vaccines, immunization procedures. CMI techniques: lymphoproliferation assay, mixed lymphocyte reaction, cell cytotoxicity assays,

Reference books

1. Essentials of Immunology - Ian Roitt - Blackwell Scientific Publications.
2. Fundamentals of immunology - William C. Boyed (Wiley Toppan).
3. Introduction to Immunology - John W. Kinball.
4. Fundamentals of Immunology - Otto S. View and others.
5. Immunology - D.M. Wier.

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester V

Paper 56014: UNIX, HTML, AND BIOPERL

Course Objectives: ➢ To acquire knowledge on the Basic UNIX general purpose Commands & learn Network UNIX commands. ➢ To learn C programming in UNIX editor environment. &to learn shell script ➢ To learn file management and permission advance commands& to learn awk, grap, perl script
Course Outcomes: At the end of course, the students able to ➢ Identify the basic UNIX general purpose commands and apply to change the ownership and file permissions using advance UNIX commands. ➢ Use the awk, grep, perl scripts and to Implement shell scripts and sed. ➢ Apply basic of administrative task and to Apply networking UNIX commands

Unit-I

Introduction to UNIX

Listing files and directories, Making Directories, changing to a different Directory, More about home directories and path names, Copying Files Moving Files, Removing Files and directories, Displaying, Searching the contents of a file on the screen Redirecting the input, Output, File system security.

Unit-II

Basics of HTML

The web browsers in use, the use of hypertext, design a web page using web documents, Hypertext Markup language, the HTML Elements, format of HTML text, Rules for the HTMLlanguage.

Unit-III

Introduction to PERL

Starting a PERL Script and data types, scalars, arrays, and hashes @ ARGV, operators, variables, control structures, file handlings and debugging.

Unit-IV

Bio PERL- BIOPERL installation and applications, BIOPERL modules – databases, sequence retrieval and alignment, Phylogenetic tree construction, restriction enzyme analysis,maturation studies.

Reference Books:

1. UNIX: Concepts and applications by Sunitha dass.
2. HTML: Web enablead commercial applicatons Development using HTML, DHMFL, PERL CGI by Bagrossivan
3. Harsha Vardhan Bal PERL programming for Bioinformatics, Tata McGraw Hill, 2003.
4. James Lee. Beginning PERL, 2004.
5. Micheal Murrows, Paul Berring. Bioinforamtics Biocomputing of PERL. Wiley, 2004.

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester V

Paper 56015: GLOBAL CITIZENSHIP EDUCATION

Course Objectives:

- To build global leadership skills by reframing the way they interact with the world.
- To empower learners of all ages to assume active roles, both locally and globally, in building more peaceful, tolerant, inclusive and secure societies.
- To enhance competencies of Empathy, Mindfulness, Compassion, and Critical Inquiry (EMCC), alongside understanding of global citizenship themes.

Course Outcomes: After completion of course, the students will

- Able to solve problems, make decisions, think critically, communicate ideas effectively and work well with others.
- The attributes of the global citizens and their roles in the sustainable development are also to enhance competencies of defined framed in the course.

Unit-I: Introduction on Global Citizenship Education (GCED)

What is Global Citizenship, and Global Citizenship Education? Key principles of GCED, the significance and relevance of GCED, supporting teachers in GCED. Template of GCED. The guidance – learning contents of global citizenship education

Unit-II Implementing global citizenship education

A conceptual framework for global citizenship; Transformative education: past and present; GCED curriculum and pedagogy; GCED: alternative paradigms. How to integrate GCED to education system; How to deliver in classroom; Key issues and challenges of GCED.

Unit-III Understanding SDG-4.7

Introduction to the UN (United Nations),
Brief history of SDG-4; SDG 4 – 10 target for education.
Citizenship: What does it entail and can it be global?

Unit-IV GCE and Role of Teacher

GCE assessment and evaluation; Teacher as Global Teacher
School and Society
Curriculum Analysis with Global Citizenship Education

References:

1. UNENSCO – Global Citizenship Education, topics and learning objectives.
2. Global Citizenship Education, Goals and Challenges in the New Millennium By Soon-Yong Pak, APCEIU Research Reports 2013-02

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester V

56011P: BIOCHEMICAL AND BIOPHYSICAL TOOLS LAB

Course Objectives: ➢ To teach students the utility of set of experimental methods in biochemistry and biotechnology in a problem oriented manner. ➢ To develop the skills required to design and interpret the data from scientific experiments.
Course Outcomes: Students should be able to ➢ To elaborate concepts of biochemistry with easy to run experiments. ➢ To familiarize with basic laboratory instruments and understand the principle of measurements using those instruments with experiments in biochemistry.

List of practicals

1. Preparation of buffers and measurement of pH
2. Separation and identification of amino acids by paper chromatography.
3. Separation and identification of sugars by TLC.
4. Separation and identification of lipids by TLC.
5. Separation of amino acids by Ion-exchange chromatography.
6. Separation of proteins by Gel filtration and affinity chromatography
7. Absorption spectra of amino acids, Proteins and nucleic acids
8. Verification of Beer's law.
9. Dialysis.
10. HPLC demonstration
11. Isolation of mitochondria by subcellular fractionation.

12. SDS PAGE
13. Agarose gel electrophoresis

56012P: MOLECULAR BIOLOGY LAB

Course Objectives: ➢ To impart practical knowledge on the isolation, evaluation, and characterization of nucleic acids from the plant, animal and microbial organisms.
Course Outcomes: ➢ Students able to perform isolation of genomic DNA from various sources ➢ Characterization can be done with the help of spectroscopy and electrophoresis ➢ Able to isolate plasmids and their characterization.

List of practicals

1. Isolation of genomic DNA from bacteria, plant and sheep liver
2. Quantification of DNA
   . Spectroscopic method (UV absorption method)
   . Colorimetric method (Diplhenylamine reagent)
3. Determination of purity of the isolated DNA by UV spectrophometry
4. Thermal denaturation of DNA and demonstration of hyperchromic effect.
5. Determination of melting temperature (Tm) and estimation of GC content.
6. Isolation of RNA and estimation of RNA.
7. Isolation of plasmids from *E.coli* and separation of CCC, Open circular and linear forms of plasmids
8. Agarose gel electrophoresis – Separation and molecular size determination of DNA
9. Isolation and separation of proteins by SDS- PAGE

56013P: IMMUNOLOGY LAB

Course Objectives: ➢ To impart the practical knowledge on immune system, and immunological diagnosis of diseases
Course Outcomes: ➢ The students will able to perform all immunological diagnosis experiments ➢ Able to prepare antigen and antibodies ➢ Purification of antibodies and detection ➢ Able to understand the immune system.

List of practicals

1. Staining of blood smear and identification of different lukocytes.
2. Determination of A,B, O and Rh blood groups in humans
3. Identification of primary and secondary lymphoid organs.
4. Recognition of T-cell by rosette formation.
5. Injection of antigen into experimental animals by different routes.
6. Preparation of antigen

7. Electrophoretic study of normal and immune serum - immunodiffusion
8. Partial purification of Immunoglobulin's by Ion Exchange chromatography and separation of immunoglobulins by gel electrophoresis.
9. Labelling of purified immunoglobulins with enzymes/dyes.
10. Western blotting
11. Spleen cell isolation and Counting.
12. Different serological tests
    a. Agglutination - Brucella system
    b. Precipitation test - Ring interface and agar gel double diffusion tests.
    c. Immunoelectrophoresis - Counter current and Rocket.
    d. Hemagglutination and Hemagglulination inhibition tests.
    e. Labeled antibody tests - ELISA, Dot ELISA, FAT and Western blotting.
    f. Viral infectivity neutralization test.
13. Cell - mediated immunity tests
    a. Leukocyte migration inhibition test
    b. Opsonic index.

56014P: UNIX, HTML, AND BIOPERL LAB

Course Objectives:

- Impart practical knowledge to create and access files; directories, relative file paths and when to use them.
- Knowledge of useful shortcuts, wildcards, tab completion and navigation through Linux.
- To master programming skills in Perl and Python and implement skills using BioPerl and BioPython

Course Outcomes:

- Students able to create new files and directories, and able to copy, move, rename and delete files, and also be able to view and navigate through open files using less, head, cat, tail
- How toInsert a graphic within a web page and also to Create a link within a web page and its Validation of a web page.
- Enabling routine and module calls and their implementation using Bioperl.

List of programmes

1. Operation of UNIX commands
2. Solving biological problems using Bioperl
3. HTML usage in web design
4. Data types
5. Operators
6. Flow control
7. Built-in Functions
8. File handling
9. Pattern matching
10. Arrays 8. Lists
11. Multiple sequence alignment
12. Protein motifs 11. Fragment Assembly

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester VI

Paper 66011: INTERMEDIARY METABOLISM

Course Objectives: ➢ To impart the knowledge on metabolism of all biomolecules and its significance in health and disorders. ➢ To give awareness Urea cycle, and its regulation. ➢ To know the biosynthesis and degradation of porphyrin.
Course Outcomes: At the end of course, students known about ➢ carbohydrate metabolism significance and their metabolic disorders. ➢ lipid digestion, absorption and transport and cholesterol synthesis and their metabolic disorders. ➢ general metabolic reactions of amino acids. Urea cycle and its regulation. Metabolic breakdown of individual amino acid sand their metabolic disorders. ➢ Biosynthesis and degradation of porphyrin and their metabolic disorders

Unit-I

Carbohydrate metabolism: Introduction to intermediary metabolism, Glycolysis and its regulation. Fermentation. HMP shunt pathway and its significance. Glucuronic acid pathway and ascorbic acid pathway. TCA cycle - reactions of the TCA cycle and regulation. Anaploretic reaction. Shuttle systems, glyoxylate cycle. Gluconeogenesis and regulation. Glycogen metabolism and regulation. Disorders of carbohydrate metabolism- glycogen, Lactose, Galactose and fructose.

Unit-II

Lipid metabolism: Lipid digestion, absorption and transport. Oxidation of fatty acids - oxidation of unsaturated, odd-chain fatty acids, peroxisomal oxidation. Regulation of fatty acid oxidation. Degradation of triacyl glycerol and phospholipids. Ketone bodies - Formation and utilization. Fatty acid synthase complex, biosynthesis and regulation of fatty acid synthesis. Biosynthesis of TAG and its regulation. Sphingolipid storage diseases. Biosynthesis of cholesterol and its regulation, Biosynthesis of prostaglandins.

Unit-III

Amino acid metabolism: General metabolic reactions of amino acids. Urea cycle and its regulation. Metabolic breakdown of individual amino acids. Ketogenic and glucogenic amino acids; Biosynthesis and regulation of aspartate family amino acids, branched chain amino acids, Metabolic defects of amino acid metabolism. Amino acids as biosynthetic precursors - formation of creatine, serotonin, melatonin, histamine, anserine, carnosine. GABA, melanin, catecholamine.

Unit-IV

Nucleic acid metabolism: Biosynthesis and degradation of porphyrin (Heme). Biosynthesis, degradation and regulation of purine and pyrimidine nucleotides, Salvage pathway. Disorders of purine and pyrimidine metabolism.

References:

1. Principles of Biochemistry. A.L.Lehninger(CBS Publishers).
2. Biochemistry. Lubert Stryer (5th Edition).
4. Harper's Review of Biochemistry. Martin et al., (Lange).
5. Text Book of Biochemistry with clinical correlation. Thomas M.Devlin (John Wiley).
6. Text Book of Biochemistry. West et al., 1966 (MacMillian).
7. Biochemistry 2nd ed. C.K.Mathews and K.E.Van Holde (1995).
8. Biochemistry 2nd ed Donald Voet and J.G.Voet (1994)(John Wiley).

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester VI

Paper 66012: INTRODUCTION TO BIOINFORMATICS

Course Objectives:

- To impart the knowledge on the aims, scope and applications of bioinformatics in biology.
- Extend the knowledge of bioinformatics and biological databases to solving real research problems
- Sequence alignment and phylogenetic analysis
- Formulate the use of a wide variety of tools, servers, biological databases and apply them in appropriate fields

Course Outcomes: After completion of course, the students should able to

- Perform all basic bioinformatics experiments by his own by using appropriate software algorithms
- Retrieve data for specific unknown gene for knowing its functions and also for its phylogenetic relevance.

Unit-I:

Define bioinformatics? Goals of Bioinformatics; Scope of Bioinformatics; Applications and limitations of Bioinformatics. Generation of large-scale molecular biology data through genome sequencing, and protein sequencing. Introduction to Internet and internet resources of biology interest. Overview of Available Bioinformatics Resources on the Web, Protein and Genome; Information Resources and Analysis Tools; Established Techniques and Methods; Sequence File Formats FASTA, GenBank, FASTQ and Structured File Formats.

Unit-II:

Define database? Types of databases; General Introduction of Biological Databases; Nucleic acid databases (NCBI, DDBJ, and EMBL). Protein databases (Primary, Composite, and Secondary). Specialized Genome databases (Pfam, SGD, TIGR, and ACeDB). Structure databases (CATH, SCOP, and PDB). Information retrieval from biological databases.

Unit-III:

Introduction to sequences, sequence alignments – Pairwise alignment (BLAST and FASTA). Statistics of Sequence Alignment Score; E-Value, P-Value, Scoring matrix, PAM, BLOSUM and Gap Penalty. Multiple sequence alignment (Clustal W). Methods for presenting large quantities of biological data: sequence viewers (SeqVISTA), 3D structure viewers (Rasmol).

Unit-IV:

Introduction to phylogenetics, construction of phylogenetic tree. Computing Tools for Phylogenetic Analysis, Distances, GROWTREE, PAUP, PHYLIP and MEGA; Construction and Visualization Phylogenetic Tree; and Application of Phyolgenetic Analysis. Secondary structure analysis tools – PROSITE, Pfam, Protein structure classification – SCOP, CATH; Protein structure alignment – RMSD, DALI, etc. Introduction on molecular modeling and drug design. Role of bioinformatics in Genomics, proteomics and metabolomics.

References

1. Text book of Bioinformatics – S C Rastogi
2. Bioinformatics – Ghosh
3. Essential bioinformatics – Xiong, Cambridge University Press Tramontano: Introduction to Bioinformatics, Chapman and Hall Series

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester VI

Paper 66013: GENETIC ENGINEERING

Course Objectives: ➢ Recall different DNA modifying enzymes used in recombinant DNA technology ➢ Compare different vectors and their applications in recombinant DNA technology ➢ Illustrate different techniques used in genetic engineering
Course Outcomes: At the end of course, the students will ➢ Choose from different DNA modifying enzymes to modify given DNA as per requirement. ➢ Design different vectors for cloning and expression of genes in various expression systems. ➢ Apply appropriate techniques to research in various fields of biotechnology. ➢ Evaluate different strategies for cloning of gene from genomics and cDNA libraries ➢ List the risks associated with genetic engineering experiments ➢ Modify genes for higher yield of biotechnology-derived products

Unit-I:

Introduction and outlines of gene cloning**,** isolation and purification of RNA & DNA. Different enzymes used in rDNA technology, Restriction and modification enzymes – Classification, nomenclature and importance, Restriction mapping. RFLP, Polymerase chain reaction – Principle, variations of PCRs (RT PCR, QPCR, inverse PCR, nested PCR) and their applications. RAPD, DNA fingerprinting. DNA sequencing – Maxum-Gilbert, Sanger and automated.

Unit-II:

Host cells and Vectors - Characteristics of a vector. Vectors used for cloning in *E.coli* (plasmid vectors – pBR, pUC, Bluescript vectors, bacteriophages, cosmids, phasemids), Super vectors - BACs, YACs, shuttle vectors, higher plants (Ti plasmid, caulimovirus) and animal cells (constructs of SV 40 and retroviruses). Baculovirus vectors. Expression vectors.

Unit-III:

Genomic and cDNA libraries – preparation, screening and significance. Cloning strategies - Generation of DNA molecules, Cloning from mRNA, Cloning from genomic DNA, Joining of DNA fragments to vector molecules - cohesive termini ligation and blunt end ligation - linkers, adaptors and homopolymer tails, delivery of recombinant molecules into host cells – transformation, transfection; Agrobacterium mediated transformation, electroporation, particle bombardment method. Screening and identification of positives clones- antibiotic, nucleic acid and protein based approaches. Southern and northern blotting and their significance.

Unit-IV:

Expression vectors – features and advantages. Expression of cloned genes, IPTG, x-gal, lac, trp, tac promoters. Factors influencing the expression of recombinant proteins. Expression of fusion protein tags, purification tags (His tags, GST tags), IPTG inducible expression systems, inclusion bodies, solubilisation of proteins. Production of recombinant insulin, growth hormone. Genetically engineered organisms.

References:

1. An Introduction to genetic engineering - Nicoll
3. Molecular Cloning: A Laboratory manual, J. Sambrook, E.Ffrisch and T.Maniatis, Old Spring Harbor Laboratory Press New York, 2000
4. Introduction to Practical Molecular Biology, P.D. Dabre, John Wiley & Sons Ltd,
5. Genetic engineering - TA Brown (Ed)
6. From Genes to Genome – Dale
7. Principles of gene manipulation – Primrose et al.

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester VI

Paper 66014: PLANT BIOTECHNOLOGY

Course Objectives:

- To impart knowledge on the developmental processes operating in plants
- Demonstrate plant tissue culture methods
- Analyze biotechnological tools for engineering plants in agriculture and industry

Course Outcomes: At the end of course, the students able to know the

- Outline the importance and fundamentals of plant tissue culture
- Summarize the applications of tissue culture
- Design vectors for plant transformation
- Create clean and green transformation protocols
- Measure the suitability of transgenics to consumers, industrialists, and environment
- Apply tissue culture techniques and get employed in a plant biotechnology-based industry

Unit-I: Introduction to cell and tissue culture. Tissue culture media. Initiation and maintenance of callus and suspension culture; organogenesis, somatic embryogenesis. Shoot-tip culture: Micro tip culture; rapid clonal propagation and production of virus-free plants. Embryo culture and embryo rescue. Hairy root culture; anther, pollen, ovary, ovule culture for production of haploid plants and homozygous lines. Protoplast isolation, culture and fusion, selection of hybrid cells and regeneration of hybrid plants, symmetric and asymmetric hybrids, cybrids. Cryopreservation.

Unit-II: Plant Transformation Technology, Vector mediated or Indirect gene transfer - Agrobacterium-mechanism of T-DNA transfer and its integration into plant genome, basis of tumor formation ,role of virulence gene, use of Ti and Ri plasmids as vectors, Direct Gene transfer-microinjection, electroporation, particle gun, Chloroplast transformation and applications Gene silencing. Nitrogen fixation and biofertilizers -nitrogen fixation genes, transfer of *nif* genes to microorganisms.

Unit-III: Application of Plant Transformation for Productivity and Performance- Herbicide Resistance, Male sterility, Virus resistance, Pest Resistance, Fungal resistance. Genetic Engineering of plant for extended shelf life of fruits, manipulation of starch biosynthesis. Terminator technology, plantibodies.

Unit-IV: Introduction to molecular markers, different types-PCR based and Non PCR based, role of molecular marker in plant breeding, types of maps-physical and genetic map, applications of molecular markers in plant biotechnology. phytodiagnostics based on immunological and molecular techniques, biopesticides, transgenic plants as biofactories- biodegradable plastics, therapeutic proteins

References:

1. Molecular approaches to crop improvement. 1991. Dennnis and Liwelly eds. PP. 164.
2. Plant cell and Tissue culture. A Laboratory Manual. 1994. Reinert. J. and Yeoman,
3. Plant biotechnology, 1994. Prakash and Pierik. Oxford & IBH Publishing Co.
4. Gene transfer to plants. 1995. Potrykus-I and Spangenberg, G. Des. Springer Scan.
5. Methods in Plant Molecular Biology and biotechnology, 1993.
6. Genetic engineering with plant viruses. 1992. T. Michale. A. Wilson and J.W. Davies.
8. Microalgal Biotechnology. 1988. Borocotizka M.A. and Borocoitzka L.J. Cambridge University Press.

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester VI

Paper 66015: VALUE/SKILL BASED COURSE (R-PROGRAMMING)

Course Objectives:

- To impart knowledge on the R-programming to help graduates to be competent in Data Manipulation with R programming, Data visualization, advance analytics topics like regressions, data mining using R studio.

Course Outcomes: At the end of course, the students have an ability to

- Understand the fundamental syntax of R through readings, practice exercises, demonstrations, and writing R code.
- Apply critical programming language concepts such as data types, iteration, control structures, functions, and Boolean operators by writing R programs and through examples
- Import a variety of data formats into R using R Studio.
- Prepare or tidy data for in preparation for analysis
- Query data using SQL and R
- Analyse a data set in R and present findings using the appropriate R packages

- Visualize data attributes using ggplot2 and other R packages.

Unit-1: Introduction: R environment; Why R? R for Computational Biology and Bioinformatics; Installing R; R- GUI and IDE; Running R. Programming with R: R as a deluxe calculator, Objects: creating objects and assigning values, Types of objects: vector, matrix, array, factor, list, data frames and functions; Data structures.

Unit-II: Control Statements in R: if, for, repeat, while; Functions- user defined function and built –in functions. Working with data sets: Reading and writing data from files: read. Table, Write. Table, read.csv, write.csv, readFasta, writeFasta. File manipulation in R: Opening a file,creating a file, editing a file, renaming a file, removing a file.

Unit-III: Graphics in R: Introduction to graphics package: scatterplot, boxplot, bar plot, plotting time series, plotting categorical data, basic graphics functions-high level functions and low-level functions, saving graphical output. R packages for Microarray/NGS Data analysis, Protein Structure visualization, etc.

Unit-IV: Statistics using R: Basic statistical operations: mean, median, range, minima and maxima, variance, standard deviation, correlation coefficient, covariance, R for statistical applications (Flexi module- Only for Internal Assessment. Lecturers may expand and/ or interpret the syllabus to update it or suit the particular cohort in any way.): Packages in R: CRAN, designing packages, installing packages, loading packages, unloading packages, listing packages (popular packages for bioinformatics applications, Bioconductor – overview, features, overview of packages in Bioconductor.

References:

1. Sandip Rakshit: R Programming for Beginners. McGraw Hill Education Lander: R for Everyone: Advanced Analytics and Graphics. Pearson Education India
2. Adler, J. (2010). R in a nutshell: A desktop quick reference.
3. R programming for bioinformatics. CRC Press.
4. R, Notes on R: A Programming Environment for Data Analysis and Graphics Version 2.10.1. • Venables, W. N., & Smith, D. M. (2009).
5. The art of R Programming – Norman Matloss (A Tour of Statistical software designing).

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester VI

66011P: BIOINFORMATICS LAB

Course Objectives:

- To impart the practical knowledge on use of bioinformatics in biology.
- To enrich knowledge on biological databases, and retrieving information
- Sequence alignment and phylogenetic analysis

Course Outcomes: After completion of course, the students should able to

- Perform all basic bioinformatics experiments by his own by using appropriate software algorithms

- Build existing software skills, to develop new algorithms and analysis methods
- Perceive knowledge about analysing big datasets statistically and bioinformatically
- Improve skills in a professional environment via an industrial or academic internship in bioinformatics

List of practicals

1. Nucleotide sequence from primary nucleotide database
2. Protein sequence from protein database
3. Protein structure from a structure database
4. Access of secondary biological data from various Biological database
5. Pairwise alignment using a dot plot
6. Pairwise alignment using dynamic programming
7. Heuristic Sequence Alignment using BLAST/ FASTA
8. Multiple sequence alignment CLUSTAL W
9. Construction of Phylogenetic tree PHYLIP
10. Gene prediction analysis
11. Prediction of the secondary structure of the protein.
12. Visualization of Protein Structure

66012P: GENETIC ENGINEERING LAB

Course Objectives:

- To experimentally train the graduates to perform gene cloning tools and also screen the recombinants from experiment. Also to know the production genetically engineered proteins through rDNA technology
- To educate use of PCR and its variations in diagnosis of various diseases.

Course Outcomes: At the end of course, the graduates will perform

- All molecular and gene cloning experiments by adapting all cloning strategies
- Screen the cDNA and genomic libraries for interested genes for cloning.
- Hands on experience on the tools of PCR and its variations
- They can prepare recombinant proteins as well as GMOs

List of practicals

1. Preparation of competent cells
2. Isolation of genomic DNA from competent cells, or plant cells or animal cells.
3. Restriction digestion with one or more restriction enzymes to perform restriction mapping
4. RAPD experiment
5. Southern blotting
6. Amplification of gene by PCR
7. RT-PCR analysis
8. Real-Time PCR analysis
9. Isolation of vector DNA (plasmid) from bacteria
10. Ligation of cloned DNA to vector
11. Transformation by Calcium chloride induced process.
12. Transformation of BL-21 competent cells with pGEX 4T-1 vector.
13. IPTG induction of BL-21 cells containing pGEX 4T – 1 and isolation of proteins from control and induced cells.
14. Analysis of the protein profile of 13rd experiment on SDS-PAGE

15. Purification of GST protein from whole cell lysate obtained from 13rd experiment
16. Cloning of the PCR product in TA cloning vector – transformation in DH5 a bacteria.
17. Screening for recombinant plasmid for experiment 16 by i) colony PCR ii) Restriction digestion.
18. Selection of recombinant clones by blue – White screening.

66013P: PLANT BIOTECHNOLOGY LAB

Course Objectives:

- To provide hands on experience on the plant biotechnology particularly plant tissue culture tools
- Aims to understand molecular background in plant biotechnology tools to development new products.
- Encouraging students to go for research

Course Outcomes: The student is expected to acquire practical skills in basic plant biotechnology techniques. This means that after successful completion of this course students are expected to be able to:

- Become familiar with sterile techniques, media preparation, DNA extraction methods, gene isolation and nucleotide sequence analysis, Acquaint with principles, technical requirement, scientific and commercial applications in Plant Biotechnology,
- Support methodologies in plant tissue/cell culture to plant improvement, as well as DNA handling with PCR-based detection diagnostic tools,
- Become motivated to set goals towards pursuing higher level positions, such as lab manager and key scientist in plant biotechnological research institutes and industries.

List of practicals

1. Basic sterilization techniques and culture media preparation.
2. Explant isolation methods
3. Callus induction methods
3. Shoot tip culture.
3. Root culture.
4. Endosperm culture.
5. Anther culture.
6. Embryo culture
7. Plant DNA- Isolation and analysis.
7. PCR and RAPD analysis.
8. Restriction digestion of genomic DNA and PAGE analysis.
9. Synthetic seed production (Artificial seed).
10. Agrobacterium mediated gene transformation.
11. Root induction and hardening
12. Shoot induction

66014P: VALUE ADDED COURSE - R-PROGRAMMING LAB

Course Objectives:

➢ Aims at building a skill-set to tackle real-world data analysis challenges as a data engineer. It is a guide to understand how to program in R and how to use R for effective data analysis and for data visualization.
Course Outcomes: After completing course, the student will able ➢ Explain critical R programming concepts ➢ Demonstrate how to install and configure R Studio ➢ Apply OOP concepts in R programming ➢ Explain the use of data structure and loop functions ➢ Analyse data and generate reports based on the data ➢ Apply various concepts to write programs in R

List of practicals

1) R program to make a simple calculator that can add, subtract, multiply and divide using switch cases and functions
2) R program to create a list containing strings, numbers, vectors and logical values and do the following manipulations over the list.to. access the first element, names position and remove the elements in the list.
3) R program to find the sum of natural numbers without formula using the if–else statement and the while loop.
4) R program a list and data frame to find out the total marks, average, maximum marks and minimum marks of every subject of student.
5) R programming.to create Matrices,
6) R programming packages

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and BioinformaticsSemester VII

Paper 76011: GENOMICS, PROTEOMICS AND METABOLOMICS

Course Objectives: The course aims to provide adequate knowledge about ➢ Principles of basic methods of genomic, proteomic and metabolomic analysis. ➢ Extensive knowledge of various methodologies of next generation sequencing and microarray technologies used in genomics and proteomics. ➢ Formulate and assess experimental design for solving theoretical and experimental problems in Genomics, Proteomics and metabolomics fields
Course Outcomes: On completion of the course, the students will be able to ➢ Inferring the basic concepts of genomics, proteomics and metabolomics ➢ Suggesting and outlining solution to theoretical and experimental problems in Genomics, Transcriptomics, metabolomics and Proteomics fields. ➢ Comprehend and solve diverse problems of genomics. Transcriptomics, proteomics and metabolomics in human welfare, health and disease

Unit I: Genomics – Concept of Genomics, types of genomics and its databases, genome sizes and organization of structures of genomes of viruses, prokaryotes and eukaryotes and organelle genomes. Human genome project and its applications. **Structural Genomics** – Concept and its significance. Genomics strategies for major genome sequencing projects, approaches and assembly methods, NGS methods and advantages, gene analysis and annotation. Gene ontology, Centers of Genomics. **Comparative genomics** – introduction, comparative genomics of prokaryotes, eukaryotes and organelles.

Unit-II: Functional genomics – concepts and applications. Analysis of gene function-Forwardgenetics, reverse genetics – knock-ins, knock-outs, RNAi technology. Mutagenesis as functional genomics tool –T- DNA Insertional mutagenesis, transposon (*Ac*/*Ds* and *En*/*Spm*), Genome wide mutation screening – TILLING, DeALING. Transcriptomics and expression profiling Genome expression analysis, RNA content and profiling, Microarray (cDNA and protein microarray) SAGE, SADE and microbead – based expression profiling. **Epigenomics**
– mechanism and applications. Gene editing (CRISPR-CAS9) system.

Unit-III: Proteomics – Principles and concept. Importance of proteomics, strategies in analysis of proteome: 2-D PAGE, Peptide fingerprinting; protein digestion, separation and characterization (LC/MS-MS, MALDI-TOF, SELDI, SALSA, DIGE, SILAC). Methods of studying Protein-protein interactions: GST Pull-down assay, Coimmunoprecipitation, Yeast two-hybrid system. Post translational modifications and their predictions through bioinformatics tools. Novel Protein Identification through Databases and search engines in proteomics. Protein expression analysis - Protein biochips, Protein microarrays (Ab array, Ag array). Protein engineering – principles and applications.

Unit-IV: Metabolomics – Concepts and applications. Approaches for metabolomics – targeted and nontargeted; Metabolite library. Metabolite isolation and analysis by Mass Spectrometry. Metabolome Foot printing and Finger printing and metabolic target analysis - Quenching protocols for microbial metabolite profiling. Metabolites and their pathways; KEGG pathways, MetaCyc, The Human Metabolome Databases, Biocart; Computational modeling of metabolic control and pathway simulation. Metabolic pathways discovery and disease characterization;

Mining of novel and new metabolites. Integrated analysis of transcriptomics and metabolomics; industrial applications.

References:

1. Principles of Gene Manipulation and Genomics. 3rd Edition By S B Primerose and R. M. Twyman.
2. A Primer of genome science. 2nd Edition by G Gibson, and S V Muse
3. Essential bioinformatics by Jin Xiong, Cambridge University press.
4. From Genes to Genome by Dale and Schanz.
5. Functional genomics by Hunt and Livesey.
6. Genomics by Arther Lesk.
7. Database Annotation in Molecular Biology: Principles and Practice, Arthur M. Lesk 8. Bioinformatics: Sequence and genomic analysis by D. W. Mount, Cold Spring Harbour Laboratory Press.
8. Recombinant DNA (Second Edition), James D. Watson and Mark Zoller
9. Gene Cloning and DNA Analysis – An introduction (Fourth Edition), T.A. Brown
10. Protein array, Biochips and Proteomics by Smith and Albala (Eds), Marcel Dekkar, New York.
11. Introduction to proteomics: Tools for new biology by Daniel C. Liebler, Humana Press.

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester VII

Paper 76012: ANIMAL BIOTECHNOLOGY

Course Objectives: The course aims to provide adequate knowledge about ➢ In depth knowledge about isolation and maintenance of animal cells in culture and their application in the production of human or animal viral vaccines, antibodies and pharmaceutical proteins ➢ To get knowledge on production of transgenic animals, and gene therapy ➢ To impart knowledge on IVF and aquaculture,
Course Outcomes: On completion of the course, the students will be able to ➢ Gather knowledge to maintain cultured cells in vitro for the production of vaccines and recombinant proteins ➢ Perform IVF technology and also produce transgenic animals. ➢ Maintain aquaculture and also used technology for production of pearls.

Unit-I: History and development of animal tissue culture. Application of animal cell culture. Equipment and materials required. Principles of sterile techniques. Sources of tissues, types of tissues. Balanced salt solution. Cell culture media - components of the medium, physical, chemical and metabolic functions of media. Role of serum and supplements, serum-free media, features and specifications of MEM, DMEM, RPMI and Ham's medium. Role of antibiotics in media. Measurement of cell number. Measurement of cell viability and cytotoxicity.

Unit-II: Primary culture – Mechanical and enzymatic desegregation, establishment of primary culture. Subculture - passage number, split ratio, seeding efficiency, criteria for subculture. Cell lines - definite and continuous cell lines, characterization, authentication, maintenance and preservation of cell lines. Contamination - bacterial, viral, fungal and mycoplasma,

contamination detection and control. Cell transformation – normal vs. transformed cells. Viral and chemical-mediated methods of cell immortalization. Scale-up of animal cell culture.

Unit-III: *In vitro* fertilization - Concept of superovulation, collection, maintenance, and maturation of oocytes, fertilization of oocytes, Maintenance and assessment of embryos, embryo transfer - Artificial insemination, preparation of foster mother, surgical and non- surgical methods of embryo transfer.. Animal cloning - concept of nuclear transfer, nuclear reprogramming and creation of Dolly. Transgenic animals. Application of transgenic animals. Functional knockouts. Gene therapy - *ex vivo* and *in vivo* gene therapy methods, applications. Vaccine production through cell culture.

Unit-IV: Aquaculture: Principles and species suitable for aquaculture. Pisciculture, Genetic status of culture stocks. Chromosome manipulations - Production of all male and sterile populations, Hypophysation in fishes and prawns. Pearl culture - pearl producing mollusks, rearing of oysters, nucleation for pearl formation and harvesting of pearls. Probiotics and their significance in aquaculture. Molecular tools for the identification of diseases in aquatic species.

References:

1. Culture of Animal Cells, (3rd Edn) R Ian Fredhney. Wiley-Liss
2. Animal Cell Culture – Practical Approach, Ed. John RW. Masters, Oxford
3. Animal Biotechnology – Ramasamy

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester VII

Paper 76013: DATA MINING IN BIOINFORMATICS

Course Objectives: ➢ To impart the concepts of Data Mining in biology and how it can be used solve biology problems. ➢ To utilize data mining techniques and enhance its application in acquiring biological data ➢ To teach large scale biological data analysis using bioinformatics Software.
Course Outcomes: At the end of course, the students able to perform the ➢ Hands on training experience and perform all mining experiments by his own. ➢ Association rules discovery and usage, ratio rule mining. ➢ Dimensionality reduction techniques, data clustering and classification. Link analysis

Unit-I:

Data Mining: Definition, Data mining process, architecture and component data mining system, mining frequent pattern, associations and correlations: Pattern mining and Interestingness of pattern, Association Rules. Feature selection methods.
Mining Complex type of data: Sequence Mining, Web Mining, Text Mining, Spatial Data Mining. Trends in data mining, Issues in data mining-Security and social issues.

Unit-II:

Classification and Prediction: Decision tree induction, Bayesian classification, Rule based classification, HMM, ANN based classification (back-propagation), Support vector machines

(SVM), Ensemble method, associative classification. Visualization Techniques, Machine Learning and Statistical Techniques.
Specialized Techniques: Time Series Analysis, Web Mining of Textual Data, Improving Performance. Application of Data Mining in Biodata analysis: DNA/protein sequence Analysis, Genome analysis, Protein Structure Analysis, Pathway analysis.

Unit-III:

Data Warehousing: Basic Concepts, Data Warehouse Architecture, Benefits of a data warehouse, Three-tier Decision Support Systems (DSS), Online Analytical Processing (OLAP) and its Servers, Multidimensional Data Model, Data Cube, Warehouse schema (Star schema, Snowflake schema); Enterprise Warehouse, Virtual Data Warehouse; Metadata; Data Pre- processing, Data Warehouse Design and Usage Sequence pattern classification including non- trivial data base, feature extraction, processing, training & prediction soft computing tools.

Unit-IV:

Clustering: Portioning method, Hierarchical method, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Clustering High-Dimensional Data, Constraint-Based Cluster Analysis, Outlier Analysis. Mining Stream, Time-Series, and Sequence Data. Anomaly detection – statistics-based, density-based, clustering-based. Evaluation and validation of data mining results.

Reference Books:

1. Bioinformatics-A Practical guide to the analysis of genes & proteins by Andres D. Baxevnes B.F. Francis Ouellette
2. Advanced Data Mining Technologies in Bioinformatics – Hui- Huang Hsu.
3. Bioinformatics Managing scientific data by Zoe Lacroix, Terence Critchlow.
4. Bioinformatics computing by Bryan Bergeron,M.D.
5. J. Han, M. Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann
6. M. Kantardzic, "Data mining: Concepts, models, methods and algorithms, John Wiley &Sons Inc.
7. M. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education.
8. Ning Tan, Vipin Kumar, Michael Steinbanch Pang, "Introduction to Data Mining", Pearson Educatio

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester VII

INTERNAL ELECTIVE Paper 76014: A. PLANT SYSTEM PHYSIOLOGY

Course Objectives: ➢ Recall the concepts central to the study of plant science ➢ Apply a comprehensive exposure to the subject of plant physiology
Course Outcomes: The students able to ➢ Translate the fundamental concepts of plant physiology ➢ Outline the plant metabolism ➢ Illustrate mineral nutrition in plants

Unit I.

Photosynthesis and Respiration & photorespiration: Light harvesting complexes; mechanisms of electron transport; photoprotective mechanisms; CO2 fixation-C3, C4 and CAM pathways. Citric acid cycle; plant mitochondrial electron transport and ATP synthesis; alternate oxidase; photorespiratory pathway.

Unit II.

Plant hormones and Secondary metabolites: Biosynthesis, storage, breakdown and transport; physiological effects and mechanisms of action. Biosynthesis of terpenes, phenols and nitrogenous compounds and their roles.

Unit III.

Sensory photobiology: Structure, function and mechanisms of action of phytochromes, cryptochromes and phototropins; stomatal movement; photoperiodism and biological clocks. Solute transport, transpiration. Solute transport and photoassimilate translocation

Unit IV.

Stress physiology: Responses of plants to biotic (pathogen and insects) and abiotic (water, temperature and salt) stresses; mechanisms of resistance to biotic stress and tolerance to abioticstress

References:

1. Plant Physiology- Salisbury & Ross
2. Plant Growth & Development: Hormones and Environment- Srivastava
3. Plant Physiology-Taiz and Zeiger

List of practicals

1. Measurement of DPO in Plants by Gravimetric (Potato) Method.
2. To Measure the Rate of Transpiration under Different Conditions of Light and Wind by Ganongs photometer.
3. Separation of Chlorophyll Pigments by Paper Chromatographic Method
4. Experiment to Study Synthesis of Starch during Photosynthesis
5. Mohls Half Leaf Experiment
6. Demonstrate End and Exosmosis using Potato Osmoscope
7. Demonstrate Unequal Transpiration in Plants by Cobalt Chloride Paper
8. Passage of Air through Stomata using Colocasia Leaf
9. Kuhne's Fermentation Vessel Experiment
10. Show Geotropism using Clinostat (Nullifying Effect)
11. Experiment to Show Phototropism in Plants using Phototrophic Chamber.
12. Experiment to Determine the Rate of Plant Growth by using Arc Auxanometer

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and BioinformaticsSemester VII

INTERNAL ELECTIVE Paper 76014: B. ANIMAL SYSTEM PHYSIOLOGY

Course Objectives:

- To provide basic knowledge on structures and functions of various physiological

Course Outcomes: At the end of course, the students

- Understand the structural details and functions of various important organs (heart,lungs, brain and kidneys).
- Enable the students to understand fundamentals of sensory perception and nerve transmission.
- Students also learn the importance of endocrine glands and reproductive organs

Unit-I. Cardiovascular System: Blood, hemopoiesis, homeostasis. Comparative anatomy of heart structure, myogenic heart, specialized tissue, ECG – its principle and significance, cardiaccycle, heart as a pump, blood pressure, neural and chemical regulation of all above. Thermoregulation,

Unit-II. Respiratory system and digestive system: Comparison of respiration in different species, anatomical considerations, transport of gases, exchange of gases, waste elimination, neural and chemical regulation of respiration. Digestive system - Digestion, absorption, energybalance, BMR.

Unit-III. Nervous system and endocrine system: Neurons, action potential, gross neuroanatomy of the brain and spinal cord, central and peripheral nervous system, neural control of muscle tone and posture. Sense organs – vision, hearing and tactile response. Endocrinology - Endocrine glands, basic mechanism of hormone action, hormones and diseases

Unit-IV. Excretory system and reproductive system: Comparative physiology of excretion, kidney, urine formation, urine concentration, waste elimination, micturition, regulation of water balance, blood volume, blood pressure, electrolyte balance, acid-base balance. Reproductive processes, gametogenesis, ovulation, neuroendocrine regulation.

References:

1. C.L. Prosser, Comparative Animal Physiology. W.B. Saunders & Company
2. R. Eckert. Animal Physiology. Mechanisms and Adaptation. W.H. Freeman & Company
3. W.S. Hoar. General and Comparative Animal Physiology
4. Schiemdt-Nielsen. Animal Physiology. Adaptation and Environment. Cambridge
5. C.L. Prosser. Environment and Metabolic Physiology. Wiley-Liss, New York.

List of practicals

1. Estimation of unit Oxygen consumption of fish with reference to body weight.
2. Determination of haemoglobin content, hematocrit and cell counting
3. Preparation of blood smears.
4. Nerve muscle preparation, Muscle twitch, Comparison of muscle andnerve irritability, effect of stimulus strength, effect of stimulus frequency (tetany), effect of load or stretch, effect of prolonged activity(fatigue), neuromuscular fatigue, stimulation of motor points in human.
5. Recording of action potential by oscilloscope and demonstration of its various features. Experiments to demonstrate characteristic of reflexarc. Experiment in human (students themselves) to demonstratesome aspect of sensory physiology.
6. Normal cardiac activity, effect of temperature, effect of drug, heart block, tetanization of heart.
7. Measurement of blood pressure
8. Oxygen consumption in fish and effect of temperature (by dissolvedoxygen meter) and terrestrial animal (mouse). Oxygen consumption (by respirometer), heart rate, blood pressure

glycemia altered by exercise.
9. Effect of insulin on glycemia, study of stages in estrous cycle
10. Oxygen consumption of fresh water fish with reference to body weight.
11. Detection of nitrogenous waste products (Ammonia, urea and uric acid). in fish tank water, frog tank water, bird excreta and mammalian urine/ Kidney.
12. Pulmonary function test by Spirometer
Spotters 1. B.P.apparatus 2 Stethoscope. 3. ECG apparatus 4. Types of Muscle cell 5. Pace Maker 6. Nerve Cell 7. Nephron 8. Spirometer

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester VII

Paper 76014: C. SYSTEMS BIOLOGY

Course Objectives:

- Aims at the analysis and understanding of biological phenomena using omics tools, mathematical models and simulations.
- To view the cell as a complex system of interacting components (DNA-protein, protein-protein or metabolite-enzyme). As the individual components often are involved in many different reactions, complex networks are evolving which govern the cellular activities. These networks can be deduced from a global analysis of cells using omics tools (transcriptomics, proteomics and metabolomics) and other experimental approaches.

Course Outcomes: After the course the student:

- understands the concepts of Systems biology and how they can be applied to address various research questions
- knows how omics technologies are applied to generate data
- can apply computational tools to treat high-throughput data
- can differentiate between a reductionistic and a holistic view of a cell
- can quantitatively describe biological phenomena
- analyze the behavior of small biological networks using modeling and simulation
- can model basic microbial metabolism

Unit-I: Systems biology fundamentals

Systems Biology: Introduction, Basic Concept and significance, System level understanding of biological system, Measurement Technologies and experimental methods, Measurement for Systems Biology, Next-generation Experimental Systems. System structure identification - Bottom-up-approach, and Top-down-approach. Application areas of Systems Biology. Basic concept of Modelling System Biology, Merits of computational modelling.

Unit-II: Biological Networks

Systems Biology Networks- basics of computer networks, Biological uses and Integration. Micro array – definition, Applications of Micro Arrays in systems biology. Network visualization and structural analysis of Biological Networks – Metabolic Networks; Transcription Regulation Networks and Protein-protein Interaction Networks. System Biologydatabases and software for System Biology.

Unit-III: Tools and databases

Tools and databases for modelling: Introduction- databases KEGG, EMP, MetaCyc, Enzymekinetics database BRENDA, AraCyc etc., Expression databases, Gene expression databases, Biomodels database, Basics of Systems Biology Markup Language (SBML), SBML editors and various databases related to systems biology.

Unit-IV:

Metabolome, Interactome and Transcriptome (basic concepts), Protein- Protein Interaction Databases, Systems Biology databases. Gene regulation at a single cell level - Transcription Networks -basic concepts -coherent Feed Forward Loop (FFL). Automated Reverse Engineering of Metabolic Pathways by Means of Genetic Programming.

References

1. Edda Klipp, Wolfram Liebermeister, Christoph Wierling ,Systems Biology a Textbook by Wiley-BlackWell Publications (2009 Edition).
2. Uri Alon , An introduction to Systems Biology: Design Principles of Biological Circuits, (Chapman and Hall / CRC 2007 Edition)
3. Edda Klipp, Ralf Herwig, Axel kowald, Christoph Wierling, Hans Lehrach ,Systems Biology in practice : concepts, implementation and application. (Wiley – VCH 2005)
4. Uri Alon, An Introduction to Systems Biology: Design Principles of Biological Circuits, Chapman & Hall/CRC Press, Mathematical and Computational Biology, 2nd edition, 2006.
5. Hiroaki Kitano: Foundations of Systems Biology, MIT Press 2001.

List of practicals

1. Gene and Protein data handling
2. Genome Database navigation
3. Alignment and phylogeny
4. Ortholog identification
5. Large scale domain analysis
6. Downloading and manipulating transcriptomes
7. Transcriptome meta-analysis
8. Cis-regulatory element search algorithms
9. Interactome analysis and protein interaction domains
10. Motif searching for key interaction sequences
11. Reconstruction of a network project - I
12. Reconstruction of a network project - II

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester VII

76011P: GENOMICS, PROTEOMICS AND METABOLOMICS LAB

Course Objectives:

- Students apply state-of-the-art techniques to analyze genome and microbiome datausing

➢ Explore key advances in the field of genomics over the past two decades of both humans and non-model organisms that have driven the current revolution in genome sciences
Course Outcomes: At the end of course, the able to perform ➢ Genome and proteome analysis by using web based servers and softwares ➢ Analyse the microarray data ➢ NGS data analysis ➢ Proteome and metabolome analysis

List of practicals

1. Web based servers and softwares for genome analysis: ENSEMBL, VISTA, UCSC Genome Browser, NCBI genome. Exploring the Gene expression databases like GEO
2. Analysis of a sample microarray data.
3. Assembling and editing of Genomic data; Genome alignment and analysis tools- BWA (BurrowsWheeler Aligner), SAMtools, GATK (The Genome Analysis Toolkit), IGV (Integrative Genomics Viewer)
4. NGS Data analysis; Data quality assessment; De-novo Genome assembly
5. Genome Annotation
6. Use of PAUP for Phylogenetic analysis based on RAPD Data.
7. Physical Mapping of the Genome
8. 2D gel electrophoresis, sample preparation and mass spectrometry-derived proteomic data analysis.
9. Learn data analysis using databases and search engines such as Mascot and Protein Pilot through e-workshops
10. Protein electrophoresis-1D+2D, HPLC, FPLC, MALDI-TOF & LC-MS
11. Analysis of recombination signals in genome and drawing genome map
12. Analysis of motifs in genes
13. Identification of CORE and PAN genome using comparative genomics
14. Introduction to protein interaction databases
15. Analysis of protein interaction networks
16. Metabolomics data processing tools: hands on open source R based programs, XCMS, MetFrag, MetFusion, rNMR, BATMAN
17. Metabolomics data analysis: Using R Bioconductor, understanding usage of univariate and multivariate data analysis, data fusion concepts, data clustering and regression methods
18. Metabolomics downstream analyses: KEGG, BioCyc, and MetExplore for metabolic pathway and network analysis with visualisation of differential expression, understanding metabolomics flux analysis
19. Metabolomics standards and databases: data dissemination and deposition in EMBL-EBI MetaboLights repository; PHENOMenal, workflows4metabolomics

76012P: ANIMAL BIOTECHNOLOGY LAB

Course Objectives: ➢ Understanding the principles of animal cell culture and its application
Course Outcomes: At the end of course, the student should perform ➢ Animal cell culture work with primary, secondary cell line preparation, preservation and maintenance, MTT assay, toxicity assay, cell viability assay. etc.

1. Preparation of tissue culture medium and membrane filtration
2. Preparation of single cell suspension from spleen and thymus
3. Cell counting and cell viabililty
4. Macrophage monolayer from PEC, and measurement of phagocytic activity
5. Trypsinizaation of monolayer and subculturing
6. Cryopreservation and thawing
7. Measurement of doubling time
8. Role of serum in cell culture
9. Preparation of metaphage chromosomes from cultured cells.
10. Isolation of DNA and demonstration of apoptosis by DNA laddering
11. MTT assay for cell viability and growth
12. Cell fusion with PEG
13. Primery culture technique chicken embryo fibroblast.
14. Secondary culture of chicken embryo fibroblast.
15. Cultivation of continuous cell lines.
16. Quantification of cells by trypan blue exclusion dye.
17. Isolation of lymphocytes and cultivation of lymphocytes

76013P: DATA MINING IN BIOINFORMATICS LAB

Course Objectives:

- The main objective of this lab is to impart the knowledge on how to implement classical models and algorithms in data warehousing and data mining and to characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering
- Practical exposure on implementation of well-known data mining tasks and exposure to real life data sets for analysis and prediction.
- Learning performance evaluation of data mining algorithms in a supervised and an

Course Outcomes: At the end of course, the students able to perform

- All mining experiments and get hands on training.
- The principle algorithms and techniques used in data mining, such as clustering, association mining, classification and prediction.
- Handling a small data mining project for a given practical domain

List of practicals

1. Pre-processing – data type conversion, and data transformation
2. Filters – Replace missing values, and add expression
3. Feature selection – Selection attributes – filter, wrapper, dimensionality reduction
4. Supervised techniques – Classifier - Function multi-layer perceptron
5. Classifier - Bayes - Native Bayers rule, ZeroR
6. Non-supervised techniques – Clustering – Partitioned algorithm, Hierarchal algorithm, supervised algorithm.
7. Association Rule mining – Apriori algorithm
8. Experimenter – Dataset test, based test algorithm
9. Knowledge flow – feature selection, and clustering
10. Knowledge flow classification

Students may also involve in following data mining projects.

Project I –Databases/Data Warehouse Design

• Modeling: Conceptual and logical modeling of biomedical data
• System design of biomedical data warehouses
• Online Analytical Processing (OLAP) tools for biomedical data

Project II –Cluster Analysis

• Implement several clustering algorithms that partition data points into groups based on their similarity
• Implement parallel clustering algorithm on MapReduce
• Evaluate the clustering results using internal or external index

Project III –Classification

• Build classifiers that learn from training data and apply to test data to predict their class labels
• Select informative features that lead to a good classifier
• Evaluate the performance of the classification results

76014P: 76014 A OR B OR C LAB

In this practicals, student should any one of the elective which has been selected in theory. Respective practical examination should be attended in the semester end examination. For example, Student choses 76014 Plant System Physiology as his/her internal elective, so he/she has to take practical lab of Plant system physiology only in the semester end examination.

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester VIII

Paper 86011: MICROBIAL BIOTECHNOLOGY

Course Objectives: The students acquired to know the ➢ Knowledge on significant discoveries and chronological developments in the field of fermentation industry. ➢ Knowledge on the immobilization of cells and enzymes. Biotechnological applications of enzymes in Food and Drink Industry. ➢ Knowledge on the importance of industrially important microbes to human welfare.
Course Outcomes: ➢ Students learn about isolation, screening and preservation of industrially important microorganisms. ➢ Students learn about advantages and disadvantages of different industrially importance of micro-organisms ➢ Students understand preparation of different culture media and kinetics of growth in both closed and open systems

Unit I:

Introduction to Fermentation process

Fermentation – Definition. The component parts of a fermentation process, chronological development of fermentation industry. Fermentors/Bioreactors – types and features. Isolation, preservation and strain improvement of industrially important microorganisms. Media design and sterilization for industrial fermentation. Principles of microbial growth and culture system, scale up, and downstream processing.

Unit II:

Immobilized Enzymes

Introduction, definition, applications. Commercial production of enzymes. Methods of immobilization of cells and enzymes. Stabilization of enzymes and cells. Production of amylases, glucose isomerase and proteases. Biosensor – definition, types and applications. Enzymes as analytical reagents, instrumental techniques available for using enzymatic analysis in Medicine and Industry, Biotechnological applications of enzymes-Food and Drink Industry.

Unit III:

Production of products.

A brief outline of process for the production of some commercially important organic acids – citric acid, lactic acid, acetic acid, aminoacids - Glutamic acid , Lysine, aspartic acid; antibiotics – penicillins, aminoglycosides, tetracyclines; Vitamins – Vit B_{12}, Beverages- alcohol, wine and beer. Production of hepatitis B vaccine.

Unit IV:

Microbial transformations – types of biotransformation reactions, Steroids and antibiotics transformation. **Introduction to food technology** - Elementary idea of canning and packing. Sterilization and pasteurization of food products. Technology of typical food/food products (bread, cheese, idli, yoghurt). Food preservation. Commercial production of SCP. Production of biogas from biomass.

References:

1. Industrial Microbiology - J.E. Casida
2. Industrial Microbiology – A.H.Patel
3. Microbial biotechnology Glazer and Nikaido 1995
4. Principles o fermentation technology, Stanbury, Whittaker and Hall 1997
5. Prescott and Dunns Industrial microbiology. Reed (Ed)
6. Biotechnology 3 rd edition by john E.Smith . Cambridge low price editions.

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester VIII

Paper 86012: DEVELOPMENTAL BIOLOGY

Course Objectives: ➢ To provide knowledge on basic concepts, gametogenesis fertilization, morphogenesis and organogenesis in both plants and animals development.
Course Outcomes: At the end of course, the student able to know ➢ the basic concepts in development biology. ➢ about gametes formation, fertilization and knowledge on early development ➢ the morphogenesis and organogenesis in both plants and animals ➢ Apoptosis and aging in living organisms

Unit I: Basic concepts of development

Potency, commitment, specification, induction, competence, determination and differentiation; morphogenetic gradients; cell fate and cell lineages; stem cells; genomic equivalence and the cytoplasmic determinants; imprinting; mutants and transgenics in analysis of development.

Unit II: Gametogenesis, fertilization and early development

Production of gametes, cell surface molecules in sperm-egg recognition in animals; embryo sac development and double fertilization in plants; zygote formation, cleavage, blastula formation, embryonic fields, gastrulation and formation of germ layers in animals; embryogenesis, establishment of symmetry in plants; seed formation and germination.

Unit III: Morphogenesis and organogenesis in animals

Cell aggregation and differentiation in *Dictyostelium*; axes and pattern formation in *Drosophila*, amphibia and chick; organogenesis – vulva formation in *Caenorhabditis elegans;* eye lens induction, limb development and regeneration in vertebrates; differentiation of neurons, post embryonic development-larval formation, metamorphosis; environmental regulation of normal development; sex determination. **Programmed cell death, aging in animals**

Unit IV: Morphogenesis and organogenesis in plants

Organization of shoot and root apical meristem; shoot and root development; leaf development and phyllotaxy; transition to flowering, floral meristems and floral development in *Arabidopsis* and *Antirrhinum,* **senescence in plants**

References:

1. Animal Embryology
2. Guha and maheswari Embryology

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester VIII

Paper 86013: MOLECULAR MODELLING AND STRUCTURALBIOINFORMATICS

Course Objectives: ➢ To understand the concept of molecular modelling, and structural bioinformatics. ➢ Enables the student to gain knowledge in Classical & Statistical mechanics and Quantum mechanics and its applications. ➢ Gives an insight into the kinetics and dynamics of the biomolecules
Course Outcomes: ➢ Understand the theoretical foundation of computational chemistry, with an emphasis on electronic structure calculations using quantum chemistry and classical molecular dynamics simulation techniques ➢ Understand the structural dynamics of biomolecules ➢ Energy Minimization in the folding process

Unit-I: Introduction to Molecular Modelling

Concept of molecular modelling. Representation of chemical compounds (small and macromolecules like proteins, nucleic acids) - Nomenclature, Line notations, Standard structure exchange formats, Representation of 3D structures and codes, Molecular surfaces, Molecular graphics. Molecular Modelling Methods - Outline, Advantages and Disadvantages of Molecular Mechanics, Semi-Empirical, Ab-Initio and Density Functional Theory.

Unit-II Molecular and Quantum Mechanics

Molecular Mechanics (MC): Force Fields – Definition and Features, Functional Forms – Bond stretching, Angle bending, Torsional terms, Out-of-plane bending, Cross terms, Electrostatic, Vander Waals and Hydrogen Bonding interactions. Force fields for small molecules and biomolecules. Quantum Mechanics based Chemical Models: Semi empirical based Models, Schrodinger equation, Born-Oppenheimer approximation, Hartree-Fock approximation, LCAO approximation, Roothaan-Hall equations, Configuration Interaction models, Moller- Plesse models, RHF model, Gaussian Basis Sets.

Unit-III Energy minimization, Simulation and Structural Bioinformatics

Energy Minimization, Simulations and Structural Bioinformatics: Energy Minimization – Statement of Problem, Derivative and Non-Derivative Methods, Simulation Methods - Time Averages, Ensemble averages, Molecular Dynamics Methods and packages, Molecular dynamics simulation of macromolecules, Free energy calculations, Molecular dynamics trajectories for activated processes. Monte Carlo Methods, Differences between MD and MC, Conformational Analysis. Structural Bioinformatics: Protein Structure Comparison and Alignment, Structural Alignment Methods - CE, VAST, DALI, SSAP, TM-align. RMSD, Z- score for structural comparison. Databases of structure based classification; CATH, SCOP andFSSP;

Unit-IV Structural bioinformatics

Structural Bioinformatics: Secondary structure prediction: Algorithms viz. Chou Fasman, GOR methods; nearest neighbor and, machine learning based methods, analysis of results and

measuring the accuracy of predictions. Tertiary Structure prediction: Fundamentals of the methods for 3D structure prediction (sequence similarity/identity of target proteins of known structure, fundamental principles of protein folding etc.) Homology/comparative modeling (HMM), fold recognition, threading approaches, and ab initio structure prediction methods. Structural Quality Assurance - Structure as Models, Error Estimation and Precision, Stereo Chemical Parameters. Anfinsen Thermodynamic Hypothesis. Domain and motif databases and analytical tools. Visualization of structures using Rasmol or SPDBV or CHIME or VMD.

References

1. Computational Modeling of Genetic and Biochemical Networks by James M.Bower and Hamid Bolouri, MIT press.
2. A. R.Leach - Molecular Modeling Principles and Application, 2nd edition, Longman Publication
3. Carl Branden and John Tooze, "Introduction to protein structures", Garland publishing Inc., 1999.
4. Heerman D.W., "Computer Simulation Methods", Springer- Verlag, 1990.
5. McCammonJ.A. and Stephen C. Harvey, "Dynamics of proteins and nucleic acids", Cambridge U. Press, 1987. 5. Lab Manual.

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester VIII

OPEN ELECTIVE Paper 86014: A. INTRODUCTION TO BIOINFORMATICS

Course Objectives: ➢ The course aims at the masters students who have basic knowledge in biology and computer science to gather basic and top view of Bioinformatics. ➢ The course also aims to enable students to use the basic tools and software to analyse and interpret the biological sequence data and information
Course Outcomes: At the end of course, the students will able ➢ To locate and use main databases at the NCBI and EBI resources ➢ Know the difference between databases, tools, repositories and be able to use each one to extract specific information ➢ Extract data from specific databases using accessions numbers, gene names etc.

Unit I:

Define bioinformatics? Goals of Bioinformatics; Scope of Bioinformatics; Applications and limitations of Bioinformatics. Generation of large-scale molecular biology data through genome sequencing, and protein sequencing. Introduction to Internet and internet resources ofbiology interest.

Unit II:

Define database? Types of databases; General Introduction of Biological Databases; Nucleicacid databases (NCBI, DDBJ, and EMBL). Protein databases (Primary, Composite, and

Secondary). Specialized Genome databases (SGD, TIGR, and ACeDB). Structure databases (CATH, SCOP, and PDB). Information retrieval from biological databases.

Unit III:

Introduction to sequences, sequence alignments – Pairwise alignment (BLAST and FASTA) and multiple sequence alignment (Clustal W). Methods for presenting large quantities of biological data: sequence viewers (SeqVISTA), 3D structure viewers (Rasmol).

Unit IV:

Introduction to phylogenetics, construction of phylogenetic tree. Introduction on molecular modeling and drug design. Role of bioinformatics in Genomics, proteomics and metabolomics.

References

1. Text book of Bioinformatics – S C Rastogi
2. Bioinformatics – Ghosh
3. Essential bioinformatics - Xiong

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester VIII

OPEN ELECTIVE - Paper 86014: B. BIOTECHNOLOGY FOR HUMAN WELFARE

Course Objectives: ➢ Impart a comprehensive understanding of the basic techniques as applied to biological systems and living organisms to produce or modify products or processes for human welfare. ➢ To impart knowledge and skills to provide broad understanding of biotechnology and its implications on society
Course Outcomes: After completion of course, the student will ➢ Know the importance of various molecular techniques used in biotechnological industry and theimportance of modern agriculture and its application. ➢ Learn about various applications-based techniques in biotechnology like forensic science and the relatedactivities currently going on and that will lay the foundations for the future work in relation to crime.

Unit-I: Introduction

Definition of biotechnology, scope and applications of biotechnology in relation to humanwelfare. Industry applications – Bioprocessing engineering (fermentation technology), protein engineering in enzyme production, industrial production of sugars, alcohol, antibiotics, citric acid.

Unit-II: Agriculture

Applications of biotechnology in agriculture. Plant tissue culture and its importance, explants, and their response, callus culture, suspension culture, and somatic hybridization. N2 fixation and its importance. Biofertilisers. Microbial interactions – rhizosphere, commensalism, mutualism and parasitism, Production of transgenic plants for crop improvement, genetically modified plants – BT cotton, brinjal, etc.

Unit-III: Human health

Animal cell culture and its importance, types vaccines and vaccines production, therapeutic agent's production (insulin, growth hormone, HBV vaccine production through rDNA technology), monoclonal antibodies and its applications, gene therapy and its applications, concept of diagnosis of diseases through biotechnology, Human genome project, DNA fingerprinting and its implications in forensic medicine. Animal cloning, transgenic animals and their importance. Biotechnology in animal husbandry.

Unit-IV: Environment

Organic pollutants, degradation of organic pollutants and hydrocarbons, microbial leaching, bioremediation, Agricultural waste degradation, Superbug in oil spills degradation, biotechnology in waste treatment. IPR, bioethics and biosafety of biotechnology to the society.

References

1. Sateesh, MK 2010. Bioethics and Biosafety. IK International Pvt Ltd.
2. Dubey, RC 2010. A Textbook of Biotechnology. S Chand Publications.
3. Singh, BD 2013. Expanding Horizons in Biotechnology. Kalyani Publication.

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester VIII

OPEN ELECTIVE - Paper 86014: C.
SWAYAM/MOOCS/NPTEL

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics
Semester VIII

86011P: MICROBIAL BIOTECHNOLOGY LAB

Course Objectives: ➢ Students acquire the knowledge on industrially important microbes for production of various products ➢ Knowledge on the immobilisation of enzymes, also production of industrially important enzymes from different micro-organisms ➢ Knowledge on the Bio-transformations ➢ Know the knowledge about the scale up and downstream process
Course Outcomes: ➢ Students learn about isolation, screening and preservation of industrially important microbes from various sources. ➢ Students learn about immobilisation of immobilization of cells and enzymes, also Production of industrially important enzymes from different micro-organisms ➢ Students able to produce commercially important organic acids, beverages.

List of practicals

1. Isolation of industrially important microorganisms.
2. Maintenance and improvement.
3. Enzymatic test of milk by methylene blue reductase test
4. Production of wine from grapes
5. Alcohol estimation in wine by dichromate oxidation followed by redox titration.
6. Production of citric acid and estimation.
7. Determination of lactic acid concentration in curd sample
8. Experiments on microbial fermentation process
9. Role of yeast in bread making
10. Immobilization of enzymes and enzyme activity of catalase enzymes.
11. Isolation of amylase producing microorganisms from soil,
12. Harvesting purification and recovery of end products
13. Determination of antibiotic sensitivity of disease causing microorgansims
14. Production of biofertilizers.
15. Studies on enzyme kinetic behavior, growth analysis, biomass estimation, determination of mass transfer co-efficients
16. Slides: Aspergillus niger, Bacillus, Saccharomyces, Lactobacillus bulgaricus

86012P: MOLECULAR MODELLING AND STRUCTURAL BIOLOGY LAB

Course Objectives: ➢ To construct molecular models, using a ball and stick model set. ➢ It may be helpful to use the model kits to visualize the 3D Structure. ➢ To equip students with key skills of molecular modelling techniques currently practiced in any pharmaceutical research and development unit.
Course Outcomes: ➢ The student will be able to describe and comprehend the fundamental concepts of molecular modelling and computational-driven drug discovery.

- The student will learn some of the advanced techniques such as molecular simulations and visualization tools
- The student will be well versed in theoretical and practical aspects of molecular modelling.

List of programmes

1. Solving and Building of structures
2. Protein structure modeling by SwissModel server
3. Structural prediction through homology modeling, Stereo chemical quality.
4. Protein function identification by profunc.
5. Visualization software usage – RASMOL, Pymol.
6. Chem sketch drawing the chemical structures.
7. Finding conserved domains in the protein structure
8. Homology modelling of protein
9. Modular used protein modelling.
10. Simulation of A, B and Z forms of DNA
11. Constant energy and constant temperature simulations of macromolecules.
12. Molecular dynamics simulation of a peptide fragment with known structures using AMBER
13. Energy minimization
14. Non-polarizable and polarizable rigid models and Flexible models in water and small organic molecules
15. Structural and dielectric properties of a polar medium
16. Calculation of structure, energy and free energy through simulations.
17. Concept of hydrophobic and hydrophilic interactions

86013RP: MINOR RESEARCH PROJECT

Course Objectives:

- To understand the relevance, basic concepts and importance of research projects.
- To utilize the knowledge on the relevance, basic concepts and importance of research projects to perform a research project

Course Outcomes:

- To understand the importance of research concepts and to put them in practice while working on projects.
- To utilize all concepts for designing a experimental based research project.

As per NEP-2020, the Committee recommends that all students must complete a 2 - credit requirement where they are engaged in 4-6 weeks of structured **minor research project** with an external organisation or within university campus under respective internal supervisor. The same mini research project will be used in 10^{th} semester for further extensive practical execution. This **minor research project** at the end of 8^{th} semester will be assessed by the Head of Dept., one senior faculty in the department and concerned project Supervisor.

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester IX

Paper 96011: ENVIRONEMNTAL BIOTECHNOLOGY

Course Objectives: The students acquire the knowledge on ➢ Microbiology of waste water treatment and microbes used in bioremediation ➢ On the importance of Bio-fertilizers (Rhizobia, free living N_2 fixers and Phosphate solubilizing bacteria) and biopesticides and their importance significance ➢ Knowledge of different methods in Microbial leaching
Course Outcomes: Students able to know the following on completion of course ➢ Students learn about waste water treatment ➢ Students learn about the importance of microbes in Bioremediation of Pesticides and other pollutants. ➢ Students develop skills to isolate and production of Biofertilizers (Rhizobial, free living N_2 fixers and Phosphate solubilizing bacteria) and Biopesticides and their importance and practice for large scale production.

Unit I: Waste water treatment: Environmental pollution and biotechnological methods for management**.** Water pollution and sewage. Microbiology of waste water treatment – aerobic and anaerobic processes, activated sludge, oxidation ditches, trickling filters, towers, rotating discs, rotating drums, oxidation ponds. Aerobic and Anaerobic microbes. Purification of water by water weeds and membrane filters, reclaim of treated waste water.

Unit II: Bioremediation: Pesticides and other pollutants degradation by microorganisms and genetically engineered microbes. Degradation of oil spills and plastics by microorganisms for production of useful products. Recovery of minerals by microbes. Bioindicators of hazardous pollutants, Aquifer (underground water) indicators and mineral indicators. Use of biosources for detecting environmental pollutants and environmental resources.

Unit III: Biofertilizers and Biopesticides: Bioremediation of contaminated soils and water land, Biopesticides in integrated pest management, Biofertilizers (Rhizobial, free living N_2 fixers and Phosphate solubilizing bacteria) and their importance significance and practice. Production of biopesticides and biofertilizers for large scale production. Genetically engineered bacteria in bioremediation of organic pesticides, insecticides, oil spills.Phytoremediation

Unit IV: Microbial leaching – Introduction, organisms for leaching, chemistry of leaching and commercial processes. Genetically engineered microbes in environmental health. Genetically engineered plants and microbes in agriculture and productivity,

Referenes:

1. Microbial Ecology – fundamentals and applications. Atlas and Bartha
2. Environmental Microbiology. Grant and Long
3. Microbial aspects of Pollution. Skyes and Skinner.
4. Microbial Biotechnology – Glazer and Nikaido 1995
5. Biotechnology – A Text Book of Industrial Microbiology – Crueger and Crueger.
6. Concepts in Biotechnology – Balasubramanian, Bryce, Dharmalingam, Green and Jayaraman

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester IX

Paper 96012: BIOETHICS, BIOSAFETY, AND IPR

Course Objectives: ➢ To discuss about various aspects of biosafety regulations, IPR and bioethics concerns arising from the commercialization of biotech products. ➢ Intended to remind the students about their responsibilities towards themselves and society, and promotes creativity among them by providing detailed insight into intellectual property rights.
Course Outcomes: At the end of course, the students known about ➢ Understanding of Good laboratory practices, and biosafety. ➢ Know-how of issues and bioethics related to molecular technologies and GMOs. ➢ Understanding the intellectual property rights, concept of patenting organisms and process of filing for a patent

Unit-I

Bioethics - Introduction, ethical conflicts in biological sciences - interference with nature, bioethics in health care - patient confidentiality, informed consent, euthanasia, artificial reproductive technologies, prenatal diagnosis, genetic screening, gene therapy, transplantation. Bioethics in research – cloning and stem cell research, Human and animal experimentation, animal rights/welfare, Agricultural biotechnology - Genetically engineered food, environmental risk, labeling and public opinion. Sharing benefits and protecting future generations - Protection of environment and biodiversity – biopiracy. Biotechnology and socialresponsibility.

Unit-II

Biosafety and Biosecurity - introduction; historical background; introduction to biological safety cabinets; primary containment for biohazards; biosafety levels; GRAS organisms, biosafety levels of specific microorganisms; recommended biosafety levels for infectious agents and infected animals; definition of GMOs & LMOs; principles of safety assessment of transgenic plants – sequential steps in risk assessment; concepts of familiarity and substantial equivalence; risk – environmental risk assessment and food and feed safety assessment; problem formulation – protection goals, compilation of relevant information, risk characterization and development of analysis plan; risk assessment of transgenic crops vs cisgenic plants or products derived from RNAi, genome editing tools.

Unit-III:

International regulations – Cartagena protocol, OECD consensus documents and Codex Alimentarius; Indian regulations – EPA act and rules, guidance documents, regulatory framework – RCGM, GEAC, IBSC and other regulatory bodies; Draft bill of Biotechnology Regulatory authority of India - containments – biosafety levels and category of rDNA experiments; field trails – biosafety research trials – standard operating procedures - guidelines of state governments; GM labeling – Food Safety and Standards Authority of India (FSSAI).

Unit IV

IPR – Introduction to intellectual property; types of IP: patents, trademarks, copyright & related rights, industrial design, traditional knowledge, geographical indications, protection of new GMOs; International framework for the protection of IP; IP as a factor in R&D; IPs of

relevance to biotechnology and few case studies; introduction to history of GATT, WTO, WIPO and TRIPS; plant variety protection and farmers rights act; concept of 'prior art': invention in context of "prior art"; patent databases - country-wise patent searches (USPTO, EPO, India); analysis and report formation. Basics of patents: types of patents; filing of a patent application; precautions before patenting-disclosure/non-disclosure - patent application- forms and guidelines including those of National Bio-diversity Authority (NBA) and other regulatorybodies.

References:

1. Sasson A. Biotechnologies in developing countries present and future, UNESCO publishers,
2. Matthew Rimmer, Intellectual Property and Biotechnology: Biological Inventions (2008)
3. Kshitij Kumar Singh, Biotechnology and Intellectual Property Rights: Legal and Social Implications Springer (India) (2014)
4. Bioethics: the basics, Alastair V. Campbell, Routledge; 2 edition (19 June 2017)
5. IPR, Biosafety and Bioethics, DeepaGoel and ShominiParashar, Pearson; 1 edition (1 January 2013)
6. Diane O. Fleming; Debra A. Long; Biological Safety: Principles and Practices, ASM Press; 4th edition, 20062.
7. Nancy Ann SilbergeldJecker; Albert R. Jonsen; Robert A. Pearlman; Bioethics: Introduction to History, Methods, and Practice; Jones & Bartlett Publishers; II edition, 2007
8. Lim Li Ching; TerjeTraavik; Biosafety First: Holistic Approaches to Risk and Uncertainty in Genetic Engineering and Genetically Modified Organisms; Tapir Academic Press, 2007
9. 21st Century Complete Guide to Biosafety and Biosecurity (CD-ROM): by U.S. Government, Publisher: Progressive Management, 2004
10. Wadehra, B.L. Law Relating To Intellectual Property, (2011), Fifth Edition, Universal Law Publishing Co.Pvt. Ltd. 10. GanguliPrabuddh, Intellectual Property Rights , (2001), Tata McGraw-Hill Publishing Company Ltd.

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester IX

Paper 96013: CELL SIGNALING, COMMUNICATION, AND CANCER BIOLOGY

Course Objectives:

- Develop a basic understanding of the cell signalling and cancer and its biology
- Relate the cell signalling affects health and lead to cancer
- Extend the knowledge earned from the course

Course Outcomes:

- Students able to reveal the mechanism of signal transport across and within cell
- Infer cancer causing mutations and specific therapeutic targets.
- Compare the biological treatment processes and development of suitable technologies
- Relate the molecular biology of cancer with clinical aspects of the disease

Unit I:

Cell signalling - Intracellular and intercellular signaling, types of signal receptors - Cytosolic, Nuclear & Membrane bound receptors, Hormones and their receptors, cell surface receptor, signaling through G-protein coupled receptors, Chemo receptors of Bacteria (Attractants & Repellents), signal transduction pathways, secondary messengers, protein kinases, kinase inhibitors in therapy, regulation of signaling pathway, bacterial chemotaxis and quorumsensing.

Unit II

Cellular communication: Intercellular cell signaling. Regulation of hematopoiesis, general principles of cell communication, cell adhesion and roles of different adhesion molecules, gap junctions, extracellular matrix, integrins, neurotransmission and its regulation.

Unit III:

Cancer - basic concepts, Introduction and Characteristics of Cancer Cells, Types of Tumors, Factors influencing on the development of Cancer, Genetic Alterations in Cancer Cells, modulation of cell cycle in cancer, causes of cancer. Importance of DNA repair mechanisms in cancer.

Unit IV:

Molecular Basis of Cancer – Genetic rearrangements in progenitor cells, oncogenes, tumor suppressor genes, growth factors. metastasis, interaction of cancer cells with normal cells, telomerase, apoptosis, angiogenesis and metastasis, cancer therapy. Epigenetics, miRNAs in human cancer. Cancer therapeutics. Cancer diagnosis.

References

1. The Cell by Cooper.
2. Cell and Molecular biology – De Robertis and De Robertis (1998) Waverly Pvt.
3. "Cancer Biology", Raymond W. Ruddon, Oxford University Press
4. Cell & Molecular Biology by Gerald Karp (2nd Ed.) Wiley publishers.
5. The World of the cell by Becker, Reece, Poenie (3rd edition) Benjamin Publishers.
6. Molecular Biology of the cell by Bruce Alberts.
7. The biochemistry of Cell Signalling-Ernst J.M.Helmreich. Oxford Press.
8. The world of Cell. 5th edition- Becker, Kleinsmith, Harden,-Pearson Publishers.
9. The Biology of Cancer – Robert Weinberg. Edition – 2nd ISBN:9780815342205 – 2013
10. Textbook readings; primary literature; in-class discussion. The Molecular Biology of Cancer: A Bridge from Bench to Bedside. Stella Pelengaris, Mike Khan -2nd Edition – 2013
11. Molecular Biology of Cancer. Lauren Pecorina, 4th edition. Oxford University Press – 2016.

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester IX

OPEN ELECTIVE - Paper 96014: A. NATURAL PRODUCTS IN INDUSTRIAL APPLICATIONS

Course Objectives:

- To describes the process of identification and isolation of natural products from natural sources, their chemical synthesis, biological activities, ecological relevance and possible applications in the fields of pharmacology, biotechnology and biomedicine

Course Outcomes:

- Rationalize the contribution of natural products in new drug discovery.
- Express the challenges encountered in different stages of natural products based drug discovery.
- Plan different isolation and bioassay screening methods for evaluation of natural products

Unit I:

Introduction to bioactive natural compounds

Terpenes, phenols, flavonoids, tannins, quinones, amines and alkaloids, anthocyanins, amino acids, and nucleosides. Production of natural products by plant tissue culture, and molecular farming.

Unit II:

Isolation and characterization of bioactive compounds

Solvent extraction, Isolation of phenols, nucleosides, and alkaloids. Characterization by UV, IR, NMR and MS spectroscopy. Biological activity screening against microbes and cancer cells, toxicity evaluation through teratological study and mutagenic and carcinogenic study.

Unit III:

Therapeutic applications of bioactive compounds

Bioactive compounds therapeutic applications in - Anesthetics, Sedatives and hypnotics, Anticonvultants, Muscle relaxants, CNS stimulants, Antipyretic analgesics, Cardiovascular drugs, Antihistamines, diuretics, NSAIDS, antimalarials, Antibiotics, antivirals, Anticancer agents. Insulin and oral hypoglycemic agents, Steroids, Antipsychotics (Tranquilizers),

Unit IV:

Natural products in drug discovery

Important parameters for drug discovery. Concept of lead molecule. Computational approaches for the discovery of natural lead structure. Strategies for development of drug from natural products using bioinformatics tools. Natural product derived pharmaceuticals.

References:

1. Modern phytomedicine (2006)
2. Medicinal chemistry (2009)
3. Integrated Approach to Nature as Source of New Drug Lead, peer-reviewed chapter, In book: Molecular Insight of Drug Design, Seema Kohli, 2018, Intechopen.

4. Innovative Approaches in Drug Discovery, Ethnopharmacology, Systems Biology and Holistic Targeting, 1st edition, Bhushan Patwardhan and Rathnam Chaguturu, 2014, Academic Press is an imprint of Elsevier.
5. Natural Products Analysis: Instrumentation, Methods, and Applications, Kindle edition, Vladimir Havlicek, Jaroslav Spizek, 2014, Wiley online library.
6. Innovative omics-based approaches for prioritisation and targeted isolation of natural products as new strategies for drug discovery, Wolfender J-L, Litaudon M, Touboul D and Queiroz EF, Natural Product Reports, 2019, 36:855-868.

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester IX

OPEN ELECTIVE - Paper 96014: B. GREEN HOUSE TECHNOLOGY

Course Objectives: ➢ Production of vegetables and flowers throughout the year or part of the year. ➢ Production of hybrid seeds, high value vegetables, ornamental plants, medicinal plant**s,** cut flowers and fruits, which fetch more prices in domestic as well as international markets.
Course Outcomes: On successful completion of this course, the students will be able to ➢ Understand the basic principles of greenhouse farming ➢ Know the different types of protected structures and its uses ➢ Acquainted with soil and climatic factors under protected condition

Unit I: Protected cultivation– International and Indian scenario of protected culture – Status of protected cultivation in Andhra Pradesh – Pros and Cons of protected cultivation. Types of protected structures– Low cost structures – Green house – Poly house – Poly tunnels – Net house – Hot beds – Cold frames – Maintenance of structures. Green house components and functions – Designs and principles used in protected structures – Features and specifications of protected structures – Materials for protected structures –Survey, structural drawing and layout plan - Levelling, and erection of protected structures – Maintenance of protected structures.

Unit II: Soil factors: Soil temperature, pH and Electrical conductivity (EC) maintenance – Micro and Macro nutrient content – Organic carbon content - Cation exchange capacity (Sodium and Ammonium Acetate, Centrifuge Method) management. Factors responsible for crop growth Environmental factors in protected cultivation: Light intensity and air temperature
- Relative humidity (RH) and CO2concentration - Air movement mechanism

Unit III: Nursery– Components of nursery - Nursery media and its properties - Perlite – Vermiculite – Sphagnum moss - Coco peat – Lay outs – Plant propagation structures; Nursery and its types, Vegetable nursery – Fruit nursery – Flower crops nursery – Methods of nursery Preparation: raised bed nursery – Portray nursery; Plant propagation- Sexual propagation, A Sexual propagation and micro propagation; Watering, Weeding and nutrient management in nursery – Pest and disease management in nursery – Common possible errors in nursery activities.

Unit IV: Protected Cultivation Techniques for Vegetable and cut flower crops- Tomato & Chrysanthemum. Protected cultivation techniques - Introduction – Varieties – Nursery preparation; Season and planting, Irrigation and weed management – Nutrient and fertilizer

management – Intercultural operations – Maturity indices – Harvesting – Postharvestmanagement. Integrated pest and disease management, Packaging and transport.

References

1. Kumar.N, Introduction to Horticulture(7 th Ed.),Oxford &IBH, 2017.
2. Brahma Singh, Balraj Singh, NavedSabir, MurtazaHasan, Advances in protected cultivation, New india publishing agency,ISBN – 10
3. Spehia.R.S&Sharma I.P, Protected cultivation for sustainable Horticulture, Specifications – ISBN : 9788121107877 / 2011 /
4. Singh.D.K,Modern vegetable varieties & Production Technology, IBDC Publi, 2007
5. Jitendar Singh, Precision farmimg in Horticulture,- New India Publishing House – February 2013. 2. Protected cultivation of high value vegetables and cut flowers – A value chain approach, ICAR, New Delhi

Web sources

i. cari.res.in/MBM-English/MBM-CARI-7 ii.www.actahort.org/books/710/710_38.htm iii.www.aphorticulture.com iv. http://www.jains.com/Protected%20Cultivation/poly%20houses.htm v. http://nhb.gov.in/pdf/Technical_Standard.pdf

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester IX

OPEN ELECTIVE - Paper 96014: C. SWAYAM/MOOCS/NPTEL

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics
Semester IX

96011P: ENVIRONMENTAL BIOTECHNOLOGY LAB

Course Objectives: ➢ Students to know the knowledge on sewage treatment. ➢ Know the knowledge on waste water treatment, Biofertilisers, biopesticides prodcution. ➢ Know the knowledge on Bioremediation. ➢ Know the knowledge on Characterization of microbes useful in biodegradable organic matter destruction.
Course Outcomes: ➢ Students learn about significant microbes in waste water treatment. ➢ Students learn about the importance of microbes in Bioremediation of Pesticides and other pollutants. ➢ Students develop skills to isolate and production of Biofertilizers (Rhizobial, free living N_2 fixers and Phosphate solubilizing bacteria) and Biopesticides and their importance and practice for large scale production.

List of practicals

1. Isolation of biofertilisers
2. Bactetriological examination of water by multiple tube fermentation test
3. Detection of coli forms for determination of the purity of potable water.
4. Methods of Water and Soil sampling and assessment of pH.
5. Determination of dissolved oxygen (DO) concentration of different water samples.
6. Estimation of CO2 and total hardness (calcium and magnesium) of different water samples.
7. Determination of Biological oxygen demand (BOD) and Chemical oxygen demand (COD) of a sewage sample.
8. Isolation of Bacteriophages from sweage sample
9. Determination of Total dissolved solids (TDS) of water sample.
10. Isolation of xenobiontics degrading bacteria by selective enrichment technique.
11. Survey of degradative plasmids in microbes growing in polluted environment.
12. Isolation and characterization of Iron and Manganese reducing bacteria
13. Study of microflora of Industrial wastes and effluents.
14. Determination of atmospheric pollutants (NOx, SOx, and particulate matters).
15. Estimation of Nitrate, Chloride, Phosphates and sulphates in drinking water.
16. Study on biogenic methane production and visit to biofuel plant

96012P: CELL SIGNALING AND CANCER BIOLOGY LAB

Course Objectives: ➢ To illustrate the cellular and molecular mechanisms that are dysregulated in cancerous cells and also cellular signalling mechanisms.
Course Outcomes:

- Students will be able to summarize the prevailing theories of cancer developmentand treatment.
- Students will be able to explain at least one type of experiment used in cancer research
- Understanding the cancer diagnosis and therapeutics.

List of practicals

1. Identification of cancer cells
2. Staining of isolated nerve fiber by silver nitrate method.
3. Staining of skeletal & cardiac muscle by methylene blue.
4. Cell proliferation assay
5. Cell signalling
6. Practical parts can consist of demonstrations of histopathological aberrations in cancer.
7. Study of cancer cell morphology
8. Determination of Cell proliferation by MTT assay
9. Determination of Cell Viability by Tryphan blue exclusion test
10. Analysis of cell cycle by flow cytometry
11. Demonstration of cell migration by wound healing assa
12. Also web-based material will be used. Seminars together with researchers will give the students the opportunity to discuss current problems within cancer research.

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester IX

96013SOC: DRUG DESIGN AND DEVELOPMENT (Theory + Lab) Skill orientatedcourse

Total marks : 100 marks Credits 4

Theory : 50 marks (Internal – 10 + Semester end – 40 marks)

Practical : 50 marks

Course Objectives:

- To provides a foundation of integrated knowledge of the multi-disciplined process of developing a new medication.
- To explore the process of drug development, from target identification to final drug registration.
- To identify and design molecules for new medications greatly shortening the discovery phase of drug development by powerful computer-based technology

Course Outcomes: At the end of course, the student

- be able to describe the process of drug discovery and development
- be able to discuss the challenges faced in each step of the drug discovery process

- have gained a basic knowledge of computational methods used in drug discovery
- It includes real world challenges encountered in the areas of discovery, development, manufacturing, global regulatory approval and commercialization ofnew medicines.

96013SOC: Theory syllabus

Unit-I

Drug design and targeting: Procedures followed in drug designing and discovery. Target identification, and validation; Assay development; Screening technologies for target; Screening and Design - Small molecule screening, Biologics, High Throughput Screening (HTS), Virtual *in silico* screening, combinatorial library screening. Molecular Docking - Types of Molecular Docking, docking algorithms and programs, Structure-based methods to identify lead compounds; de novo ligand design; Strategy for lead molecule identification, optimization and validation. Clinical candidate selection. Computer aided drug design-Molecular mechanics, designing of ligands for known and unknown receptors, various forces and chemical aspects involved in drug receptor interactions. QSAR and use of various molecular descriptors to identify structural moieties that contribute for binding and activity. Pharmacophore modelling. Optimization of target interaction. Molecular visualization software. Pro-drug.

Unit-II

Drug development – How to go from molecule to medicine. Target drug product profile. Different phases in drug development, approval and life cycle management, timelines and cost. Drug dosage forms and drug delivery. Drug bioavailability, ADMET properties prediction. Improve absorption, making drugs more resistant to chemical and enzymatic degradation, making drug less resistant to drug metabolism, targeting drugs, reducing toxicity. Points to consider in Drug Metabolism PharmacoKinetics (DMPK) at different stages in drug development. Pre-clinical toxicity (*in vitro, in vivo*) and clinical toxicity testing. Human studies, Patenting and regulatory affairs, chemical and process development, designing a manufacturing process, registration and market the drug.

References

1. Manfred E Wolff, (ed), Burger's Medicinal Chemistry and Drug Discovery, Vol – I Principles and Practice, 5th Ed., Join Wiley and Sons, 1995.
2. J. G Vinter and Mark Gardner, (Eds.) Molecular Modelling and Drug Design, The Macmillan Press Ltd., London, U.K., 1994.
3. Lachman et. al. Theory and Practice of industrial Pharmacy. Varghese Publishing house. Hind Rajasthan Building, Bombay-400014
4. Textbook of Drug Design. Krogsgaard-Larsen, Liljefors and Madsen (Editors), Taylor and Francis, London UK, 2002.
5. Drug Discovery Handbook S.C. Gad (Editor) Wiley-Interscience Hoboken USA, 2005
6. Pharmacopoeia of India, Govt. of India, Ministry of health and family welfare Delhi, 1996.
7. Greer, J., Eickson, J.W,Baldwin,JJ and Varney,MD. Application of the three- dimensional structures of protein large molecules in structure- based drug design.
8. Satya Prakash Gupta, QSAR and Molecular Modeling, Springer, Anamaya Publish,2008
9. Kuntz, I.D, Meng, EC; and shoichet, BK structure – based Molecular Design.

96013SOCP: Skill Practical syllabus

Course Objectives:

- Drug design' or 'tailor-made compound' aims at developing a drug with high degree of chemotherapeutic index and specific action.
- Drug design seeks to explain effects of biological compounds on the basis of molecular interaction in terms of molecular structures

Course Outcomes:

- Explain the major technical aspects of the drug discovery process, starting with target selection to compound screening to designing lead candidates
- Explain principles underpinning the design of new drug molecules
- understand the concept of a pharmacophore in drug-receptor interactions
- Describe and evaluate current modern drug discovery concepts (which attempt to identify high quality drug candidates) using either a target-based or phenotypic approach to tackle the related disease
- Compare multiple drug discovery tools and methods used for finding, identifying and designing a new drug
- Identify the pre-clinical steps to gain assurance that it is safe and appropriate to initiate clinical evaluation of the candidate. Recognise the commercial importance of intellectual property.

List of programmes for skill orientation

1. FILE conversion tools- OPEN BABLE.
2. ACTIVE Sites determination-CASTP server
3. Drug –receptor interactions (Molecular docking)
4. AUTODOCK
5. Chemo informatics (MOLINSPIRATION)
6. Drug Bank-Drug card analysis (DRUG BANK)
7. ADMET properties prediction
8. Target validation; Principles; HIV gp41 example.
9. Target validation through High-throughput Technologies
10. Enzymes as a drug target
11. Receptors as a drug target
12. Lead identification.
13. Drug design software
14. Drug design via enzyme inhibition
15. Ligand-based drug design and molecular visualization
16. Docking of a polypeptide ligand into a protein.
17. Docking and binding energy calculations
18. QSAR.
19. 3D-QSAR.
20. CoMFA.
21. Structure based drug designing: Target identification and Validation Protein mapping: Constructing a model protein– homology modelling, Validation of protein models– Ramachandran plot, binding site identification- Receptor Grid generation.
22. Lead Identification and Modification Practicals:

Drug discovery teams (groups of 3-4 students) will test a series of structurally related compounds to determine their affinity, potency and efficacy at the humanβ2 adrenoceptor. Radioligand Binding Assays (Week A) - The analysis of binding data obtained from cells expressing the human β2 adrenoceptor. Kinetic, saturation and competition binding parameters, eg. the dissociation constant (KD) and maximumbinding capacity (Bmax) of a radioligand; IC50 and inhibitory constants (KI) for aseries of compounds will be determined.

Functional Assay (Week B) - Functional assays measuring cAMP accumulationwill be performed to determine the potency (EC50) and efficacy (Emax) of the compounds at the human β2 adrenoceptor.

Structure Activity Relationships (Week C) - The data generated in weeks A and B will be analysed and the relationship between the structure of a compound and its affinity, potency and efficacy at the human β2 adrenoceptor will be explored.

Physicochemical properties will be calculated for each compound (such as logP, number of rotatable bonds, polar surface area) and the effect of the substituents and stereochemistry of the compounds on activity will be examined.

23. Molecular Modelling Practical - This practical will teach how to use molecular visualisation software to explore the structure and properties of small, drug-like molecules, including conformational models and superimpositions.

24. Molecular Modelling Practical: Visualisation - Students will use the same molecular visualisation software to examine protein structures, protein/ligand interactions, and DNA/ligand interactions pertinent to structure-based drug design.

25. Drawing chemical compound structure by using computer software like ChemDraw.

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester X

Paper 06011: RESEARCH METHODOLOGY

Course Objectives: ➢ Identify the essential components of research ➢ Design the various strategies involved in experimental research ➢ Recommend the importance of statistical analysis in research
Course Outcomes: At the end of course, the student can able to ➢ Build various steps involved in the conduct of proper research and writing article. ➢ Analyze systematic methods for data collection, data processing, and data analysis ➢ Evaluate statistical methods to assess the outcome of the research

Unit I

Introduction to research methodology - Define research? Basic and applied research. Significance of Research. Defining and formulating the research problem, selecting the problem, necessity of defining the problem, criteria of good research. importance of literature review in defining a problem, literature review-primary and secondary sources, reviews,

monograph, patents, research databases, web as a source, searching the web, critical literature review, identifying gap areas from literature and research database, development of working hypothesis.

Unit- II

Data collection and analysis - Formulation and Validation of hypothesis - Designing experimental techniques and Execution of designed experiments. Accepts of method validation, observation and collection of data, methods of data collection, sampling methods, data processing and analysis strategies and tools, data analysis with statically package (Sigma STAT,SPSS for student t-test, ANOVA, etc.), hypothesis testing. Data compilation and analysis - Presentation of research findings in graphs and tables.

Unit-III

Interpretation and Scientific writing - Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation. Significance of scientific report writing, Different Steps in Writing Report, Precautions for Writing Research Reports, and Conclusions. Preparation of Manuscript/Dissertation for research proposals. Introduction or review of literature, aims and objectives, Materials and methods, Result analysis – evaluation of results, statistical approach, Discussion and comparison of results, literature citation, bibliography and reference, impact factor of journals.

Unit – IV

Plagiarism; software used in plagiarism; Ethics in manuscript writing; Conflicts of interest; Copyright issues; patents; uploading of manuscript; Thesis; Dissertation; Shodhganga and its importance; Themes and role of different scientific funding agencies of India and abroad.

References

1. Kothari, C.R. (2004). *"Research Methodology (Methods and Techniques)".* New Age International (p) Ltd., New Delhi.
2. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers.
3. Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International. 418p.
4. Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, Ess Ess Publications. 2 volumes.
5. Trochim, W.M.K., 2005. Research Methods: the concise knowledge base, Atomic Dog Publishing. 270p

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester X

INTERNAL ELECTIVE - Paper 06012: A. STEM CELL BIOLOGY AND REGENERATIVE MEDICINE

Course Objectives:

- To acquire knowledge and understanding of the basic biology of embryonic and tissue-specific stem cells, the potential application of stem cell for the treatment of human diseases and different experimental approaches used to study and characterize stem cells
- Use of stem cells in the regenerative medicine and tissue engineering.

Course Outcomes:

- Extensive theoretical and practical knowledge on Stem cells and Regenerative medicine in a short period of time ¬ Wide Job opportunities in industries, companies, Universities and other laboratories
- Increases the opportunities to pursue higher studies in foreign countries
- The course prepares students for leadership in the critically important and dynamic industries of stem cells, biotechnology and pharmaceuticals

Unit I

Basics of stem cell biology: Overview, different types of stem cells, stem cell differentiation, Self-renewal of Stem Cells, Study the factors that generate stem cells and to maintain stem cells in undifferentiated, trafficking of stem cells Asymmetric Cell Division and Cellular Aging, Germ Cell Specification, Nuclear Reprogramming, Stem cell plasticity. Molecular mechanism of iPSCs reprogramming. Bioinformatics resources related to Stem cells.

Unit II

Stem cell assay protocols and stem cell therapies: Isolation of defined stem cell population, Stem cell banks, Progenitor cell assays, Flow cytometry, cell selection through MAb, Magnetic approaches to cell separation. Stem cell therapies – Clinical applications – neurodegenerative diseases Human embryonic stem cells - Generation of human embryonic stem cell lines; ES cells a tool to study cellular & molecular mechanisms of disease. Use of embryonic stem cellsfor drug testing.

Unit III

Regenerative Medicine: Define regenerative medicine, Importance in medicine, Organogenesis Hematopoietic and Vascular Stem Cells, Mesenchymal and Cardiac Stem Cells Pancreatic and Liver Regeneration, Neural Stem Cells.

Unit IV

Tissue engineering: Embryonic Stem Cells role in tissue engineering, and their Ethics, Hematopoietic Stem Cells and Transplantation, Cancer Stem Cells, Cell and Gene Therapy, Scaffolds for tissue regeneration

References:

1. Nature Insight "Stem Cells," edited by Natalie Dewitt, Nature 414, 87-131, 2001.
2. Cogle, C. *et al.* (2003) An overview of stem cell research and regulatory issues. Mayo Clin Proc 78(8): 993-1003

3. Stem cell basics and application" Ed. By K. D. Deb and S. M. Totey, Tata McGraw Hill Pvt. Ltd, 2011.
4. "Hand book of Stem Cells" Edited by RoberLanza, Elsevier, Academic Press, 2011.
3. "Stem Cells Handbook", Edited by Stewart Sell, Human Press, 2010.

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester X

INTERNAL ELECTIVE - Paper 06012: B. NANOBIOTECHNOLOGY

Course Objectives: ➢ To provide basic knowledge on nanoparticles, synthesis and characterization methods and their biomedical applications.
Course Outcomes: ➢ Students acquire knowledge on different types of nanoparticles and motivate towards Nanobiotechnology. ➢ Students develop knowledge on various nanoparticles synthesis methods, characterization techniques and advanced biomedical applications of Nanotechnology. ➢ Students also get basic knowledge on the concepts of nanotoxicology. ➢ To give an insight into complete systems where nanotechnology can be used to improve our everyday life.

Unit-I

Introduction to Nanobiotechnology: Definitions, history of nanotechnology; motivation for nanotechnology; nanoparticles - properties, and types, bionanomaterials and properties. Different formats of nanomaterials and applications with example for specific cases. Calculating the size and concentration of nanoparticles.

Unit-II

Nanoparticles fabrication – micro and nanolithocraphy; characterization – structurally (XRD, TEM, SEM, ECASA, EDAX, STM, AFM, Zeta potential), chemical and optical characterization (UV-Vis); Vibrational characterization (FTIR, Raman). Outline design of enzyme reactors based on nano-structured materials; Use of biological organisms (biological methods) for nanoparticle synthesis, Magneto tactic bacteria for synthesis of magnetic nanoparticles; Viruses as components for the formation of nanomaterials – VLPs, VNPs; Roleof plants in nanoparticle synthesis.

Unit-III

Nanobiotechnology and its advanced biomedical applications covering topics like medical nanorobotics, artificial organ, DNA chip, smart bomb for cancer, nanodiagnosis, treatment nanosystem for heart; nanosurgeries; Nano drug delivery system, nanobiotechnology for HIV virus and its diagnosis and treatment; Cancer diagnosis and treatment through nanotechnology. Nanotechnology for tissue regeneration. DNA based nanodevices.

Unit-IV

Nanoparticles as molecular labels and imaging applications. Nanodevices for sensing and therapy. Environmental and safety aspects of nanotechnology, Potential Health Impact of

Nanoparticles, Nanosensors, nanobiolistics. Nanotribology, Nanomedicine - Preclinical and clinical considerations of nanomedicines, overview of current clinical nanomedicines, Regulations of nanomedicines for human health. Concept of nanotoxicology.

References

1. Nanotechnology: Understanding Small Systems, Third Edition. Ben Rogers, Jesse Adams, Sumita Pennathur. 2017 by CRC Press
2. Nanostructures and Nanomaterials: Synthesis, Properties and Applications, Guozhang Cao Imperial College Press, 2004
3. Introduction to Nanoscience and Nanotechnology. Gabor L. Hornyak, H.F. Tibbals, Joydeep Dutta, John J. Moore. 2008 by CRC Press
4. Medical Nanotechnology and Nanomedicine Harry F. Tibbals. 2010 by CRC Press
5. Nanoparticles in Translational Science and Medicine, Volume 104, 1st Edition, 2011, Academic Press
6. Nanobiotechnology & Nanobiosciences, Claudio Nicolini, 2009, Pan Stanford Publishing, Ltd.

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester X

Paper 06012: C. AGRICULTURAL BIOTECHNOLOGY

Course Objectives: ➢ To understand the significance of advances in plant and agricultural biotechnology ➢ To understand the ways in which biotechnology can be utilized for human welfare
Course Outcomes: ➢ The students will understand the principles and applications of agriculture biotechnology. ➢ Students will become familiar with plant tissue culture and recombinant DNA technology and its application in crop improvement ➢ Students will acquire knowledge to develop climate resilient crops.

Unit I:

Production of commercially useful compounds by cell culture Secondary plant products useful to mankind; cultured plant cells and tissues as a source of secondary products; cell line selection and commercial production of pharmaceutically important compounds using cell culture techniques; physical and chemical factors that influence the production of secondary metabolites in vitro; biotransformations using cell culture methods; production and use of biopesticides.

Unit II:

Agriculturally important microorganisms and their application. Molecular aspects of beneficial plant microbe association. Types of plant microbe association; symbiotic and other beneficial associations, pathogenic association; Molecular biology of Agrobacterium Infection, Molecular biology of Rhizobium infection. Plant mycorrhizal association in plant improvement; plant mycorrhizal and the molecular mechanism of antagonistic process.

Unit III:

Introduction to biotic and abiotic stress; Biotic stresses – viral resistance, bacterial resistance, fungal resistance, insect resistance; Abiotic stresses – drought tolerance, salt tolerance, temperature tolerance, submergence tolerance, photooxidative stress.

Unit IV:

Biotechnology for crop improvement Conventional methods for crop improvement; tissue culture in crop improvement; genetic engineering in for increasing crop productivity by manipulation of photosynthesis, nitrogen fixation, nutrient uptake efficiency; Genetic engineering for abiotic stress tolerance; Molecular breeding; plants as bioreactors (production of antibodies and pharmaceuticals in plants). Biofuels, Golden rice for ß-carotene accumulation; Current status of transgenics, biosafety norms and controlled field trails and release of transgenics (GMO's).

References:

1. Principles of plant breeding by Robert W allard
2. Plant cell, tissue and organ culture Applied and fundamental aspects by Bajaj and Reinhard
3. Plant tissue culture and biotechnology by W Barz

YOGI VEMANA UNIVERSITY

5 years Integrated *M. Sc.*, Biotechnology and Bioinformatics

Semester X

06011MPD: MAJOR PROJECT/DISSERTATION

Course Objectives: ➢ To utilize the knowledge on the relevance, basic concepts and importance of research projects to perform a research project. ➢ To utilize the understanding of the research methodology concepts to successfully complete a short-time, experiment-based research project
Course Outcomes: ➢

Duration of project - 3 months

Students are required to carry out a research project of 3-4 month duration related to Biotechnology and bioinformatics. Arrangements could also be made to pursue research studies at institutions other than the relevant faculties of Yogi Vemana University. In such circumstances, the student is assigned with two supervisors: an internal supervisor from the panel of teachers and an external supervisor from the institution where the research project is carried out. After completion of project, students have to submit their project dissertation to the Yogi Vemana University, Kadapa and also to be given project viva and presentations in thepresence of departmental board (internal) and external examiner.

Paper No.	Title of paper	Marks in semester end exam	Internal marks for exam	Total marks
06011 MPD	Major Project Individual project Viva- voce	 200 100	 100 -	 300 100
		300	100	400

MODEL QUESTION PAPER

5 Year M.Sc., Degree Examinations 2018 (Model Paper)
Semester: VI
Subject: Biotechnology and Bioinformatics

Paper 66012: Genetic Engineering

Time: 3 Hours Max marks: 75 Marks

Part – A
Answer any FIVE (5) questions.
Each question carries Three (3) marks (5X3=15)

1. Isolation of mRNA
2. RAPD
3. pUC19
4. Charan phases
5. Adapters
6. Gene gun method
7. Taq promoters
8. His tag

Part B Answer
all questions.
Each question comes FIFTEEN (15) Marks (4 X15=60)

9. Discuss about the restriction endonucleases properties, classification, and nomenclature.

OR

10. Describe in detail about the Sangers dideoxy chain termination method.

11. Give detailed account on the vectors used cloning of genes in plants.

OR

12. Explain about the supervectors.

13. Describe the genomic library preparation.

OR

14. Discuss about the methods used in the screening and identification of positive clones.

15. Write about the factors influencing the expression of recombinant proteins.

OR

16. Describe the production of insulin through recombinant DNA technology.

MODEL QUESTION PAPER

5 Year M.Sc., Degree Examinations 2018 (Model Paper)
Semester: VI
Subject: Biotechnology and Bioinformatics

Paper 96013SOC: DRUG DESIGN AND DEVELOPMENT

Time: 2 Hours Max marks: 40 Marks

Part – A
Answer any TWO (2) questions.
Each question carries Three (3) marks (5X2=10)

1. Biologics
2. QSAR
3. DMPK
4. Ames test

Part B Answer
all questions.
Each question comes FIFTEEN (15) Marks (2 X15=30)

9. Discuss about procedures used in drug design and discovery.

OR

10. Describe in detail about the lead identification and validation.

11. Give detailed account on the different phases used in drug development.

OR

12. Explain about the drug manufacturing process design and production of drug.

5 Year M.Sc., Degree Examinations 2018 (Model Paper)

Semester: X

Subject: Biotechnology and Bioinformatics

Paper 06011: Research methodology

Time: 3 Hours Max marks: 100 Marks

Part – A

Answer any FIVE (5) questions.

Each question carries four (4) marks (5X4=20)

1. Origin of problem
2. Peer reviewed journal
3. Impact factor
4. Evaluation of results
5. GMO
6. Legal aspects of biotechnology
7. WIPO
8. Patenting

Part B

Answer ALL questions.

Each question comes twenty (20) Marks (4 X20=80)

9. Discuss about the literature survey for identification of problem and formulation of hypothesis.

OR

10. Describe the preparation of manuscript for publication in scientific journal.

11. Give detailed account on the experimental design for any research work.

OR

12. Explain the methods of evaluation and presentation of results.

13. Describe the social, and ethical issues of biotechnology.

OR

14. Explain the implications of biotechnology in health, environment, food and sustainable agriculture.

15. Discuss about the IPR definition, classification and importance in science and technology.

OR

16. Describe the global and Indian Biodiversity Act.

YOGI VEMANA UNIVERSITY: KADAPA
DEPARTMENT OF BIOTECHNOLOGY & BIOINFORMATICS

Pre PhD Examination Syllabus Paper

I: RESEARCH METHODOLOGY

UNIT – I:

Characteristics of Research –definition, steps in research process, selection of research problem, literature survey, hypothesis, Designing experimental techniques for validating the hypothesis, Execution of designed experiments, presentation and interpretation of research data, preparation of abstract/technical report/manuscript for publication in peer reviewed scientific journals, research proposal preparation for grants.

UNIT – II:

Ethical and legal aspects in biotechnology, Bioethics and Biosafety regulations. IPR, importance of IPRs in the field of science and technology, patenting, Indian patent Act, Regulatory mechanisms in releasing GMO's, Global and Indian biodiversity Act, WTO, GATT, TRIPS.

UNIT – III:

Techniques: Isolation and separation of cell organelles and macromolecules, Principles and application of centrifugation (Preparative, analytical). Chromatography principles and applications (GLC, Gel filtration, affinity, ion exchange, HPLC and FPLC). Electrophoresis (agarose gel, PAGE, 2D gel). Spectrophotometric principles and application (UV-Visible, MS,NMR). X-RD.

UNIT- IV

Biostatistics – collection, classification and tabulation of data. Importance of statistics in biology, principles of experimental design, normal distribution test, significance, analysis of variance (ANOVA), F-test, T-test. Correlation and regression analysis.

UNIT – V:

Bioinformatics definition, history and application of Bioinformatics in Biology. Sequence date bases and their use: NCBI, EMBL, DDBJ, protein sequence data bases: UNIPROT, PDB, PIR. Sequence database searching tools: FASTA, BLAST. Sequence Alignment: Pairwise and multiple Sequence Alignment (MSA) (CLUSTALW). Phylogeny: phylogenetic tree.

References:

1. Concepts in Biotechnology – Balasubramanyam.D
2. From Genes to Clones, Introduction to Gene Technology- Winnacker, Ernst.L
3. Safety, Moral, Social and Ethical issues related to genetically modified foods –
4. Molecular Biology and Biotechnology – Meyer R A
5. Biotechnological Innovations in Environmental Management – Leach and VanDam
6. Modern Practical Experimental Biochemistry – Rodney Boyer

YOGI VEMANA UNIVERSITY: KADAPA
DEPARTMENT OF BIOTECHNOLOGY & BIOINFORMATICS

Pre PhD Examination

Paper I: Research Methodology

(Model question paper)

Time: 3 hours Max. Marks: 100

Answer all questions Each question carries 20 marks

Unit – I

1. Write down the steps involved in designing and execution of an experiment after formulation of hypothesis

(OR)

2. How will you prepare a research proposal for obtaining grants? Name the national and international funding agencies who support for research in biotechnology.

Unit – II

3. Describe the ethical and legal aspects of biotechnology

(OR)

4. What is IPR? Write its importance in the field of science and technology

Unit – III

5. Describe the methodology involved in protein isolation and purification

(OR)

6. Discuss the principle and applications of mass spectroscopy.

Unit – IV

7. Describe analysis of variance (ANOVA)

(OR)

8. Discuss the importance of statistics in biotechnology

Unit – V

9. Write down on multiple sequence alignment

(OR)

10. How will you construct the phylogenetic tree?

YOGI VEMANA UNIVERSITY: KADAPA
DEPARTMENT OF BIOTECHNOLOGY & BIOINFORMATICS

Panel of examiners for paper setting and evaluation for 5 Year M Sc

Eligibility:
Any Government university teacher (Professor, Associate Professor and Assistant Professor) or Institution Scientist are eligible for paper setting, evaluation and conducting practical examinations for 5 Year Integrated Biotechnology & Bioinformatics course.

Panel of examiners for paper setting and evaluation for Pre-Ph.D examination and Ph.D Thesis evaluation

Eligibility:
Any Government university teacher (Professor, and Associate Professor) or Institution Scientist (Above Scientist D cadre) are eligible for paper setting & evaluation of Pre-Ph.D examinations and also for thesis evaluation and conducting Viva-voce in Biotechnology & Bioinformatics course as per university norms.

BOS, CHAIRPERSON & CONVENER
(DR. K. RIAZUNNISA)

MBA & MBA(HRM)

I Semester

MBA 12001: PRINCIPLES OF MANAGEMENT

Course Objective: On successful completion of the course the students should have :

a. To familiarize the students with management theory, functions, principles and practices of management.

b. Learnt the scientific decision making process and problems and solving techniques and also learn the modern trends in management.

Learning Outcomes;

- Management principles deal with human traits and, hence, are employed creatively.
- Planning functions of management provide a very useful way of classifying the activities of managers engaged in as they attempt to achieve organizational goals
- Understand the role of top, middle and lower levels of management
- Describe the qualities of a good leader
- A good management control system stimulates action by spotting the significant variations from the original plan and highlighting them *for* the people who can set things right

Unit-I : INTRODUCTION Management-Concept, Significance, Principles and Functions-Management and Administration, Managerial Roles –Managerial Skills- social responsibility of business, Management by Objectives(MBO) Management Thought.

Unit-II: PLANNING AND ORGANIZATION

Planning-Nature and Process of Planning- Types of Planning - Characteristics of sound plan-Decision Making-Nature of Decision Making-Process and Techniques-Organization-Levels -Organization Structures-Staffing Policies-Line and Staff Relations–Delegation, Centralisation and Decentralisation.

Unit-III : STAFFING

Nature and Importance of Staffing – Man power Planning, requirement and Selection – Personal Characteristics needed by Managers

Unit –IV: DIRECTING

Directing Techniques of Direction –Leadership-Leadership styles, Functions of a Leader, Qualities of Leader - Communication-Types of Communication-Motivation-Need Theories.

Unit-V: CONTROL

Controlling-System of controlling- Methods, Tools and Techniques of control-Making Controlling Effective-Organising process-Departmentation Types-Making Organising Effective.

Reference Books

1. Agarwal R D Organisation and management – Tata McGrawhill.

2. Koontz and Weichrich Essentials of management – Tata McGrawhill

3. Aswathappa K. Human Resource and personnel Management, Text and cases-Tata McGrahills.

4. Sherlekar- S.A Management – Himalaya publishing house.

5. Robbins Stephen.p and Mary coulter – management – PH1 publisher.

MBA 12002 - ORGANISATIONAL BEHAVIOUR

Course Objective: This course is designed to enable the students to understand the concepts, theories, processes and dynamics of human behavior in Organizations.

Learning outcomes: On completion of the course, the student will be able to understand the concepts and theories of organisation behaviour. He will be able to understand the importance and role of group dynamics, motivational theorems, organisational culture, organizational change and organisational development.

UNIT – I Organisational Behaviour: Meaning – Importance – Nature and Scope – Approaches – Key elements – Challenges and opportunities for O.B. – Contributing disciplines to O.B. – O.B. Models.

UNIT – II Individual: Individual Behaviour - Perception – Process, factors influencing perception – barriers in perceptual Accuracy – enhancing perceptual skills – Attribution - Learning – characteristics, theories and principles of Learning. Motivation – Theories of Motivation – Maslow, Herzberg, David Mcclelland and Porter and Lawler - Personality – Stages of Development, determinants of Personality.

UNIT – III Group Dynamics: Meaning, Determinants of group behaviour and types of groups – Group Dynamics – frame work of group behaviour. Developing inter – personal relations, Transactional Analysis – Johari Window.

UNIT – IV Organisational Culture: Organization Design, culture and climate. Creating an ethical organizational culture – Conflicts – Meaning, conflicts at individual, group and organisational level – sources of conflicts – functional and dysfunctional aspects – Strategies for conflict resolution.

UNIT – V Organisational Change: Organisational Change – change management and its dimensions, process. Pressures for change – resistance to change – overcoming resistance to change. Approaches to manage Organizational Change – Lewin's and Kotter's Plan for Implementing Change. – Organisational Development.

Suggested Books:

1. Fred Luthans, ***Organisational Behaviour,*** Tata McGraw Hill.
2. Stephen P.Robbins, ***Organisational Behaviour,*** Pearson Education, New Delhi, 2006.
3. Aswathappa.K., ***Organisational Behaviour*** , Himalaya Publishing House, New Delhi.
4. Donald R.Brown& Don Harwey, ***An Experimental Approach to Organisational Development,*** Pearson Education.
5. Sarma V. s. Veluri, Organisational Behavour, Jaico Publishing House.
6. Paton McCalman, ***"Change Management"***, Sage Publications.
7. VenkataRatnam, ***"Negotiaed Change",*** Sage Publications.
8. Jai, B.P.Sinha, ***"Culture and Organisational Behaviour"***, Sage Publications.
9. Arun Kumar N Meenakshi., Organisational Behavour, Vikas Publishing House.
10. Keith Davis & John Newstrom, *Human Behaviour at work*, Mc-Graw Hill.

MBA 12003 – BUSINESS COMMUNICATION

Course objective: To train students to enhance their skills in written as well as oral Communication. This course will help students in understanding the principles & techniques of business communication.

Outcome: after completion of the course, students will be able to knowledge on written ond oral communication, role of communication in business, models of communication, presentations etc.,

Unit - 1: Fundamentals of Communication : communication definition - Objective of Communication – The process of Human communication, Types of Communication – formal and in formal communication –verbal and non verbal communication- types of verbal communication; Communication barriers –Overcoming Barriers; Understanding Cultural Effects of Communication -Listening Skills- Role of communication in Business

Unit- 2: Managing Organizational Communication – Formal and Informal Communication – Intra and Personal Communication – Models for Inter personal Communication – Exchange theory – Johari window and Transactional Analysis.

Unit - 3: Business writing skills – Significance of Business Correspondence, Essentials of Effective Business Correspondence – Business Letter and Forms- E-mail – Memo – Reports and Proposals; Oral Presentations – Meetings- Minutes of Meeting, Media management; Use of Technology in Business Communication, Seminars, workshop, conferences, Business etiquettes.

Unit- 4: Managing motivation to influence interpersonal communication – Inter-personal perception – role of emotion in inter personal communication – gateways to effective interpersonal communication; Emotional intelligence- charecteristics

Unit-5: Time Management – Goal Setting – Time log – Self Awareness – Self Motivation Effective presentation and Interview Skills: Art of giving interviews in relation to placement appraisal interviews in selection and placement – Appraisal interviews – Exit Interviews – Web/ video conferencing and Tele-Conferencing.

Suggested Books:

1. K. Bhardwaj, Professional Communication, IK Int. Pub. House, New Delhi.
2. Krizan, Merrier, Logan and Williams, Effective Business Communication, Cengage, New Delhi.
3. HC Gupta, SG Telang, Business Communication, Wisdom, Delhi
4. Penrose, Business Communication for Managers, Cengage , New Delhi
5. McGrath, Basic Managerial Skills for All 5thEdtion, Prentice Hall of India.
6. Urmila Rai & S.M. Rai, Business Communication, Himalaya Publishers
7. Meenalshi Raman – Business Communication Oxford University Press
8. Lesikar I Flatley, Basic Business Communication, Tata McGrw Hill.
9. Bovee and Thill: Business Communication Today, MacGraw-Hill, Second Edition
10. Guffey M. E.: Business Communication Process & Product, Thompson, South – Western

MBA 12004: MANAGERIAL ECONOMICS

Course objectives:

The course is designed to impart knowledge of the concepts and principles of Economics, which govern the functioning of a firm/organization under different market conditions. The course aims at enhancing the understanding capabilities of students about macro-economic principles and decision making by business and government. This course will enlighten the students to apply various techniques of economics in embracing business challenges

Learning outcomes: Relation of Managerial Economics with other disciplines and its relationship with management; understand the demand for and supply of the firm's products; Managerial decision under different market conditions; Importance of Production function; Causes and consequences of Inflation

Course Layout:

Unit- I

Introduction: Nature, scope, uses, relation with traditional economics, operations research, Mathematics, Statistics, Accounting; responsibilities of a managerial economist, objectives of a firm, Basic tools in Managerial Economics: Opportunity cost principle, Incremental principle, principle of time perspective, discounting principle, Equi marginal principle.

Unit-II

Demand and Supply: Law of demand: Demand determinants, assumptions, exceptions, demand schedule, demand curve, demand function, types of demand, demand foresting methods; elasticity of demand: price, income, cross, promotional; Law of supply: determinants of supply, kinds of supply elasticity.

Unit-III

Market Structure and Pricing Practices: Market structure: perfect, monopoly, Duopoly, monopolistic, oligopoly, monopsony, oligopsony; profit: role of profit, theories of profit; break even analysis (theory & Problems): assumptions, managerial uses, limitations, margin of safety, profit-volume analysis; pricing methods, dumping

Unit-IV

Production and Cost analysis: Production function: with one, two and all variable inputs, Cobb-Douglas, CES production functions, managerial uses of production function; Economies of scale: internal, external; types of cost.

Unit-V

Capital Management & Business Decisions: Techniques of traditional and modern investment appraisal (theory &Problems); Business Cycles: characteristics, phases, Inflation types, causes, effects, National income: measures, concepts; The multiplier, Acceleration principle, Fiscal policy: objectives, tools, monetary policy: objectives, instruments.

Reference Books

1. Managerial Economics Theory and Applications. Dr D.M. Mithani, Himalaya publishers

2. Managerial Economics R.L Varshny, K.L Maheshwari, sultan Chand publishers

3. Managerial Economics analysis, problems P.L Mehatha, sultan Chand publishers
4. Managerial Economics D.N Dwivedi, Vikas Publishers

MBA 12005: RESEARCH METHODOLOGY AND BUSINESS ANALYTICS

Course Objective: On successful completion of the course the students should familiarize with doing research work and analysing big data which helps management in taking decisions.

Learning outcomes: On successful completion of the course the student will be able to:

- Identify the overall process of designing a research study from its inception to its report.
- Apply appropriate analytical methods to find solutions to business problems that achieve stated objectives.
- Calculate and interpret the correlation between two variables.
- Calculate the linear regression equation for a set of data and know basic assumptions behind regression analysis.
- Explore small and large sample data to create testable hypothesis and identify appropriate statistical tools.

Unit-I

Introduction: Meaning and Definition of Research, Nature and importance of research the role of business research, aims of social research, research process, Quantitative and Qualitative Research, Types of Research, Research design, Importance of Research Planning, Meaning of research design, Functions and goals of research design, Pilot study and case study, Concepts of a Research plan, Induction and Deduction method, Snapshot studies, cross sectional and longitudinal studies. Sources of data, Sampling techniques, Report writing.

Unit- II

Measures of Central Tendency and Dispersion, Skewness and Kurtosis-Correlation Analysis: Types of correlation, scatter diagram, limits for coefficient of correlation, Karl Pearson's coefficient of correlation, Spearman's rank correlation, Properties of Correlation, Regression analysis: concept, least square fit of a linear regression, two lines of regression, Multiple Regression, Properties of regression coefficients.

Unit- III

Statistical Inference: Hypothesis Testing:- Introduction, Types of hypothesis, procedure for testing of hypothesis, Types of Errors in testing of hypothesis- One tailed and Two tailed tests of hypothesis. Tests of significance for small samples: - application, t-test, F-Test, Chi-square test, ANOVA one way and two-way classifications.

Unit – IV

Business Analytics : Introduction, Evolution of Business Analytics – Differences between Business Intelligence and Analytics – Business Analytics Life Cycle, Process – Business Analytics as Solution for Business Challenges; Introduction to Excel, SPSS, R and Python.

Unit – V

Master Data Management: Data Warehousing – Data Mining – Meta Data – Data Marts - Data Integration – Concept of OLTP and OLAP.

Reference Books

1. N.D. Yohra,2001, Quantitative Techniques in management, Tata McGraw Hill, 2ndnedition.
2. Barry Render, Ralph M. Stair, Jr. and Michael E. Hanna, 2007, Quantitative analysis for management, 9th Edition, Pearson publication
3. Gupta S.P. Statistical Methods. Sultan chand and sons, New Delhi.2005
4.C.R.Kothari, Research Methodology: Methods and Techniques,2/e,Vishwa Prakashan, 2006.
5. William G. Zikmund, Business Research Methods, Thomson, 2006.
6. Carver & Nash, Data Analysis with SPSS, Cengage, New Delhi
7. James R. Evans, Business Analytics Methods, Models and Decision, Pearson, 2015

8. Shashi K. Gupta & Praneet Rangi Kalyani Pub. Business Analytics
9. Sahil Raj, Business Analytics, Cengage Learning India Pvt.Ltd., 2015.

MBA 12006 – ACCOUNTING FOR MANAGERS

Course Objective: The Objective of the course is to provide the basic knowledge of book keeping and accounting and enable the students to understand the Financial Statements and make analysis financial accounts of a company.

Course Outcomes: Upon Successful completion of the course, students will be able to

- Understand the fundamentals of financial accounting, the principles and concepts underlying them.
- Construct the financial statements viz., the Income Statement and Balance Sheet
- Gain practical knowledge on valuation tangible and intangible assets
- Exploit the issue and forfeiture of shares.

UNIT-I:

Introduction: Book-Keeping – Branches of Accounting – Systems of Accounting –Objectives of Accounting – Importance of Accounting - Users of Accounting Information - Principles of Accounting – Accounting concepts – Accounting conventions – Role of computers in Accounting.

UNIT-II:

Accounting Process: Double Entry System of Accounting – Classification of Accounts – Accounting cycle – Journal – Ledger – Trial balance - Manufacturing account - Trading and profit and loss account - Balance sheet with adjustments.

UNIT-III:

Valuation of Tangible Assets Concept of Depreciation – Purpose – Causes – Methods of depreciation – Fixed installment method – Diminishing balance method – Sum of year's digits method - Annuity method.

Valuation of Inventory – Concept - Objectives – Methods of taking inventories - Inventory valuation methods – Simple average method – Weighted average method - FIFO method – LIFO method.

UNIT-IV:

Valuation of Intangible Assets: Concept of Goodwill, Patents, Copyrights, Trademarks, R&D costs – Methods of valuation of goodwill – Average profit method – Super profit method – Capitalization method – Annuity method.

UNIT-V:

Issue of Shares: Meaning – Classification of shares – Equity shares – Preference shares –Issue of Shares for cash – For consideration other than cash - Entries for Issue of shares - Shares issued at par, premium and discount – Forfeiture of Shares.

Reference Books

- S.N. Maheswari, Accounting for Managment, Sultan Chand Publishing House Pvt. Ltd.

- Jain S.P, Narang K.L and Simmi Agarwal, "Accounting For Managers", Kalyani Publishers, New Delhi.
- Wild. J.J., Subramanyam, K.R. Halsey, R.F., Financial Statement analysis, Tata McGraw Hill.
- Narayana Swamy, "Financial Accounting: A Managerial Perspective", Pearson Education.
- Prasad, G. " Financial Accounting and Analysis" Jai Bharat Publishers, Guntur.
- Ramachandran and Kakani, " Finanical Accounting for Management", TMH, New Delhi.
- Prasad, G. "Accounting for Managers", Jai Bharat Publishers, Guntur.

MBA 12007: INFORMATION TECHONOLOGY FOR MANAGEMENT

Course Objective : The primary objective of this course is to familiarise the student with basic concepts of information technology and their applications to business processes. To elevate students' awareness of information technology and develop an in depth and systematic understanding of key aspects of IT Management.

Learning Outcomes: On successful completion of the course the student will be able to:

- Identify the overall structure and process of computer system and its type and application in management,
- Work withMS-Office tools like MS-Word, Ms-Excel and MS-Powerpoint for personal use and office use,
- Understand the Management Information System concepts and SDLC process and DSS and GDSS concepts
- Familiarise with the Information Technology tools and trends in present day scenario.

UNIT - I

Introduction : Basics of Computers - Major components of a computer system –- Types of Computers – Organisation System of Computer - Operating Systems: Definition, Functions, Types and Classification – Introduction to MS-Office – Features and Applications of MS–Word - – Types of Menus – Home – Insert – Design – Layout – References – Mailing – Review and View menus. (Theory and Practicals)

UNIT - II

MS-PowerPoint : Introduction - Features – Slide Creation – Slide Layouts – Slide Preparation – Slide Sorting – Slide Formatting – Home – Insert – Design – Animation – Slide Show – Review – View menu Options – Slide Show - Applications of MS-PowerPoint - Writing programs using menus. Introduction to MS-Excel : Introduction – Features – Advantages – Limitations. Menus in MS-Excel : Home – Insert – Page Layout – Formulas – Data – Review – View Menu Options. (Theory and Practicals)

UNIT - III

Introduction: System : Definition - Types of System - Information System : Types – Management Information System (MIS) : Meaning – Importance – Need - Characteristics – Organizational Structure of MIS – Role of the Management Information System – Applications of MIS**.** Tools and Techniques for System Development **- System Development Life Cycle (SDLC) :**Stages in developing SDLC.**Concept ofDecision Support System (DSS) :** Meaning – Architecture – Characteristics – Components – Concept of Group Decision Support System (GDSS) – Components. (Theory only)

UNIT - IV

Functional Information Systems : The Major Business Systems – Basic Elements of a Business organization -Marketing Information System – Concept – Components – Architecture - Financial Information System – Concept – Components – Architecture - Human Resource Information System – Concept – Components – Architecture(Theory only)

UNIT - V

Information Technology Tools and Trends : Concepts of IT : Multimedia - Image processing systems and Document Management Systems – Tools of IT - Trends in IT – Techniques of IT –Applications of IT – e-Business and e-Commerce tools and techniques – ERP - Introduction – Advantages and Limitations – EDI Technology. (Theory only)

REFERENCE BOOKS

1. RohitKhurana, Introduction to Information Technology, Pearson Education.
2. ITL education: Introduction to Computer Sciences, Pearson Publishers
3. Hunt and Shelly: Computers and commonsense, PHI publishers.
4. Dhiraj Sharma, Information Technology for Business, Himalaya Publishing House.
5. Kenneth C. Laudon and Jane P. Laudon: Management Information System, Eighth edition Prentice Hall of India.
6. Jawadekar W.S., Management Information System, TaTa McGraw Hill Publishing Company Limited, New Delhi.
7. James A.O Brien: Management Information Systems, TaTa McGraw Hill Publishing Company Limited, New Delhi.
8. Effy OZ, Management Information System, Vikas Publishing House.
9. Gordon B. Davis and Margrethe H. Oison, Management Information System, TaTa McGraw Hill Publishing Company Limited, New Delhi.
10. C.S.V. Murthy: Management Information System, Himalaya publishing House.

MBA 12008 – HUMAN VALUES AND PROFESSIONAL ETHICS

Course Objective : To create awareness, Conviction and commitment to Values and Ethics for improving the quality of life through education and for advancing social and human well being.

Learning Outcomes: After completion of the course the students learns about morals, Values, work ethics and learns to respective ethics and develop civic virtue.

UNIT – I

Definition and Nature of Ethics – Its relation to Business and Environment. Need and Importance of Professional Ethics – Goals – Ethical Values in various Professions – Ethical theories about right action.

UNIT –II

Nature of Values – Good and Bad, Ends and Means, Actual and potential Values, Objective and Subjective Values, Analysis of basic moral concepts – right, ought, duty, obligation, justice, responsibility and freedom, Good behavior and respect for elders – moral development theories.

UNIT – III

Value education – definition and its relevance to present days – Concept of human values – self introspection – self esteem – family values – components – structure – and responsibilities of family – neutralization of anger – adjustability – threats of family life-Time allotment for sharing ideas and concerns.

UNIT –IV

Business ethics –Ethical standards of business – Immoral and illegal practices and their solutions – characteristics of ethical problems in management – causes of unethical behavior – ethical abuses and work ethics.

UNIT – V

Environmental and social ethics: ethical theory, man and nature, ecological crisis issues related pollution, waste, climate change, energy and population, social issues – human rights violation and social disparities.

References:

1. R.S. Naagarazan –A TEXT BOOK ON PROFESSIONAL EHICS AND HUMAN VALUES – New age International (p) Ltd.
2. M.Govindarajan, S. Natarajan, V.S. Senthil Kumar – PROFESSIONAL ETHICS & HUMAN VALUES.

3. R.R.Gran, R.Sangal, G.P. Bagania – FOUNDATION COURSE IN HUMAN VALUES & PROFESSIONAL ETHICS.
4. Jayashree Suresh, B.S. Raghavan – HUMAN VALUES AND PROFESSIONAL EHTICS.

II SEMESTER

MBA 22001: MARKETING MANAGEMENT

Course Objective: The course is designed to obtain knowledge and understanding of the key concepts of marketing and enables to apply to the practical situations in the workplace.

Learning Outcomes: On successful completion of this course, the students would be familiarized with the fundamentals of marketing, nuances and complexities involved in product and pricing decisions, skills needed to take better distribution decisions and promotion-mix decisions and will be able to understand emerging trends in marketing to take proactive measures in the present cutthroat competition.

Unit-I

Introduction to Marketing: Definition, Nature, Scope and importance of Marketing – Marketing Concepts – Marketing Vs. Selling –Marketing Mix- Marketing Environment: Meaning, Significance of Scanning Marketing Environment, Components of Micro environment, Macro environment.

Unit-II

Analysing Marketing opportunities: Consumer behaviour-Meaning- factors influencing buying behaviour-consumer decision making process, Segmentation: Need- Benefits - Bases of segmentation, Target market, Product differentiation, Product Positioning, Marketing Research: Concept - Objectives - types - Process – Merits and Demerits.

Unit-III

Developing Marketing Strategies: Concept of Product- Product Classifications- Product Mix- New Product development - Product Life Cycle, Designing Marketing Strategies for: Market leaders – Challengers - Followers and Nichers – Ansoff matrix, Branding: Essentials of a good brand - types of brands, Packaging and labelling.

Unit-IV

Planning Marketing programs: Objectives - factors affecting pricing decisions- pricing methods- Pricing Strategies for existing products and new products.Channels of Distribution: Definition, Need and Types of Channels, Channel Management Decision – Retailing – Types of Retailers – Retailer Marketing Decisions – Trends in Retailing, Wholesaling.-The growth and types of wholesaling – Wholesaler Marketing Decisions – Trends in Wholesaling, Other forms of distribution.

Unit-V:

Marketing Communication: Concept – importance – Promotional Mix: Advertising - Sales promotion - Personal Selling - Public Relations – Recent trends in Marketing: Social Marketing – Ambush Marketing – Green Marketing – Emotional Marketing – `Digital Marketing.

Reference Books

1. Marketing Management, R.S.N Pillai, Bagavathi, S.Chand
2. Business Marketing Management: B2B, Hutt & Speh, Cengage Publisher
3. Marketing Management Text & Cases, Indian Context Tapan K Panda, Excel Publisher
4. Principles of Marketing Kotler Armstrong PHI Publisher

5. Marketing Management, Rajan Saxena .TMH Publisher

MBA 22002: PRINCIPLES OF HUMAN RESOURCE MANAGEMENT

Course Objective: To equip the students with basic concepts, methods, techniques and issues of Human Resource Management and the various functions of HRM including Quality of Work Life in the liberalized environment.

Learning Outcomes:

On completion of this course, the students will be able

1.To develop the understanding of the concept of human resource management and to Understand its relevance in organizations.

2. To develop necessary skill set for application of various HR issues.

3. To analyse the strategic issues and strategies required to select and develop manpower resources.

4. To integrate the knowledge of HR concepts to take correct business decisions.

UNIT - I: Human Resource Management Introduction: Concept and Functions of Human Resource Management; Approaches to Human Resource Management; Evolution of HRM in India; HRM and Environment; Organizing the HR Unit; Line and Staff Relationship; Policies and Procedures; Planning HR activities; Controlling HR Function.

UNIT – II: Procurement: Organizational Design and Job Design; Job Analysis; Job description; Job specification; Human Resource Planning ; Recruitment: Sources of Recruitment; Selection Procedure (including e-recruitment and selection procedure) and Induction.

UNIT – III: Training and Development: Workers training; training process; training methods; Management Development Programs; Performance appraisal Methods and Problems; Talent Management; Career Planning and Development.

Unit IV: Employee Compensation: Factors affecting compensation; Equity and Compensation; Job Evaluation; Variable Compensation; Fringe Benefits; Motivation of employees; Quality of work life; Trade Unions; Collective Bargaining; Conflict Management.

Unit V: Maintenance: Communication and Counseling; Employee Welfare; Employee Health and Safety; .Separation: Turnover, Retirement, Lay Off, Retrenchment; Discharge; Dismissal and V.R.S. ;Maintenance of HR Data Base; HR Research; HR Audit; HR Accounting.; Challenges and Opportunities in the Globalized Era; Outsourcing of HR functions.

Suggested Books

1.Personnel Management, Flippo, Edwin B, McGraw Hill Publishing Company..

2.Personnel Manaement Text and Cases C.B. Mamoria, Himalaya publications

3.Human Resource Management text and cases V.S.P. Rao, Excel Books.

4.Human Resource Management Text and cases K. Aswathappa, Tata McGraw-Hill

5.Human Resource Management Garry Dessler, Pearson Education.

6. Human Resource Management - Dr. C.B. Gupta - Sultan and Sons.

7. Personnel & Human Resource Management - P. Subba Rao - Himalaya Publishing House.
8. Personnel Management & Human Resources - C.S. Venkata Rathnam & B.K. Srivastava. Tata McGraw-Hil

203– FINANCIAL MANAGEMENT

Course Objective: The Course aims at familiarizing the participants with the skills related to basic principles, tools and techniques of Financial Management.

Course Outcomes: Upon Successful completion of the course, students will be able to

- Practically understand and follow day-to-day developments in financial management
- Develop an attitude of integrative thinking while analyzing and interpreting financial statement and accounting information
- Develop the skill of evaluating the projects using capital budgeting techniques
- Construct the optimum capital structure of the organization
- Critically evaluate the working capital requirement of the business firms
- Able to understand dividend theories and its valuation.

UNIT–I

Foundations of Finance: Introduction to Finance - Nature and scope of Financial Management - Functions – Goals - Profit Vs Wealth; Agency Conflict- Role of financial manager**. (Theory Only)**

UNIT-II

Financial Statement Analysis: Meaning – Classification – Tools - Trend analysis – Comparative statement analysis – Common-size statement analysis – Ratio analysis - Funds flow statement analysis . **(Theory & Problems)**

UNIT-III

Financing Decisions: Sources of Finance – Short term sources – Long term sources. Leverage analysis – Operating leverage – Financial leverage – Combined leverage. Capital structure decisions – Factors determining Capital Structure -Tools for designing optimum capital structure – EBIT-EPS analysis – Financial BEP and Indifference Curve analysis – CAPM - Capital Structure theories – Net Income Approach – Net Operating Income Approach – M-M Hypothesis – Traditional Approach. Cost of Capital – Elements of Cost of Capital – Measurement of Cost of Capital – WACC. **(Theory & Problems)**

UNIT-IV

Investment Decisions: Nature and significance of Investment Decision – Estimation of Cash Flows – Steps in Capital Budgeting Process – Evaluation techniques – Traditional techniques – Payback period – ARR - Discounted Cash Flow techniques – NPV – Profitability Index – IRR – Discounted Payback Period - The NPV Vs IRR Debate. **(Theory & Problems)**

Liquidity Decisions: Concepts and characteristics of Working Capital –Approaches of working capital - Factors determining the working capital - Operating cycle –Methods of estimating working capital requirements. **(Theory & Problems)**

UNIT-V

Dividend Decisions: Meaning – Forms of dividends - Concept of relevance and irrelevance theories – Walter's Model – Gordon's Model – MM Hypothesis – Factors determining Dividend Policy. **(Theory Only)**

Reference Books

1. I.M. Pandey, "Financial Management", Vikas Publishing, 2007.
2. M.Y Khan & P.K. Jain, "Financial Managemengt, Text and Problems", TMH, New Delhi.
3. Prasanna Chandra, "Financial Management: Theory and Practice", TMH, New Delhi.
4. Bruner. R.F., "Case Studies in Finance", Tata McGraw Hill, New Delhi.
5. Managerial Finance, Gitman L.J.,11th Edition, Pearson Education 2006.
6. Principles of Corporate Finance, Richard A Brealey etal., Tata McGraw Hill 2007.
7. Corporate Finance: Theory and Practice, Vishwanath.S.R.2007, 2/e, Sage Publications.
8. Financial Management – Text and cases, Bringham & Ehrhardt, Cengage, 2005.
9. Case Studies in Finance, Bruner.R.F.2007, 5th Edition, Tata McGraw Hill, New Delhi.

MBA 22004: PRODUCTION MANAGEMENT

Course Objective: The Objective of the course is to enable students to understand the production Planning and Controlling aspects of a typical production and operations organization.

Learning outcomes: Core features of Production Management function, gaining knowledge to run work systems effectively, analyzing various facility alternatives, Plan and implement suitable quality control measures in quality circles, better understanding of modern production tool.

Course Layout:

Unit I

Production System: Meaning, Classification of Production system: Intermittent(project,job,batch),continuous(mass,process);Responsibilities of Production Manager; Differences and similarities between manufacturing and service operations; Product design: Characteristics of good product design; Approaches to product design (Quality function deployment, Concurrent engineering, Ergonomics, Value engineering); Productivity: types, importance, influencing factors; production planning: tactical, operational, strategic; Maintenance management (including problems):objectives, types.

Unit II

Design of Work System: Work study: benefits, work study procedure; Method study: objectives, method study procedure, process charts; Work Measurement (including problems): benefits, techniques of work measurement.

Unit III

Flow shop scheduling: Shop floor planning (including problems): Johnson's rule, extension of Johnson's rule, CDS Heuristics; Inventory management: objectives, Inventory control techniques (including problems); Facility location: errors in selection, relative importance of location factors; facility layout: factors influencing facility layout, types of layout.

Unit IV

Quality Management: relevance of quality control, impact of poor quality, statistical process control: acceptance sampling for variables and for attributes, control charts (including problems) for variables and for attributes; Six Sigma: types of six sigma belts, benefits; quality circles; vendor analysis.

Unit V

Modern production management Tools: Just in time manufacturing: wastes in production process, benefits; push and pull production system, Kanban system; ISO 9000 series: -benefits, steps in ISO 9000 registration; Business process reengineering: characteristics, steps in implementing BPR, advantages; Lean manufacturing: steps, components,

Reference Books

1.Production Management, Martand T. Telsang S. Chand Publishers

2.Production and Operations Management K. Aswathappa, K.Shridhara Bhat Himalaya Publishing House

3.Production and Operations Management R. Pannerselvam PHI publishers

4.Production and Operations Management S.N Chary McGraw Hill

5.Production and Operations Management -Text and cases Upendra Kachru, Excel Books

MBA 22005: OPERATIONS RESEARCH

Course Objectives: This module aims to impart knowledge to students the concepts and tools of operations research, understand mathematical models used in operations research and apply these techniques constructively to make effective business decisions.

Learning outcomes: On completion of the course the student will be able to:

- Formulate real-world problems as a linear programming model and describe the theoretical working s of the graphical, simplex and Big-M methods, demonstrate the solution process by hand and solver.
- Formulate transportation and assignment problems and describe theoretical workings of the solution methods for transportation and assignment problems, demonstrate solution process by hand and solver.
- Design and solve PERT/CPM.
- Simulate different real life probabilistic situations using Monte Carlo simulation technique.
- Apply the knowledge of game theory concepts to articulate real-world decision situations for identifying, analyzing, and practicing strategic decisions to counter the consequences.

Unit-I

Definition, Importance of Operations Research for Management, Nature of Operations Research, Scientific method in operation research, Characteristics and phases of Operations Research, Classification of models, Principles of modeling, Problem models of Operations Research, scope and limitations. Linear programming: formulation, terminology, applications of LPP, advantages and limitations of LPP Graphical solutions, Simplex method, Big-M method and two phase method.

Unit-II

Transportation problem:- General TP, Transportation table and loops, formulation, optimal solutionof a TP, finding an IBFS, Degeneracy in TP, Transportation algorithm(Modi method),unbalanced transportation problem. Assignment problem:- Mathematical formulation of the assignment problem, Traveling salesman problem, solutions, differences of transportation and assignment problems , Hungarian method, unbalanced assignment problem .

Unit-III

Network Analysis:- Activity, merge event, burst event, looping, dangling, Redundancy, project Management by PERT/CPM, project crashing, PERT analysis and Computations, differences of PERT/CPM.

Unit-IV

Game theory:- concepts, Characteristics, pay off matrix, maximin- minimax principle, saddle point, Dominance, Zero-sum game, two, three and more persons games, analytical method of solving two person zero sum games, mixed strategies of S_A ,S_B and value of the game, graphical solutions for (m×2) and (2× n) games, linear programming method of simplex method in game theory, Iterative method

Unit – V

Simulation:- Meaning – Definition of Simulation – Types of Simulation – Advantages and Disadvantages of Simulation – Event Type of Simulation – Monte – Carlo Simulation – Generation of Random Numbers – Simulation of Queuing System – Simulation of an Inventory System – Simulation Languages.

Reference Books

1, Shenoy, G.V. Srivastava, V. K. and Sharma S.C., "Operations Research for Management".
2. Kantiswaroop, Man Mohan and Gupta, Operations Research.
3. Goel and Mittal, Operations Research.
4. Sharma S.K. k.,Operations Research.
5. Hamdy, A. Taha:Operations Research: An introduction, prentice Hall of India New Delhi, 2007.
6. R.Panneerselvnam PHI 2nd Ed. Operations Research

MBA 22006 – BUSINESS ENVIRONMENT

Course Objective: The present course aims at familiarizing the students with various aspects of economic, social, political and cultural environment of India. This will help them in gaining a deeper understanding of the environmental factors influencing Indian business organizations and also the students understand the legal and regulatory framework for doing business in India.

Learning Outcomes: On completion of the course, the student would

- Be aware of dimensions of the Business Environment.
- Analyse the impact of culture and technology on business.
- Explain the economic trends and effect of Government policies as LPG.
- Be acquainting with the various legal frame works in India pertaining to Business.

UNIT – I Business Environment: Meaning – Importance – Nature – Environmental Factors – Changing the dimensions of Business environment – monitoring techniques of environmental scanning

UNIT – II Socio – Cultural and Technological Environment: Elements of Socio – Cultural Environment: Impact on Business – Culture and Sub culture pattern – Social responsibility of business – Technology up gradation – technology transfer – Technological Policy.

UNIT – III Economic and Political Environment: Significance and elements of economic environment – economic system – economic planning in India – Industrial Policy – New foreign trade policy – liberalization – privatization and globalization – Demonetization – Monetary and Fiscal policy – EXIM policy – critical elements of political environment.

UNIT –IV Legal Environment of Business: Political Institutions – Legislature, Executive and Judiciary – Changes of Legal Environment in India – Intellectual Property Rights – Major regulations pertaining to business.

UNIT – V Business Legislations: Consumer Protection Act 1986 – SICA Act – 1985 – FEMA Act 1999 – IT Act 2000 – Competition Act 2002 – MSME Act 2006.

Suggested Books:

1. Francis Cherunilam, ***Business Environment***, Himalaya Publishing House, Mumbai.
2. Fernando, A.C., ***Business Environment***, Pearson.
3. Suresh Bedi, ***Business Environment,*** Excel Books, New Delhi,
4. Adhikary.M. ***Economic Environment of Business***, Sultan Chand & Sons, New Delhi.
5. Aswathappa.K., ***Essentials of Business Environment***, Himalaya Publishing House, Delhi.
6. Justin Paul, ***Business Environment***, Text and Cases, Tata McGraw Hill.
7. Krishna Rao,P, ***WTO-Text & Cases***, PSG Excel Series.
8. R.S.N. Pillai and Bagavathi, "***Legal Aspects of Business***", S.Chand, New Delhi.
9. H.L.Ahuja, "***Economic Environment of Business"*** S.Chand, New Delhi.
10. G.Prasad, ***Business and Corporate Laws***, Jai Bharathi Publishers.

MBA 22007: DYNAMICS OF LEADERSHIP

Objectives: The course is aimed at equipping the students with necessary concepts and techniques to develop effective leadership skills to attain objectives of the enterprise in a conducive environment.

Outcomes: After completion of the course the student will be able to inspire, influence, guide and lead others to participate and attain the common goal.

Unit -I

Introduction: meaning, nature and importance, impact of leadership on organizational performance, leadership roles, types of leadership, framework for understanding leadership, traits, motives and characteristics of leaders.

Unit -II

Effective Leadership behavior and attitude: Task-related attitudes and behavior, Relationship oriented attitudes and behavior, 360-degree feedback for fine-tuning a leadership approach,

Unit-III

Leadership styles – classical leadership style, boss-centered Vs employee-centered leadership continuum, the autocratic, participative, free-rein continuum, the leadership grid style, the entrepreneurial leadership style, gender difference in leadership style, selecting the best leadership style, Leadership theories

Unit-IV

Developing team work: team leadership vs. solo leadership, advantages and disadvantages of group work and team work, the leader role in the team-based organization, leader actions that foster teamwork, outdoor training and team development, the leader- member exchange model and teamwork.

Unit-V

Leadership development: development through self-awareness and self-discipline, development through education, experience, and mentoring, leadership development programs, evaluation of leadership development efforts, leadership succession.

Text books

1. Andrew J. DuBrin, Leadership, Biztantra, New Delhi.
2. Gary Yukl, Leadership in organizations, Pearson Education, New Delhi.

OPEN ELECTIVE

MBA 22008: TALENT AND KNOWLEDGE MANAGEMENT

Course Objective: The main objective of this paper is to enable the students understanding the significance of Talent and Knowledge Management in today's business scenario.

Learning Outcome:

Students will be able to understand

1. Talent Management Process
2. Knowledge management aspects
3. Knowledge management assessment and solutions

Unit – I: Introduction : Meaning and importance of talent management, Designing and building a talent reservoir, Segmenting the Talent Reservoir, Talent Management Grid, Creating a talent management system, Institutional strategies for dealing with talent management.

Unit – II : Competency Management : Meaning, characteristics, types–Steps in developing a valid competency model, Talent management information systems; Developing a talent management information strategy, Role of leaders in talent management.

UNIT-III: Introduction to KM & Role of IT: Meaning & Importance of Knowledge Management, Data–information - Knowledge - Wisdom interrelationship, Organizational knowledge: Characteristics and components of organizational knowledge, Building knowledge societies, Role of Information Technology in Knowledge Management System.

UNIT-IV: Future of Knowledge Management & Industry Perspective: knowledge management in manufacturing and service industries, Knowledge management in finance, Knowledge management in marketing, Business ethics and Knowledge Management, Challenges and future of knowledge management.

UNIT-V: Knowledge Management Process: Stages of Knowledge Management process, Knowledge Capital vs. Physical Capital, Knowledge Management Strategies, Factors influencing Knowledge Management, Web portals, Information architecture – Net banking in India.

Suggested Books

1. Sudhir Warier, "Knowledge Management", Vikas Publishing House Pvt. Ltd.
2. Thorne & Pellant, "The Essential Guide to Managing", Viva Books.
3. Stuart Barnes(Ed) "Knowledge Management Systems". Cengage Learning.\
4. Ed by Lance A. Berger and Dorothy R Berger. "The Talent Management Handbook", 2004, Tata McGraw Hill edition.
5. Ed by Larry Israelite, "Talent Management", ASTD Press.
6. Sajjad M Jasmuddin, "Knowledge Management", 1st ed, 2009, Cambridge.
7. Stuart Barnes, "Knowledge Management Systems", Ed, Cengage Learning
8. Donald Hislop, "Knowledge management in Organizations", 2009, Oxford University Press, Second edition.

MBA 22009: FUNDAMENTALS OF BUSINESS MANAGEMENT

Course Objective: The course aims to acquaint with fundamentals of management and various functional areas of management.

Learning Outcome:

- To Apply elements of effective decision making to areas that are central to career development
- To have an understanding of the basic concepts, and processes of communication
- To obtain knowledge and understanding of the key concepts of marketing and enables to apply to the practical situations in workplace
- To strategically plan for the human resources needed to meet organizational goals and objectives
- To aim at familiarizing the participants with the skills related to basic principles, tools and techniques of Financial Management

Unit – I:

Fundamentals of Management: Concept – Significance – Functions – Principles - Role and Responsibilities of a Manager – Management is an Arts Or Science – Concept of MBO – Management vs Administration – Advantages - Limitations.

Unit-II
Introduction to Business: Concept - Nature – Features – Types of Business – Business Vs Trade – Business Communication and its importance – Goal setting – Types of Strategies.

UNIT – III:
Marketing Management: Concept of Marketing –Nature – Scope – Distinction between Marketing and selling – Marketing Mix – Steps in New Product Development – Product life Cycle – Process of Marketing Research – Marketing Strategies – e-Marketing – Social Marketing.

UNIT-IV:
HRM: Concept – Nature – Objectives – Significance - functions – Role of HR Manager – HR Planning – Recruitment Process – Sources of Recruitment – Methods of Recruitment – Job Induction – Job Description - Job Specification – Job Analysis – Job Evacuation Process – Training and Development – Career Planning and Development Methods – Leadership – Motivation – Stress Management.

UNIT- V:
Financial Management: Concept – definitions – Nature – Scope – Objectives – Significance – Financial Decisions – Sources of Finance – concept of Cost of Capital Importance – classifications of costs – Computation of Specific Source of fund cost – WACC Concept of working capital Management – Objectives – Sources of W.C – Kinds of W.C – Components of W.C – Importance – Operating cycle – Cash Conversion cycle – Estimation of working capital – Dividend Policy – Issue of Dividend and Bonus Shares.

Reference Books:
1.Philip Kotler, Marketing Management, Pearson Education.
2.Heinz Weirich and Harold Koontz, Management, TMH.
3.I.M.Pandey, Financial Management, Vikas Publishers.
4.Garry Dessler, Human Resource Management, Pearson Edition.

III SEMESTER

MBA 32001: BUSINESS LAW

Course Objective: The course aims to acquaint students with various laws governing business operations in India.

Learning Outcomes: On completion of this course, the students would be able to learn thoroughly about the general contracts, understand the contracts relating to the sale of goods, use negotiable instruments in practical life and familiarize with the legal frame work regarding forms of business association and income taxation.

Unit – I

The Indian Contract Act – 1872: Nature of a Contract - Classification of Contracts - Essentials elements of valid Contract — Capacity of parties – Free Consent – Performance of Contract - Discharge of Contracts – Breach of Contract and its Remedies.

Unit – II

Sale of goods Act – 1930: Meaning of Contract of Sale of Goods- Essential Elements of Contract of Sale, Conditions and Warrantees; Performance of Contract of Sale, Unpaid Seller: Concept - Rights of Unpaid Seller. **Indian Partnership Act – 1932**: Elements of partnership - Constitution of Partnership - Forms of partnership - Types of partners– Rights, Duties and Liabilities of Partners. The LLP Act, 2008: Meaning, formation and LLP vs. partnership firm.

Unit- III

Negotiable Instruments Act – 1881: Meaning - Characteristics– Promissory Note – Definition- Characteristics, Bills of Exchange: Definition – Characteristics – difference between promissory note and Bill of exchange, Cheque: Definition – Characteristics – differences between Cheque and Bill of exchange – Crossing of Cheque - Types of Endorsements, Electronic funds transfer terminology– NEFT, MICR, RTGS, and CTS.

Unit-IV

The Companies Law: Meaning of a company - Characteristics - Types of Companies – Steps and Procedure for incorporation of the Company – Memorandum of Association - Articles of Association – Shares: Meaning- Types of Shares, Directors: appointment- removal -powers, duties and responsibilities- Company management: Meetings – types, kinds of meetings- Resolutions- types-minutes, Winding up of a company.

Unit –V

Income Tax Act – 1961(Theory only):Meaning – Characteristics - Purpose of Income Tax, Terminology of Income Tax: Income- person-Assesse- Assessment Year- Previous year , Gross Total Income , Advance Payment of Tax , Tax Deducted at Source.

Reference Books

1. Bansal, C.L., Business and Corporate laws, 1st Edition, Excel Books, 2006.
2. S.K Maheswari, S.N., Maheswari, A Manual of Business Law, Himalaya Publishing House, 2006.
3. Lal, B.B., & Vashisht, N., Direct Taxes, Latest Edition, Pearson Education, 2009.
4. Kapoor, N.D., Mercantile law, Sultan Chand & Sons, 2006

MBA 32002: TOTAL QUALITY MANAGEMENT

Course Objectives: This course is designed to learn the fundamentals of Total Quality Management with emphasis on quality philosophies and tools in the managerial perspective.

Learning Outcomes:
1. Summarize the Total quality principles.
2. Demonstrate the tools utilization for quality improvement.
3. Analyze the various types of techniques are used to measure quality.
4. Describe the dimensional barrier regarding Quality.
5. Apply the various quality systems in implementation of Total quality management.

UNIT- I: Total Quality Management: Meaning & Definitions of quality, Need for quality, quality Evolution, Dimensions of quality, Basic concepts of total quality management, Principles of TQM, Service Quality , Customer Satisfaction , Gurus of TQM, TQM Framework.

UNIT- II: Management Tools: Forced Field Analysis – Affinity Diagram – Just in time –Quality Circles – Cost Benefit Analysis – Flow Charts – Run and Control Charts – Check Sheets – Histograms – Scatter Diagrams – Cause and Effect Analysis – Process Simulation.

UNIT- III: Tools for Quality: Benchmarking – Quality Function Deployment – Quality By Design – Failure Mode and Effect Analysis – Total Productive Maintenance – ISO 9000 – ISO 14000 and ISO 18000.

UNIT- IV: Six Sigma: Definition --– Competitive Advantage -- Implementation of Six Sigma – Design for Six Sigma and Tools.

UNIT- V: Business Process Reengineering: Introduction, Meaning & Concerpt of Business Process Reengikneering — Principles and applications of Business Process Reengineering – The Reengineering Process –Benefits and Limitations of Business Process Reengineering..

Suggested Books:

1. Besterfiled, D.H. “Total Quality Management”, Pearson Education, Inc. 2003.
2. Zeiri., “Total Quality Management for Engineers”, Wood Head Publishers, 1991.
3. Evans, J. R., and Lidsay, W.M., “The Management and Control of Quality”, 5th Edition, South-Western (Thomson Learning), 2002.
4. Oakland.J.S. “Total Quality Management”, Butterworth – Hcinemann Ltd., Oxford, 1989.
5. Narayana V. and Sreenivasan, N.S., “Quality Management – Concepts and Tasks”, New Age International, 1996.
6. Kanishka Bedi., “Quality Management”, Oxford University Press, 2006.

INTERNAL ELECTIVE

Marketing Specializations (From 311 to 313)

MBA 32311: SERVICES MARKETING

Course Objectives: After successfully completing this course, students will be able to explain the unique challenges of services marketing, including the elements of product, price, place, promotion, processes, physical evidence, and people. Design service quality measurements to build customer loyalty and evaluate the effectiveness and efficiency of customer service offerings.

Learning Outcomes: On successful completion of the course students will be able to;

- Demonstrate an extended understanding of the similarities and differences in service based and physical product based marketing activities,
- Demonstrate knowledge of the extended marketing mix for services,
- Develop and justify marketing planning and control systems appropriate to service-based activities,
- Familiarize with the steps in new service development process
-

Unit-I

Services Marketing : Concept – Characteristics - Classification of Services – Difference between services and goods – Contribution of services sector to the Economy; Trends in service Marketing ; Consumer behavior: Consumer purchase behaviors ; Evaluation of service alternatives –Customer satisfaction – Past purchase evaluation by customer.

Unit-II

Focus on the Consumer: Consumer Perception of Service, Building Customer Relationship, Service Recovery, Developing Services Marketing Mix: Service Product – Pricing in services – Service Promotion - Place in service – Role of People in Service Marketing – Physical Evidence of Service.

Unit-III

Service Quality: Meaning – Dimensions in Service Quality – Measurement of Service quality – Gap analysis in service quality – Benefits of Service quality; Customer Retention and customer loyality, Claim Settlement, reinsurance

Unit-IV

Marketing Planning for Services : Strategic Planning process; Bebefits of Marketing Planning for Services; Problems in Marketing Planning, Managing demand supply – Forecasting Demand and Measurement – Reshapping the demand – Ques and the associated Problems- Yield Management.

Unit – V

Aligning Service Design and Standards: Service Innovation and Design – Challenges, types of Service Innovations, Stages in Service Innovation and Development, Service Blueprinting, High performance service innovations, new Service Development Processes, Customer defined service standards –factors, types end development.

Reference Books

1. Christopher Lovelock, services marketing People, Technology, Strategy, Pearson Education.
2. RajendraNargundher, Services Marketing, McGraw Hill Publications.
3. Adrian Payne, The Essence of Service Marketing, Prentice Hall of India.
4. Ram Mohan Rao, Services marketing, Pearson Education.
5. Roland T. Rust, Anthony J. Zahorick and timothy i. Keilninghan, Services Marketing, Addison Wesley.
6. Bhatacharya, Services Marketing, Excel Publications.
7. VasanthiVenugopal& Raghu V.N.Services Marketing Himalaya Publishing House.
8. GovindApte, Services Marketing, Oxford University Press.

9.ValarieA.Zeithaml&mary Jo-Bitner; Service Marketing – Integrating Customer focus across the firm, TMH , Fifth Ed.2011
10.VinnieJauhari, KirtiDutta: Services-Marketing, Operations and Management, Oxford University Press 2012.

MBA 32312: SALES AND DISTRIBUTION MANAGEMENT

Course Objective: The Objective of the course is to enable students to understand sales aspects of a company and its effective distribution levels

Learning outcomes: Students with Marketing Specialization start their career in sales, business development, retailers, whole salers and distributors handling, it is essential to study basics of personal selling, sales management, distribution dynamics, various channels of distribution etc. Through this course, students will be equipped with basic skills required in sales and distribution management.

Course Layout:

UNIT 1

Nature and Scope of Sales Management; Objectives and functions of Sales management; Modes of sales presentation, Designing and delivering of sales presentation; Managing of sales territory, Objectives and Types of Quotas, Quota setting procedure; Recruiting and selecting Sales Personnel

UNIT 2

Developing Sales Training Programmes, Executing and Evaluating sales training programmes; Motivating Sales Personnel; Compensating sales personnel, Designing and Administering various Compensation Plans

UNIT 3

Buyer-Seller Dyads, Diversity of Personal-selling Situations, Theories of Selling; The Sales Budget

UNIT 4

Structure, Functions of Distribution channels and Relationships of channels of Distribution; Retailing, wholesaling, Franchising; Channel Design Process and Channel Management Decisions

UNIT 5

Market Logistics objectives, Components of logistics – warehousing decisions, Transportation decision, Inventory management decisions; Concept of EOQ, ROP, JIT.

Reference Books:

1. Sales Management: Decisions, Strategies & Cases, Richard R. Still, Edward W. Cundiff, Norman A.P. Govoni, Pearson Education, Latest Edition

2. Sales Management: Concepts Practice, and Cases, Johnson F.M., Kurtz D.L., Scheuing E.E., Tata McGraw- Hill, Latest Edition

3. Selling & Sales Management, David Jobber, Geoffrey Lancaster, Pearson Education, Latest Edition

4. Sales Management, Tanner, Honeycutt, Erffmeyer, Pearson Education, Latest Edition

5. Sales Force Management, Mark W. Johnston, Greg W. Marshall, Tata McGraw-Hill, Latest Edition

6. Still, R R. & Cundiff; Sales Management, Englewood Cliff, New Jersey, Printice Hall Inc.,

MBA 32313: RURAL MARKETING

Course Objectives: To help the students understand and appreciate the differences and similarities between urban and rural Indian markets. To make them understand and develop marketing strategies those are unique to rural India

Learning outcomes:
As a subject it will fulfill the needs of the students in understanding the process of activating factors of production, dispersal of economic activities, development of rural and tribal areas, and active involvement in the process of growth. It helps in understanding variety of challenges and strategies to satisfy the rural consumers.

Unit-I

Rural Marketing – Definitions, Scope and Significance – rural Vs Urban Marketing – Growth of Urban and rural Areas – Role of rural Marketing in Economic Development.

Unit – II

Consumer Profile and Behavior Patterns – Rural Consumer Characteristics and influences – Buying Models – Segmentation – Positioning –

Unit - III

Marketing Research Techniques in Rural Marketing. Product Strategy – Decisions with Rural Orientations and Branding – Packaging Decisions

Unit – IV

Spurious products – Innovation, Diffusion and Adoption – launching of Ne

w Product in rural Areas – Pricing Strategies.

Unit – V

Promotion Strategy – Promotional Mix with Rural Orientation – Strategies of Product Selling, Sales promotion and Publicity – Rural Advertising.

Reference Books

1. C.S.G. Krishnamacharyulu and R. Lalitha, Rural Marketing: Text and Cases, Pearson Education.

2. Sukupal Singh, Rural Marketing Management, Vikas Publications.

3. Bide & Badi, Rural Marketing, Himalaya Publications.

Finance Specializations (From 321 to 323)

MBA 32321: COST ACCOUNTING FOR MANAGEMENT

Course Objective: The primary objective of this course is to familiarize the student with basic concepts, practical experience of Cost Accounting and it's support to Management in decision making process. To elevate the students' knowledge in practicing the problems of cost Accounting and it's relevance to cost control system in any organisation**.**

Learning Outcomes: On successful completion of the course the student will be able to:

- Understand the Cost concepts, classification, advantages and limitations cost accounting,
- Analyse the methods and techniques of costing,
- Comprehend the applications of Operating costing and
- Familiarise with the cost management techniques and reports.

UNIT - I

Single/ Output/ Unit Costing: Introduction - Cost Concepts – Nature and Significance – Objectives –Need - Classification of Costs – Elements of Cost – Direct Material – Direct Labor – Overheads – Preparation of Cost Sheet and Tender – Advantages of Cost Accounting – Limitations of Cost Accounting –Differentiate Cost Accounting with Management Accounting and Financial Accounting - Process of Installing Cost Accounting System - Scope of Cost Accounting. (Theory and Problems)

UNIT - II

Methods of Costing: Introduction - Types; **Process Costing:** Meaning – features – Applications – Normal and Abnormal Losses – Process Accounts with Stocks; **Contract Costing** : Features – Procedure for preparation of Accounts in Contract costing – Calculation of profit on Contracts. (Theory and Problems)

UNIT - III

Techniques of Costing : Introduction - Decisions involving Alternative Choices : Make or Buy Decisions – Replacement Decisions - Shutdown or Continue Decision ; **Standard Costing** : Concept and Need – Types of Standards – Advantages of Standard Costing; **Variance Analysis** - Types of Variances – Problems on Materials Variance andLabour Variance. (Theory and Problems)

UNIT – IV

Operating Costing : Concept – Applications – **Transport Costing** : Concept, Applications and Problems – **Power House Costing** : Concept, Applications and Problems – **Hotel Costing** : Problems and Applications.

UNIT – V

Uniform Costing : Meaning – Need and Objectives – Scope –Areas of Uniform Costing – Pre-requisites for installation of Uniform Costing - Applications ; Uniform Costing manual – Procedure for Inter-firm Comparison – Advantages and limitations; **Cost Management Techniques** : Cost Control and Reduction – Meaning - Cost Control Techniques – Cost Reduction Tools and Techniques – Cost Reporting : General Principles – Classification of Reports – Forms of Reports (Theory only).

REFERENCE BOOKS

1. Ravi M. Kishore, Cost and Management Accounting, Taxmann Allied Services Pvt. Ltd., New Delhi
2. Saxena V.K. and Vashist C.D., Advanced Cost and Management Accounting, Sultanchand and sons, New Delhi
3. Arora M.N, Cost and Management Accounting:, Himalaya Publishing House Pvt. Ltd., Hyderabad.
4. Maheswari S.N, Accounting For Management, Sultan Chand Publications Pvt Ltd., New Delhi.
5. PrashantaAthma, Cost and Management Accounting, Himalaya Publishing House.

MBA 32322: TAXATION MANAGEMENT

Course Objective: To acquire conceptual and legal knowledge about Income Tax provisions relating to computation of Income from different heads with reference to an Individual Assessee

Course Outcomes: At the end of the course, the student will able to;

- Acquire the complete knowledge of the tax evasion, tax avoidance and tax planning.
- Understand the provisions and compute income tax for various sources.
- Grasp amendments made from time to time in Finance Act.
- Compute total income and define tax complicacies and structure.
- Prepare and File IT returns of individual on his own

Unit-I:

Introduction to Income Tax Act-1961: Concept of Income, Agricultural Income, Casual Income, Gross Total Income , Total Income, Person, Assessee - Assessment Year, Previous Year, Rates of Tax, Residential Status of an Individual - Incidence of Tax – Incomes Exempt from Tax **(Theory only).**

Unit-II:

Income from Salaries: Basis of Charge, Tax Treatment of Different Types of Salaries, Allowances, Perquisites, Profits in Lieu of Salary, Deductions from Salary Income, Computation of Salary Income of an individual assessee. **(Theory & Problems)**

Unit-III:

Income from House Property: Basis of charge - Annual Value, Let-out/Self occupied/Deemed to be let-out house - Deductions from Annual Value - Computation of income from House Property. **(Theory & Problems)**

Income from Business and Profession – Procedure for computation of income from business – Revenue and Capital Nature of Incomes and Expenses – Allowable Expenses – Expenses Expressly Disallowed – Computation. **(Theory & Problems)**

Unit-IV:

Income from Capital Gains: Meaning of Capital Asset – Types – Procedure for Computation of long-term and short-term capital gains/losses. **(Theory only)**

Computation of taxable income under the head 'Income from other sources' - General Incomes – Specific Incomes. **(Theory only)**

Unit-V:

Tax Assessment of an Individual: Deductions under Section 80. Tax Rates in respect of individuals, Computation of Tax Liability of an individual. **(Theory only)**

Tax Management: Tax deduction at source - Advance payment of tax - Tax evasion- Tax avoidance and tax planning. Preparation and filing of income tax return - Manually and on-line. **(Theory only)**

Reference Books:

1. Dr. Vinod; K. Singhania; Direct Taxes – Law and Practice, Taxman Publications
2. T. S. Reddy and Dr. Y. Hari Prasad Reddy - Taxation , by Margham publications
3. Premraj and Sreedhar, Income Tax, Hamsrala Publications
4. B.B. Lal - Direct Taxes; Konark Publications
5. Dr. Mehrotra and Dr. Goyal -Direct Taxes, Law and Practice, Sahitya Bhavan Publication.
6. Balachandran&Thothadri- Taxation Law and Practice, PHI Learning.
7. V.P. Gaur and D.B. Narang - Income Tax, Kalyani Publications
8. Dr Y Kiranmayi - Taxation, Jai Bharath Publishers, Guntur.
9. Income Tax, Seven Lecture Series, Himalaya Publications

Suggested Co-Curricular Activities:

- Seminar on different topics of Income tax
- Quiz programs
- Problem Solving Exercises

- Debate on Tax Evasion and Avoidance
- Practice of provisions of Taxation
- Visit a Tax firm
- Talk on Finance Bill at the time of Union Budget
- Guest lecture by Chartered Accountant
- Presentation of tax rates
- Practice of filing IT Returns online
- Group Discussions on problems relating to topics covered by syllabus
- Examinations (Scheduled and surprise tests)

MBA 32323: FINANCIAL MARKETS AND DERIVATIVES

Course Objective: The objective of this course is to make students efficient in the area of financial markets and derivatives, giving them the knowledge of basics in derivatives, future markets, option strategies to enlighten the students with the concepts and practical application of derivatives.

Course Outcomes: Upon Successful completion of the course, students will be able to

- Understand the role and functions of financial markets
- Evaluate the working of stock exchanges
- Understand conceptual framework of the Derivative Markets.
- Familiar with forward and future contracts and its valuation
- Determine options pricing using Binomial and Black schools options pricing Models.
- Analyze various types Swaps.

UNIT-I

Financial Markets: Meaning – Classification – Money market – Money market instruments – Capital market – Primary market – Capital market versus money market. **(Theory Only)**

Stock Exchanges: Meaning – Importance – Functions – Advantages – Limitations – BSE – NSE – Listing of securities – Objectives – Speculation in stock exchanges – Classification of speculators – Types of speculation – Role of SEBI – Securities trading system – Types of orders – Stock market operations – Trading settlements – Stock market quotations – On-line broking. **(Theory Only)**

UNIT-II

Financial Derivatives: Meaning – Definitions – Features –- Functions – Participants in financial derivatives market - Classification of derivatives – Types of derivative contract. **(Theory Only)**

UNIT-III

Forwards and Futures Contracts: Concept – Uses – Types of forwards and futures – Forwards and futures trading mechanisms – Forwards versus futures – Valuation of forward contracts – Models for determining future prices. **(Theory Only)**

UNIT-IV

Options: Concept – Types – Difference between options and futures – Option pricing models – The Binomial option pricing model – One step and two step models – The Black scholes option pricing model. **(Theory & Problems)**

UNIT-V

Swap Markets: Meaning – Features – Need – Types of swaps - Applications of swaps. **(Theory Only)**

REFERENCE BOOKS:

1. Gupta S.L., 'Financial Derivatives', PHI, New Delhi.
2. Krishnan Bal & Natra, 'Securities Market in India', Kanughkal Publisher, New Delhi.
3. Tumbull & Jarrow, 'Derivatives Securities', Thomson Publications.
4. Sananatian, 'Derivatives', TMH, New Delhi.
5. Vohra N.D., & Bagri B.R., 'Futures and Options', TMH, Second Edition, New Delhi.
6. David Dubofsky, *Option and Financial Futures – Valuation and Uses,* McGraw Hill International Edition
7. Kumar S.S.S., 'Financial Derivatives', PHI, New Delhi.
8. Hull, John C, Options, *Futures and other Derivatives,* Prentice Hall of India 7./e 2008.
9. Keith Redhead, *Financial Derivatives – An Introduction to Futures, Forwards, Options and SWAPs*,– Prentice Hall India Pvt., Ltd.,

P.Vijaya Bhaskar and B.Mahapatra, *Derivatives simplified – An Introduction to Risk Management*, Response Books, Sage Publication Pvt., Ltd,.

HRM Specializations (From 331 to 333)

MBA 32331. MANAGEMENT OF INDUSTRIAL RELATIONS

Course Objective: To enlighten the students with the Concepts and Practical applications of Industrial Laws and Employee relations.

Learning Objectives: Upon completion of the course, the student would

- Be aware of the concepts of industrial relations.
- Be acquainted with the legal framework stipulated under the Industrial Dispute Act, 1947.
- Be imbibed with the concepts, principles and issues connected with trade unions, collective bargaining and workers participation.
- Understand trade unionism in India and legal frame work under the Trade Union Act, 1926.

Unit – I: Industrial Relations: Scope and Significance – Evolution of Industrial Relations in India and comparative analysis with USA and UK– Recent Trends in Industrial Relations – Approaches to Industrial Relations – Theories of Industrial Relations.

Unit – II: Promotion of Harmonious Relations – Machinery for Prevention and Settlement of Industrial Disputes – Conciliation – Arbitration and Adjudication – Code of Discipline and Code of Conduct; Industrial Disputes Act 1947.

Unit – III: Collective Bargaining (CB) – CB Practices in India – Participative Management Forms and Levels – Schemes of Workers' Participation in Management in India – ILO and its impact.

Unit - IV: Trade Unions: Concept, Growth, functions and Objectives of Trade Unions - Trade Union Movement in India, UK and USA - Changing Role in the Context of Liberalization - Trade Union Act 1926.

Unit-V: Trade Unionism in India: Problems of Trade Union; Recognition, Leadership, Political involvement, Union rivalry; National trade Union Federations; Emerging Trends in Trade Unions in India.

Suggested Books:

1. VenkatRatnam, C.S. – Industrial Relations, Oxford University Press.

2. SC Srivathava, Industrial Relations and Labour Laws, Vikas, New Delhi.

3. M.Arora: Industrial Relations, Excel Publications.

4. P.R.N.Sinha, InduBalaSinha and SeemaPriyadarshiniShekar, "Industrial Relations, Trade Unions and Labour Legislation", Pearson Education, New Delhi.

5. Ramaswamy E.A. – The Strategic Management of Industrial Relations, Oxford University Press.

6. Cowling and James, The Essence of Personnel Management and Industrial Relations, Prentice Hall of India.

7. RatnaSen, "Industrial Relations in India", Macmillan India Ltd. New Delhi.

8. Michael Armstrong, Employee Reward, Universities Press (India) Ltd.

MBA 32332 - Employee Compensation and Administration

Course Objective: Explain how perceptions of compensation differ among society, stockholders, managers and employees. Understand the concept of a compensation strategy, where it comes from, how it relates to the organization's situation**.**

Learning Outcomes:
On completion of this course the student will be able to recognize how pay decisions help the organisation and analyze, integrate and apply the knowledge in solving compensation related problem in the organisation.

UNIT I :

Employee compensation: Concept and Significance: Wage Concept: Wage , Salary , Minimum Wage, Living Wage, Need-Based Minimum Wage, Money Wage and Real wage; Wage policy in India ; Theories of wages.

UNIT II :

Wage Administration Principles: Factors influencing Wage Fixation and Methods wage Differentials: Occupational, skill, Sex, Inter-Industry, Regional and Sectional.

UNIT III:

Wage Fixation Mechanisms: Statutory Wage fixation, Wage Boards, Collective Bargaining, Adjudication, Pay Commission; Wage Fixation in Public Sector.

UNIT IV:

Incentives : Principles and procedures for installing incentive system; Types of wage Incentive System, Wage incentive Schemes in India, working of incentive schemes, Linking wage with productivity; Fringe Benefits: Concepts and Types.

UNIT V:

Wage and salary policies in Organization: Role of HR Department in wage and salary Administration, Managerial compensation, Perquisites and special Features; Recent trends in managerial compensation in Indian Organizations, International compensation: Components of International compensation, expatriate and repatriate compensation, approaches to international compensation.

Suggested Books:

1. Subramanian, K.N., Wages in India, Tata Mc Graw Hill Publishing Co. Ltd., New Delhi.
2. Sarma. A.M, Understanding Wages Systems, Himalaya Publishing House, Mumbai.
3. Varma, Promad, Wage Determination: concepts and cases, Oxford IBH publication. Ltd New Delhi.
4. Chatterjee, N.N., Management of Personnel of in Indian Enterprises. Allied Books agency, Culcutta.
5. Aswathappa. K., Human Resource and Personnel Management. Tata Mc Graw Hill Publishing Co.

6. Dipak Kumar Bhattacharyya, Compensation Management, Oxford University press, New Delhi.

MBA 32333: EMPLOYEE WELFARE AND LABOUR ADMINISTRATION

Course Objective: To enlighten the students with the Concepts and Practical applications of employee welfare and labour administration.

Learning Outcomes:

- **Employees Welfare measures are in addition to their wages and services.**
- **ILO develop effective standards, fundamental principles, and fundamental rights at work**
- **Implementation of statutory and non-statutory welfare programmes**
- **Social security measures for employees**

Unit – I : LABOUR WELFARE

Labour Welfare : Concept, Definitions, Scope, Aims and Objectives and Philosophy of Lab our Welfare; principles of Lab our Welfare: Indian Constitution and Labour Welfare Historical Development of Lab our Welfare in India:

Unit – II: ILO

Impact of ILO; Structure, Function, Welfare work on labour welfare in India; Agencies of Lab our Welfare and Their roles: State, Management, Trade Unions and Voluntary Agencies.

Unit – III: WELFARE PROGRAMES

Labour Welfare Programmers ; Statutory and Non-Statutory, Extra Mural and Intra Mural: Canteen, Housing, Workers Education Scheme; Welfare Office: Role , Status and Functions.

Unit – IV: SOCIAL SECURITY

Social Security : Definition, Aims and Objectives; Social Assistance and Social Insurance, Financing of Social Security Schemes, Development of Social security in India; Social Security Measures for Industrial Employees.

Unit – V: **LABOUR ADMINISTRATION**

Labour Administration : Central Lab our Administrative Machinery in India; Chief Lab our Commissioner , Director general of Employment and Training, director general of factory Advice Service, Provident Fund Organization, ESI Scheme : Lab our Administration in AP

Reference Books

1. Moorthy, M.V., Principals of Lab our welfare in India, Sree Ram Centre
2. Sharma, A.M., Aspects of Lab our Welfare and Social Security, Himalaya Pub. House, Mumbai.

3.Ram Chandra P.Singh, Lab our Welfare Administration in Indian, Deep & deep Pub., New Delhi.

OPEN ELECTIVE
MBA 32003: ENTREPRENEURSHIP DEVELOPMENT

Course Objective: The objective of this course is to create conceptual understanding of the topic among the students and comprehend the environment of making of an Entrepreneur and to develop perspective understanding of startups and MSMEs in the Indian context.

Learning Outcomes:
On completion of the course, the student will be able to have conceptual understanding of the concept of entrepreneur and entrepreneurship; growth of women and rural entrepreneurship in Indian context. He would be able to generate ideas and opportunities for business ventures. Student will have through knowledge of MSMEs. He will be able to recognize various institutions like Commercial banks, SSIDC, CII, FICCI and ASSOCHAM.

Unit – I Entrepreneur and Entrepreneurship: Evolution of the Concept of Entrepreneur – Characteristics of an Entrepreneur – Distinction between an Entrepreneur and Intrapreneur and a Manager – Functions of an Entrepreneur – Types of entrepreneurs, Concept of Entrepreneurship – Functions, Problems, Entrepreneurial process – Growth of Entrepreneurship in India – Recent Trends of Women Entrepreneurship – Meaning of and Need for Rural Entrepreneurship – Problems and Development of Rural Entrepreneurship.

Unit II Startup Ideas and Opportunity Assessment: Importance of Ideas – Sources of startup Ideas – Techniques for generating ideas – Steps in potential ideas – Opportunity Recognition- sources and process – Development of Programmes E – Business Ventures – Importance of Financial Management – Project Feasibility Study.

Unit – III MSME Enterprises: Definitions, Characteristics – Relationships of MSME – Relationship with large units – Export Oriented Units - Rationale – Objectives – Scope of Small Enterprises – Opportunities for an Entrepreneurial career – Role of Small Enterprises in Economic Development – Causes and Symptoms of Sickness – Cure for Sickness.

Unit IV Project preparation and Financing Ventures: Meaning of and Preparation of Project – Importance of Report – Content; Guidelines for Report preparation – Network Analysis – PERT and CPM – Sources of Finance – Concept of working Capital and Estimation – Seed Capital – Venture Capital.

Unit V Institutional support to Entrepreneurs: Commercial Banks – Other major financial institutions – Central Level Institutions – KVIC; SIDO; NSIC : National Productivity Council (NPC); EDII – State Level Institutions – DIC – SFC-state Small Industries Development Corporation (SSIDC) – Industry Associations – Confederation of Indian Industry(CII) ; Federation of Indian Chamber of Commerce Industry (FICCI); Associated Chambers of Commerce and Industry of India (ASSOCHAM)

Suggested Books:

1. Vijay Sathe, “Corporate Entrepreneurship” 1st edition, 2009, Cambridge
2. S.S. Khanka, “Entrepreneurial Development”, 2007, S. Chand & Co. Ltd.
3. Vasanth Desai, “Dynamics of Entrepreneurial Development and Management”, 2007, HPH,Millenium Edition.
4. Dr. Vasant Desai, “Small Scale Industries and Entrepreneurship”, 2006, HPH.
5. P. Narayana Reddy, “Entrepreneurship – Text and Cases”, 2010, 1st Ed. Cengage Lerning.
6. David H. Hott, “Entrepreneurship New Venture Creation”, 2004, PHI.
7. E – Book, MSME at a glance – English version, Ministry of MSME.
8. Jaynal Ud – Din Ahmed and Abdul Rashid, MSME in India, New Century Publications.

MBA 32004: BUSINESS RESEARCH METHODS

Course Objective: The objectives of this course is to provide the students the knowledge of doing research and basicStatistical tools to apply for solving business related problems.

Learning outcomes: On successful completion of the course the student will be able to:

- Identify the overall process of designing a research study from its inception to its report.
- Apply appropriate analytical methods to find solutions to business problems that achieve stated objectives.
- Calculate and interpret the correlation between two variables.
- Calculate the linear regression equation for a set of data and know basic assumptions behind regression analysis.
- Explore small and large sample data to create testable hypothesis and identify appropriate statistical tools.

Unit-I

Introductionto Business Research Method:Concept of Business Research Method, Nature of Business Research Method, Scope of Business Research Method, Need and the role of Business Research, Characteristics of Research, Types of Research, The Research Process, Steps involved in preparing Business Research Planan Overview.

Unit- II

Research Design: Meaning of Research Design, Need for Research Design, Features of a good Design, Types of Research Design: Exploratory, Descriptive and Casual Research Exploratory Research, Experimental Designs, Types of Errors effecting Research Design, Research Design process.

Unit- III

Data Collection: Primary and Secondary Data-Sources-Advantages / Disadvantages, Data Collection Methods - Observations, Survey, Interview, Concept of Questionnaire and Schedule, Principles of Design Questionnaire and Schedule, Limitations of Questionnaire, Qualitative Techniques of Data Collection. Measurement and Scaling Techniques - Nominal Scale, Ordinal Scale, Interval Scale, Rating Scale.

Unit – IV

Sampling Theory: Meaning, Need and Importance of Sampling, Steps in Sampling Process, Types of Sampling Methods, Sampling and Non-Sampling Errors, Sample Design, Determinants of Sample Size,Steps in Designing the Sample.

Unit – V

DataAnalysis: Measures of Central Tendency and Dispersion, Correlation Analysis, Regression Analysis.
Hypothesis Testing:- Introduction, Types of hypothesis, procedure for testing of hypothesis, Types of Errors in testing of hypothesis-Tests of significance for small samples: - application, t-test, Z- Test, F-Test, Chi-square test and ANOVA- one way and two-way classifications.

Reference Books

1. N.D. Yohra,2001, Quantitative Techniques in management, Tata McGraw Hill, 2ndnedition.
2. Barry Render, Ralph M. Stair, Jr. and Michael E. Hanna, 2007, Quantitative analysisfor management, 9th Edition, Pearson publication
3. Gupta S.P. Statistical Methods. Sultan Chand and sons, New Delhi.2005
4. C.R. Kothari, Research Methodology: Methods and Techniques,2/e,VishwaPrakashan 2006
5. William G. Zikmund, Business Research Methods, Thomson, 2006.

IV SEMESTER

MBA 42001-STRATEGIC MANAGEMENT

Course Objective: The objective of this course is to analyze the main structural features of an industry and develop strategies that position the firm most favorably in relation to competition and influence industry structure to enhance industry attractiveness, to recognize the different stages of industry evolution and recommend strategies appropriate to each stage and to appraise the resources and capabilities of the firm in terms of their ability to confer sustainable competitive advantage and formulate strategies that leverage a firm's core competencies.

Learning Outcomes: On completion of the course the student will be able to understand the importance of strategies in the organizations in the midst of the tough and turbulent competitive market environment. He will have deep knowledge on the processes of strategy formulation, strategic analysis, strategy implementation and strategic control.

Unit-I: **Introduction:** Concepts in Strategic Management, Strategic Management as a process –Developing a strategic vision, Mission, Objectives, Policies – Factors that shape a company's strategy – Crafting a strategy – Industry and Competitive Analysis, Porter's Five Forces Model.

Unit-II: **Environmental Scanning and leadership**: Methods. SWOT Analysis – Strategies and competitive advantages in diversified companies and its evaluation. Strategic Analysis and Choice: Tools and techniques- BCG Matrix, Space Matrix, GE Model, Grand Strategy Matrix -Strategic Leadership: Leadership and Style – Key Strategic Leadership Actions - Developing Human Capital and Social Capital – Balanced Scorecard.

Unit-III: **Strategy Formulation** : Strategy Framework For Analyzing Competition, Porter's Value Chain Analysis, Competitive Advantage of a Firm, Exit and Entry Barriers - Formulation of strategy at corporate, business and functional levels. Types of Strategies – Tailoring strategy to fit specific industry – restructuring and diversification strategies – different methods Turnaround strategy and diversification strategies.

Unit-IV: **Strategy Implementation** : Strategy and Structure, Leadership, culture connection - Strategies for competing in Globalizing markets and internet economy – Organizational Values and Their Impact on Strategy – Resource Allocation – Planning systems for implementation.

Unit-V: **Strategy Evaluation and control** – Establishing strategic controls - Measuring performance – appropriate measures- Role of the strategist – using qualitative and quantitative benchmarking to evaluate performance - strategic information systems – problems in measuring performance – Strategic surveillance - strategic audit.

REFERENCES:

1 .Vijaya Kumar P,.HittA : Strategic Management, Cengage learning, New Delhi,2010.
2. John A PearceII, AmitaMital: "Strategic Management", TMH, New Delhi, 2012.
3. Sanjay Mohapatra: "Cases Studies in Strategic Management", Pearson, New Delhi,2012.

4. Adrian Haberberg&Alison: Strategic Management, Oxford University Press, New Delhi, 2010.
5 .P.Subba Rao: "Business Policy and Strategic Management" Text and Cases, Himalaya Publishing House, New Delhi, 2011.
6. Appa Rao, Parvatheshwar Rao, Shiva Rama Krishna: "Strategic Management and Business Policy", Excel Books, New Delhi, 2012.

MBA 42002:: ENTREPRENEURSHIP DEVELOPMENT

Course Objective: The objective of this course is to create conceptual understanding of the topic among the students and comprehend the environment of making of an Entrepreneur and to develop perspective understanding of startups and MSMEs in the Indian context.

Learning Outcomes:
On completion of the course, the student will be able to have conceptual understanding of the concept of entrepreneur and entrepreneurship; growth of women and rural entrepreneurship in Indian context. He would be able to generate ideas and opportunities for business ventures. Student will have through knowledge of MSMEs. He will be able to recognize various institutions like Commercial banks, SSIDC, CII, FICCI and ASSOCHAM.

Unit – I Entrepreneur and Entrepreneurship: Evolution of the Concept of Entrepreneur – Characteristics of an Entrepreneur – Distinction between an Entrepreneur and Intrapreneur and a Manager – Functions of an Entrepreneur – Types of entrepreneurs, Concept of Entrepreneurship – Functions, Problems, Entrepreneurial process – Growth of Entrepreneurship in India – Recent Trends of Women Entrepreneurship – Meaning of and Need for Rural Entrepreneurship – Problems and Development of Rural Entrepreneurship.

Unit II Startup Ideas and Opportunity Assessment: Importance of Ideas – Sources of startup Ideas – Techniques for generating ideas – Steps in potential ideas – Opportunity Recognition- sources and process – Development of Programmes E – Business Ventures – Importance of Financial Management – Project Feasibility Study.

Unit – III MSME Enterprises: Definitions, Characteristics – Relationships of MSME – Relationship with large units – Export Oriented Units - Rationale – Objectives – Scope of Small Enterprises – Opportunities for an Entrepreneurial career – Role of Small Enterprises in Economic Development – Causes and Symptoms of Sickness – Cure for Sickness.

Unit IV Project preparation and Financing Ventures: Meaning of and Preparation of Project – Importance of Report – Content; Guidelines for Report preparation – Network Analysis – PERT and CPM – Sources of Finance – Concept of working Capital and Estimation – Seed Capital – Venture Capital.

Unit V Institutional support to Entrepreneurs: Commercial Banks – Other major financial institutions – Central Level Institutions – KVIC; SIDO; NSIC : National Productivity Council (NPC); EDII – State Level Institutions – DIC – SFC-state Small Industries Development Corporation (SSIDC) – Industry Associations – Confederation of Indian Industry(CII) ; Federation of Indian Chamber of Commerce Industry (FICCI); Associated Chambers of Commerce and Industry of India (ASSOCHAM)

Suggested Books:

1. Vijay Sathe, “Corporate Entrepreneurship” 1st edition, 2009, Cambridge
2. S.S. Khanka, “Entrepreneurial Development”, 2007, S. Chand & Co. Ltd.

3. Vasanth Desai, "Dynamics of Entrepreneurial Development and Management", 2007, HPH,Millenium Edition.
4. Dr. Vasant Desai, "Small Scale Industries and Entrepreneurship", 2006, HPH.
5. P. Narayana Reddy, "Entrepreneurship – Text and Cases", 2010, 1st Ed. Cengage Lerning.
6. David H. Hott, "Entrepreneurship New Venture Creation", 2004, PHI.
7. E – Book, MSME at a glance – English version, Ministry of MSME.
8. Jaynal Ud – Din Ahmed and Abdul Rashid, MSME in India, New Century Publications.

INTERNAL ELECTIVES

MARKETING Specializations (From 411 to 413)

MBA 42411 : INTERNATIONAL MARKETING

Course Objectives: The objective of this course is to introduce the student to Marketing Strategy Planning for International Markets. Specifically, when the student has completed this course, he/she should, Understand the various ways that businesses can get into international marketing , Understand about multinational corporations.

Learning outcomes:

Understand the kinds of opportunities in international markets, and the international environment, Understand the market dimensions that may be useful in segmenting international markets, entry strategies, building brand, communication decisions and export marketing.

UNIT – I

International Marketing – Definition and Scope – Significance of International Marketing, Differences between International and Domestic Marketing, International Marketing Environment.

UNIT – II

International Market Entry Strategy : Entering International Markets – Product Strategy for International Markets

UNIT-III

Building Brands for International Markets – Global Advertising.Pricing for International Markets : Environmental Influences on Pricing Decisions

UNIT – IV

, Distribution Channels & Structures – Communication Decisions for International Markets – international marketing of Services.

UNIT – V

Export Marketing : International Trade, Finance and Risk Management, export Costing and Pricing, Export Procedures and Export Documentation, Export Assistance and Incentives in India.

Reference Books

1.Wawen J. Keegan, Global marketing Management, Pearson Education.
2.Philip R. catera, John L. Grahan, International Marketing, TMH.

3.Rakesh Mohan Joshi, international Marketing, Oxford.
4. R.L. Varshney and B. Bhattacharya, International Marketing Management : An Indian perspective, Sultan Chand Publications.

MBA 42412: Advertising and Sales Promotion

Course Objective: The objective of the course is to provide students with detailed knowledge on marketing mix.

Outcomes: Understand the concept and process of advertising, impact of varied advertising tools, think about effective media, Analyzeand evaluate sales promotion strategies, Effectiveness of Direct Marketing to capture the information of target customers

Unit-I

Advertising: Advertisingimportance, weakness as a promotion tool, types of advertising; Communication goals: AIDA Model, DAGMAR; advertising agency:Functions,Selecting an Advertising Agency;advertising budget: objectives, methods

Unit-II

Advertising agencies: Word of mouth advertising, advertising planning, creativity of advertisement copy, employing the internet for advertising, advertising research, agency-client interface, functions and types of agencies

Unit-III

Media Management and planning: Types of media, media scheduling decisions, media mix decisions, media evaluation and selection, media effectiveness, social and ethical aspects of media

Unit-IV

Sales promotion and sales force management: Sales promotion: objectives, types of sales promotion tools, personal selling: sales personality, retail salesman's duties, responsibilities and problems, types of salesmen, AIDAS, training sales personnel, motivating the sales force, compensating sales personnel

Unit-V

Direct marketing and Public Relations:advantages, techniques, public relations objectives, tools of public relations, event marketing : Importance, promotion of events.

Reference Books

1. Foundations of Advertising theory and practice S.A Chunawalla, K.C Sethia, Himalaya Publishing House
2. Sales & Advertisement Management, S.Rajkumar, V.Raja Gopalan, S.Chand Publisher
3. Advertising Management, Jeth Waney, Jain Oxford Publisher
4. Integrated Advertising, Promotion and Marketing communications, Krusti shah, Lon D Souza, TMH Publisher
5. Salesmanship and Publicity, Rustom S Davar, Sohrab R Davar, Nusli R Davar
6. Marketing Management, R.S.N Pillai BagavathiS.Chand Publisher

MBA 42413: RETAILING MARKETING

Course Objectives: Understand the key elements in planning, managing, and executing the retail marketing mix as they relate to the product, price, distribution, and promotion. Identify the approaches to and guidelines used to analyze and solve retailers' problems and make decisions in retail organizations.

Outcome: After completion of the syllabus for retail marketing the students will be able to have a complete idea on retailing, retail establishments, maintenance of retail establishments, retail store structure, retailing financial and HR strategies etc.

UNIT-I

Introduction to Retailing: Retailing – Meaning functions – Types of retailers – Services of retailers – significance of retailing – Multichannel retailing;

UNIT-II

Customer buying behavior – Buying process – Types of buying decisions – Factors influencing the buying process; Retailing in India - emerging Trends in retailing.

UNIT-III

Retail store locations: Evaluation of specific areas and sites for location – Site Characteristics - Trade area Characteristics – Estimating Potential sales for a store site; Store design and layout – Objectives – Space management – Visual merchandising – Atmospherics – Website design - Elements of store design – Exterior and interior.

UNIT-IV

Retail Marketing strategy: Definition Building a sustainable competitive advantage – Growth strategies – Strategic retail planning process; Financial strategy: Objectives – Strategic Profit Model – Setting and measuring performance objectives; Human Resource management in retailing- significance and strategies.

Unit-V

Retail Pricing – setting retail prices – Price adjustments – Pricing strategies; Retail communication Mix; Customer relationship Management: The CRM Process – colleting customer data – Addressing customer data and identifying target customers – developing CRM Programmes; International retailing – Opportunities and challenges.

Reference Books

1. David Gilbert, Retail Marketing Management, Pearson Education
2. A J Lamba, The Art of Retailing, TMH
3. Hasty and Reardon: Retail Management, McGraw-Hill
4. Diamond ,jay and Gerland Pimtel: Retailing, PHI

Finance Specializations (From421 to 423)

MBA 42421 – SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT

Course Objective: Investment analysis and portfolio management course objective is to help entrepreneurs and practitioners to understand the investments field as it is currently understood and practiced for sound investment decisions making.

Course Outcomes: Upon Successful completion of the course, students will be able to

- Gain knowledge of Investment,
- Evaluate Risk and return of Financial Securities
- Apply fundamental analysis and technical analysis for financial securities for decision making
- Construct the portfolios and compare the portfolio return and risk with individual securities return and risk.
- Become aware of the modern portfolio approach to portfolio construction
- Evaluate the portfolio performance.

Unit-I:

Investment Environment: Concepts of Investment, speculation and Gambling - Types of investors - Avenues of investment – Objectives of Investment – Investment Process - Financial Assets – Classification – Shares – Debentures –Innovative Financial Assets. **(Theory only)**

Unit-II:

Risk and Return:. Meaning and Types of Security Risks: Systematic Vs Non-systematic Risk. Concept of Return - Measurement of Security Returns – Valuation of fixed income Securities. **(Theory and simple problems)**

Unit-III:

Fundamental Analysis: Meaning of Fundamental analysis, Economy, Industry and Company analysis – Technical analysis. Technical analysis Vs Fundamental analysis. **(Theory only)**

Unit-IV:

Modern Portfolio Theory: Markowitz Theory – William Sharpe's Single Index Model – Capital Asset Pricing Model (CAPM) – Arbitrage Pricing Theory (APT). **(Theory and simple problems)**

Unit-V:

Portfolio Evaluation: Methods of Portfolio Evaluation – Sharpe's, Treynor's and Jensen's measures of portfolio performance evaluation. **(Theory and simple problems)**

Reference Books:

1. Bhalla, V.K., INVESTMENT MANAGEMENT, Sultanchand and Company, New Delhi.
2. Preeti Sing., INVESTMENT MANAGEMENT, Himalaya Publishing House, Mumbai.
3. Ranganathan, INVESTMENT ANALYSIS AND PORTFOLIO MANAGEMENT, (Pearson).
4. Dhanesh Kumar Khatri, INVESTMENT MANAGEMENT AND SECURITY ANALYSIS, (Macmillan)
5. Chandra P, *Managing Investments*, TMH.
6. Sharpe, Alexander, *Investments*, PHI.
7. Alexander, *Fundamentals of Investments*, Pearson education.

MBA 42422 :FINANCIAL RISK MANAGEMENT

Course Objective : To understand the operational practices and credit environment and to expose the students to pricing of loans and mechanism of credit risk in Banks and Insurance organisations.

Learning Outcomes: On successful completion of the course the student will be able to:

- Identify the risk and understand risk concepts, process and methods of handling risk.
- Analyse the methods and techniques of costing,
- Comprehend the applications of Operating costing and
- Familiarise with the cost management techniques and reports

UNIT - I

Meaning and Definition of Risk – Concepts of Risks : Definition of Perils and Hazards – Meaning of Uncertainty – Difference between Risk and Uncertainty – Risk Attitude : Causes or sources of Risks – Classification of Risks – Methods of Handling the Risk – Measuring the cost of Pure Risk – Risk Management : Definition – Features – Objectives – Significance – Principles – **Process :** Planning of Risk – Risk Identification – Risk Ananlysis – Evaluation Process - Assessment – Advantages – Limitations (**Theory and Problems**).

UNIT - II

Business Risks : Definition – Causes – Methods of Handling Business Risks – Risk Management by Individuals – Risk Management by Companies; **Entrepreneurial Risk Management** – Concept – Process - Methods of Handling Risk – Environmental Risk Management – Causes- Process (**Theory only).**

UNIT - III

Meaning and Definition of Insurance – History of Insurance Business in India – Framework of Insurance Business - Features of Insurance Contract – Functions – Importance – Essential Elements of Insurance Business - – Benefits of Insurance – **Kinds of Insurance:** Life Insurance : Definition – Classification of Life Insurance Policies – Organisation structure of LIC – Role of LIC – Calculation of Premium in Life Insurance Policies; History and Growth of GIC : Objectives – Kinds of Policies – Functions of GIC – Concept of Reinsurance - Impact of Privatisation of Insurance - IRDA : Role- Powers – Functions and Regulations (**Theory and Problems**).

Unit – IV

Meaning and Definition of Commercial Banks : History and Growth - Features – Functions – Regulations – Classification of Banks - Benefits – Limitations – Impact of Privatisation of Banks. (**Theory only**).

Unit – V

Risk Management in Insurance and Banks – Operational risks : Principles – Causes – Credit risk: : Objectives – Causes – Dimensions - BASEL I Committee : Objectives - Benefits – BASEL II and Three-Pillar Approach : Minimum capital requirement – Supervisory Review Process – Market Discipline – Key Factors for implementation of BASEL II. (**Theory only**).

REFERENCE BOOKS

1. Harrington : Risk Management and Insurance, TaTa McGraw Hill publishing House, New Delhi.
2. George : Principles of Risk Management and Insurance, Pearson Education
3. James Triesehmann, Risk Management and Insurance, Thomson Publications.
4. P.K.Gupta, Insurance and Risk Management, Himalaya Publishing House.
5. Periaswamy, P and Veeraselvam, M., Risk Management and Insurance, Himalaya Publishing House.

MBA 42423: FINANCIAL SERVICES

Course Objective: To provide conceptual understanding of financial services and in-depth knowledge of banking, mutual funds and lease financing services.

Learning Outcomes: On successful completion of the course the student will be able to:

- Understand the meaning, types and growth of Financial Services,
- Analyse the functions, issues and SEBI guidelines for Merchant banking and Mutual Funds,
- Familiarise with the lease finance, hire purchase and venture capital concepts.

Unit – I

Financial Services : Concept – Definitions – Evolution of Financial Services Sector in India – Features – Functions – Constituents of Financial Services – Significance – Types of Financial Services Sector – Regulating Authorities of Financial Services Sector- Problems of Financial Services Industry – Growth of Financial Services Industry – Recent trends in Financial Service Sector.(Theory Only)

Unit – II

Merchant Banking Services : Meaning – Origin – Scope – Functions – Registration of Merchant Banker – Issue Management – SEBI Guidelines for Merchant Banking – Problems and Prospects. (Theory Only)

Unit-III

Mutual Funds: Meaning – Evolution – Growth –Types – Advantages – Mutual Fund Organisation – Regulatory Aspects - Limitations.(Theory Only).

Unit - IV

Lease Financing: Meaning – Evolution – Classification of Lease – Advantages – Disadvantages. **Hire Purchase:** Meaning – Features – Evolution – Lease Finance Vs Hire Purchase – Sources of Law on Hire Purchase – Problems. **Factoring:** Meaning – Types – Significance – Advantages – Disadvantages (Theory Only).

Unit – V

Venture Capital : Evolution – Mechanism –Types - Problems – Benefits - Housing Finance :Housing Policy – Housing Finance Organizations – Types of Housing Loans. **Credit Rating:** Evolution – Scope of Rating – Process of Rating – Framework- Credit Rating Agencies – Regulation of CRAS. (Theory Only).

Reference Books

1. Gordon and Natrajan.,Financial Markets and Services, Himalaya Publishing House, Mumbai.
2. Madura.,Financial Institutions and Markets, Thomson.
3. M.Y. Khan, Financial Services, Tata Mc Graw Hill, New Delhi.
4. Varma, J.C., Merchant Banking, Tata Mc Graw Hill, New Delhi.
5. Vastsara& Nigam, Management of Indian Financial Institutions, Himalaya Publishing House, Mumbai.

Human Resource Management Specializations(431 to 433)

MBA 42431: INTERNATIONAL HUMAN RESOURCE MANAGEMENT

Course Objective: The course is designed to enhance the potentials of the student to manage Human Resource in Multi National Organizations to achieve Business Standards.

Learning Outcomes: On successful completion of the course, the students would be able to demonstrate the issues related to host, home and third country nationals, assess the international culture and diversities, understand the Human Resource Management activities with respect to Multinational corporations and capture the issues in international industrial relations.

Unit - I

Introduction to International Human Resource Management: Concept, Scope and Significance - Expatriate- Approaches to International Human Resource Management, Differences between Domestic and International HR Activities; Role of International HR Department - Issues and Challenges of IHRM, Organizational structure of multinational corporations,

Unit- II

Socio – Culture Contexts: Cultural Factors - Cultural Sensitivity - Culture affects Management approaches - Cross-cultural Communication - Cross Culture Differences in the Work Place – Hofstede Cross-Culture theory.

Unit – III

Recruitment and Selection: Concept – sources of Human Resources: Micro level, Macro level, Modern Sources, Techniques of Recruitment – Centralized Vs Decentralized recruitment – Selection: The Expatriate System, Reasons for Expatriate failure in foreign assignment - Selection Techniques for International Assignment: Adaptability to cultural change, Motivation for a foreign assignment and Leadership ability.

Unit – IV

Training and Development: Need for Global training - Areas of Global Training & Development, Compensation : Objectives of International Compensation Management - Complexities in International Compensation Management- - Factors Affecting International Compensation Management - Approaches to International Compensation Management, Performance Management: System of performance appraisal – Problems of Performance Appraisal – Measures for effective Performance Appraisal.

Unit -V

Introduction to International Industrial Relations: Key Issues in International Industrial Relations - Trade Unions and International Industrial Relations - Conflict Resolution in Multinational Corporations; Forms of Industrial Democracy to Multinational Corporations – Regional Integration – NAFTA, EU.

Reference Books

1. Dowling Welch, Schuler, International Human Resource Management Thomson, New Delhi.
2. Anne WilHarzing et al., International Human Resource Management., sage, New Delhi
3. P.SubbaRao, International Human Resource Management, HPH, New Delhi
4. Briscoe, Dennis R., International HRM , Prentice Hall NJ.
5. Torrington, D., International HRM : Think Globally and Act Locally, Hemal Hempstead, Prentice Hall.

MBA 42432: STRATEGIC HUMAN RESOURCE MANAGEMENT

Course Objective: The Objective of this course is to appreciate how human resource is emerging as a key resource for competitive advantage and understanding the role of HRM in organizational performance.

Course Outcome:

On completion of this course the students will be able to develop the understand of the concept of Strategic Human Resource Management and to understand it's relevance in organisation and to analyse the strategic issues and strategies required to select and to develop manpower resources.

UNIT I : Strategic Human Resource Management: Strategy meaning**,** Types of strategies, Human Resource Strategy, Human resource as assets, Evolution of SHRM, Distinctive Human Resource Practices, SHRM approaches, alternative HR strategies..

UNIT II : Human Resource Environment: Technology and Organization Structure; Worker Values and Attitudinal Trends; Management Trends, Demographic Trends: Trend's in the utilization of human resources and international developments.

UNIT III : Strategic International Human Resource contributions: Strategic Human Resource Activity Typology; Classifying Human Resource Types : Integration of strategy and human resource planning: The Human Resource manager and Strategic Planning. Strategic, Human Resource Planning**.**

UNIT IV: Strategic Human Resource Processes: Workforce Utilization and Employment Practices; Efficient Utilization of Human Resources; Dealing with employee shortages: Selection of employees; Dealing with employee surpluses and special implementation challenges. Reward and development systems: Strategically Oriented Performance Management Systems: Strategically oriented compensation systems and employee development.

UNIT V: Impact of Human Resource Practices: Individual high performance practices; Systems of high – performance human resource practices: individual Best practices vs. Systems of Practices and Universal Practices vs. Contingency Perspectives. Human Resource Evaluation: Over view of the Evaluation: Approaches to Evaluation: Evaluation Strategic Contributions of Traditional Areas: and Evaluation Strategic Contributions in Emerging Areas.

Suggested Books :

1. Greer, Charles R. (2003) Strategic Human Resource Management – A General Managerial Approach New Delhi: Pearson Education (Singapore) Ple. Ltd.
2. Mabey, Chrisopher and Salaman, Graeme, Strategic Human Resource management, Beacon, New Delhi.
3. Salaman, Graeme, Human Resource Strategies, Sage Publications, New Delhi.
4. Porter, Michael S., Competitive Advantage: Creating and Sustainig Superior Performance, Free Press, New York.
5. TanujaAgarwala, Strategic Human Resource Management, Oxford Univesrsity Press, New Delhi.

MBA 42433 : LABOUR LEGISLATIONS

Course Objective: To have a broad understanding of the legal principles governing the employment relationship at individual and collective level. To familiarize the students to the practical problems inherent in the implementation of labour statutes.

Learning outcomes:
After going through various labour laws, students will be conversant regarding conflict management in legal perspective and judicial system pertaining to labour management relations.

Unit – I: Industrial Jurisprudence: Meaning and Definitions, Sources of Industrial Jurisprudence, Industrial Jurisprudence Principles Social Justice, Natural Justice, Equity, National Economy, Dynamism, Constitutional Norms, Welfare, Res Judicata, Laches, Vicarious Liability.

Unit – II: Labour Legislations:Growth, Specific Objectives of labour legislations in India and Classification of labour legislations, International Labour Organisation (ILO) Writs and appeals under the Indian Constitution.

Unit – III: The Factories Act, 1948. The Contract Labour (Regulation and Abolition) Act 1970. The mines Act 1952

Unit – IV: The Plantations Labour Act, 1951, The Dock Workers (Regulation of Employment) Act 1948, The A.P Shops and Establishments Act 1988.

Unit – V: The Child Labour (Prohibition and Regulation) Act 1986. The Apprentices Act 1961.

Suggested Books

1. Malik, P.L Industrial Law, Eastern Book Company, Lucknow
2. Sharma A.M. Industrial Jurisprudence, Himalaya Publishing House, New Delhi
3. Mishra P.N., Labour and Industrial Laws, Central Law Publishing, Allahabad
4. Vaidyanathan, N, IOL Conventions and India, Minverva Associates, Calcutta
5. Goswami, V.G. Labour and Industrial Relations Law, Central Law Agency, Allahabad
6. Agarwal, S.L, Labour Relations Law in India, Mc Milan Company of India Ltd., New Delhi
7. Sinha, P.R.N, Industrial Relations and Labour Legislations, Oxford and I.B.H Publishing Co., New Delhi

MBA(HRM) SYLLABUS

MBA(HRM)

I Semester

MBA(HRM) 12001: PRINCIPLES OF MANAGEMENT

Course Objective: On successful completion of the course the students should have :

a. To familiarize the students with management theory, functions, principles and practices of management.
b. Learnt the scientific decision making process and problems and solving techniques and also learn the modern trends in management.

Learning Outcomes;

- Management principles deal with human traits and, hence, are employed creatively.
- Planning functions of management provide a very useful way of classifying the activities of managers engaged in as they attempt to achieve organizational goals
- Understand the role of top, middle and lower levels of management
- Describe the qualities of a good leader
- A good management control system stimulates action by spotting the significant variations from the original plan and highlighting them *for* the people who can set things right

Unit-I : INTRODUCTION Management-Concept, Significance, Principles and Functions-Management and Administration, Managerial Roles –Managerial Skills- social responsibility of business, Management by Objectives(MBO) Management Thought.

Unit-II: PLANNING AND ORGANIZATION

Planning-Nature and Process of Planning- Types of Planning - Characteristics of sound plan-Decision Making-Nature of Decision Making-Process and Techniques-Organization-Levels -Organization Structures-Staffing Policies-Line and Staff Relations–Delegation, Centralisation and Decentralisation.

Unit-III : STAFFING

Nature and Importance of Staffing – Man power Planning, requirement and Selection – Personal Characteristics needed by Managers

Unit –IV: DIRECTING

Directing Techniques of Direction –Leadership-Leadership styles, Functions of a Leader, Qualities of Leader - Communication-Types of Communication-Motivation-Need Theories.

Unit-V: CONTROL

Controlling-System of controlling- Methods, Tools and Techniques of control-Making Controlling Effective-Organising process-Departmentation Types-Making Organising Effective.

Reference Books

1. Agarwal R D Organisation and management – Tata McGrawhill.

2. Koontz and Weichrich Essentials of management – Tata McGrawhill

3. Aswathappa K. Human Resource and personnel Management, Text and cases-Tata McGrahills.

4. Sherlekar- S.A Management – Himalaya publishing house.

5. Robbins Stephen.p and Mary coulter – management – PH1 publisher.

MBA(HRM)12002 - ORGANISATIONAL BEHAVIOUR

Course Objective: This course is designed to enable the students to understand the concepts, theories, processes and dynamics of human behavior in Organizations.

Learning outcomes: On completion of the course, the student will be able to understand the concepts and theories of organisation behaviour. He will be able to understand the importance and role of group dynamics, motivational theorems, organisational culture, organizational change and organisational development.

UNIT – I Organisational Behaviour: Meaning – Importance – Nature and Scope – Approaches – Key elements – Challenges and opportunities for O.B. – Contributing disciplines to O.B. – O.B. Models.

UNIT – II Individual: Individual Behaviour - Perception – Process, factors influencing perception – barriers in perceptual Accuracy – enhancing perceptual skills – Attribution - Learning – characteristics, theories and principles of Learning. Motivation – Theories of Motivation – Maslow, Herzberg, David Mcclelland and Porter and Lawler - Personality – Stages of Development, determinants of Personality.

UNIT – III Group Dynamics: Meaning, Determinants of group behaviour and types of groups – Group Dynamics – frame work of group behaviour. Developing inter – personal relations, Transactional Analysis – Johari Window.

UNIT – IV Organisational Culture: Organization Design, culture and climate. Creating an ethical organizational culture – Conflicts – Meaning, conflicts at individual, group and organisational level – sources of conflicts – functional and dysfunctional aspects – Strategies for conflict resolution.

UNIT – V Organisational Change: Organisational Change – change management and its dimensions, process. Pressures for change – resistance to change – overcoming resistance to change. Approaches to manage Organizational Change – Lewin's and Kotter's Plan for Implementing Change. – Organisational Development.

Suggested Books:

1. Fred Luthans, ***Organisational Behaviour,*** Tata McGraw Hill.
2. Stephen P.Robbins, ***Organisational Behaviour,*** Pearson Education, New Delhi, 2006.
3. Aswathappa.K., ***Organisational Behaviour*** , Himalaya Publishing House, New Delhi.
4. Donald R.Brown& Don Harwey, ***An Experimental Approach to Organisational Development,*** Pearson Education.
5. Sarma V. s. Veluri, Organisational Behavour, Jaico Publishing House.
6. Paton McCalman, ***"Change Management"***, Sage Publications.
7. VenkataRatnam, ***"Negotiaed Change",*** Sage Publications.
8. Jai, B.P.Sinha, ***"Culture and Organisational Behaviour"***, Sage Publications.
9. Arun Kumar N Meenakshi., Organisational Behavour, Vikas Publishing House.
10. Keith Davis & John Newstrom, *Human Behaviour at work*, Mc-Graw Hill.

MBA(HRM)12003 – BUSINESS COMMUNICATION

Course objective: To train students to enhance their skills in written as well as oral Communication. This course will help students in understanding the principles & techniques of business communication.

Outcome: after completion of the course, students will be able to knowledge on written ond oral communication, role of communication in business, models of communication, presentations etc.,

Unit - 1: Fundamentals of Communication : communication definition - Objective of Communication – The process of Human communication, Types of Communication – formal and in formal communication –verbal and non verbal communication- types of verbal communication; Communication barriers –Overcoming Barriers; Understanding Cultural Effects of Communication -Listening Skills- Role of communication in Business

Unit- 2: Managing Organizational Communication – Formal and Informal Communication – Intra and Personal Communication – Models for Inter personal Communication – Exchange theory – Johari window and Transactional Analysis.

Unit - 3: Business writing skills – Significance of Business Correspondence, Essentials of Effective Business Correspondence – Business Letter and Forms- E-mail – Memo – Reports and Proposals; Oral Presentations – Meetings- Minutes of Meeting, Media management; Use of Technology in Business Communication, Seminars, workshop, conferences, Business etiquettes.

Unit- 4: Managing motivation to influence interpersonal communication – Inter-personal perception – role of emotion in inter personal communication – gateways to effective interpersonal communication; Emotional intelligence- charecteristics

Unit-5: Time Management – Goal Setting – Time log – Self Awareness – Self Motivation Effective presentation and Interview Skills: Art of giving interviews in relation to placement appraisal interviews in selection and placement – Appraisal interviews – Exit Interviews – Web/ video conferencing and Tele-Conferencing.

Suggested Books:

10. K. Bhardwaj, Professional Communication, IK Int. Pub. House, New Delhi.
11. Krizan, Merrier, Logan and Williams, Effective Business Communication, Cengage, New Delhi.
12. HC Gupta, SG Telang, Business Communication, Wisdom, Delhi
13. Penrose, Business Communication for Managers, Cengage , New Delhi
14. McGrath, Basic Managerial Skills for All 5thEdtion, Prentice Hall of India.
15. Urmila Rai & S.M. Rai, Business Communication, Himalaya Publishers
16. Meenalshi Raman – Business Communication Oxford University Press
17. Lesikar I Flatley, Basic Business Communication, Tata McGrw Hill.
18. Bovee and Thill: Business Communication Today, MacGraw-Hill, Second Edition
10. Guffey M. E.: Business Communication Process & Product, Thompson, South – Western

MBA(HRM)12004: MANAGERIAL ECONOMICS

Course objectives:

The course is designed to impart knowledge of the concepts and principles of Economics, which govern the functioning of a firm/organization under different market conditions. The course aims at enhancing the understanding capabilities of students about macro-economic principles and decision making by business and government. This course will enlighten the students to apply various techniques of economics in embracing business challenges

Learning outcomes: Relation of Managerial Economics with other disciplines and its relationship with management; understand the demand for and supply of the firm's products; Managerial decision under different market conditions; Importance of Production function; Causes and consequences of Inflation

Course Layout:

Unit- I

Introduction: Nature, scope, uses, relation with traditional economics, operations research, Mathematics, Statistics, Accounting; responsibilities of a managerial economist, objectives of a firm, Basic tools in Managerial Economics: Opportunity cost principle, Incremental principle, principle of time perspective, discounting principle, Equi marginal principle.

Unit-II

Demand and Supply: Law of demand: Demand determinants, assumptions, exceptions, demand schedule, demand curve, demand function, types of demand, demand foresting methods; elasticity of demand: price, income, cross, promotional; Law of supply: determinants of supply, kinds of supply elasticity.

Unit-III

Market Structure and Pricing Practices: Market structure: perfect, monopoly, Duopoly, monopolistic, oligopoly, monopsony, oligopsony; profit: role of profit, theories of profit; break even analysis (theory & Problems): assumptions, managerial uses, limitations, margin of safety, profit-volume analysis; pricing methods, dumping

Unit-IV

Production and Cost analysis: Production function: with one, two and all variable inputs, Cobb-Douglas, CES production functions, managerial uses of production function; Economies of scale: internal, external; types of cost.

Unit-V

Capital Management & Business Decisions: Techniques of traditional and modern investment appraisal (theory &Problems); Business Cycles: characteristics, phases, Inflation types, causes, effects, National income: measures, concepts; The multiplier, Acceleration principle, Fiscal policy: objectives, tools, monetary policy: objectives, instruments.

Reference Books

1. Managerial Economics Theory and Applications. Dr D.M. Mithani, Himalaya publishers

2. Managerial Economics R.L Varshny, K.L Maheshwari, sultan Chand publishers

3. Managerial Economics analysis, problems P.L Mehatha, sultan Chand publishers

4. Managerial Economics D.N Dwivedi, Vikas Publishers

MBA(HRM)12005: RESEARCH METHODOLOGY AND BUSINESS ANALYTICS

Course Objective: On successful completion of the course the students should familiarize with doing research work and analysing big data which helps management in taking decisions.

Learning outcomes: On successful completion of the course the student will be able to:

- Identify the overall process of designing a research study from its inception to its report.
- Apply appropriate analytical methods to find solutions to business problems that achieve stated objectives.
- Calculate and interpret the correlation between two variables.
- Calculate the linear regression equation for a set of data and know basic assumptions behind regression analysis.
- Explore small and large sample data to create testable hypothesis and identify appropriate statistical tools.

Unit-I

Introduction: Meaning and Definition of Research, Nature and importance of research the role of business research, aims of social research, research process, Quantitative and Qualitative Research, Types of Research, Research design, Importance of Research Planning, Meaning of research design, Functions and goals of research design, Pilot study and case study, Concepts of a Research plan, Induction and Deduction method, Snapshot studies, cross sectional and longitudinal studies. Sources of data, Sampling techniques, Report writing.

Unit- II

Measures of Central Tendency and Dispersion, Skewness and Kurtosis-Correlation Analysis: Types of correlation, scatter diagram, limits for coefficient of correlation, Karl Pearson's coefficient of correlation, Spearman's rank correlation, Properties of Correlation, Regression analysis: concept, least square fit of a linear regression, two lines of regression, Multiple Regression, Properties of regression coefficients.

Unit- III

Statistical Inference: Hypothesis Testing:- Introduction, Types of hypothesis, procedure for testing of hypothesis, Types of Errors in testing of hypothesis- One tailed and Two tailed tests of hypothesis. Tests of significance for small samples: - application, t-test, F-Test, Chi-square test, ANOVA one way and two-way classifications.

Unit – IV

Business Analytics : Introduction, Evolution of Business Analytics – Differences between Business Intelligence and Analytics – Business Analytics Life Cycle, Process – Business Analytics as Solution for Business Challenges; Introduction to Excel, SPSS, R and Python.

Unit – V

Master Data Management: Data Warehousing – Data Mining – Meta Data – Data Marts - Data Integration – Concept of OLTP and OLAP.

Reference Books

1. N.D. Yohra,2001, Quantitative Techniques in management, Tata McGraw Hill, 2ndnedition.
2. Barry Render, Ralph M. Stair, Jr. and Michael E. Hanna, 2007, Quantitative analysis for management, 9th Edition, Pearson publication
3. Gupta S.P. Statistical Methods. Sultan chand and sons, New Delhi.2005
4.C.R.Kothari, Research Methodology: Methods and Techniques,2/e,Vishwa Prakashan, 2006.
5. William G. Zikmund, Business Research Methods, Thomson, 2006.
6. Carver & Nash, Data Analysis with SPSS, Cengage, New Delhi

7. James R. Evans, Business Analytics Methods, Models and Decision, Pearson, 2015
8. Shashi K. Gupta & Praneet Rangi Kalyani Pub. Business Analytics
9. Sahil Raj, Business Analytics, Cengage Learning India Pvt.Ltd., 2015.

MBA(HRM) 12006 – ACCOUNTING FOR MANAGERS

Course Objective: The Objective of the course is to provide the basic knowledge of book keeping and accounting and enable the students to understand the Financial Statements and make analysis financial accounts of a company.

Course Outcomes: Upon Successful completion of the course, students will be able to

- Understand the fundamentals of financial accounting, the principles and concepts underlying them.
- Construct the financial statements viz., the Income Statement and Balance Sheet
- Gain practical knowledge on valuation tangible and intangible assets
- Exploit the issue and forfeiture of shares.

UNIT-I:

Introduction: Book-Keeping – Branches of Accounting – Systems of Accounting –Objectives of Accounting – Importance of Accounting - Users of Accounting Information - Principles of Accounting – Accounting concepts – Accounting conventions – Role of computers in Accounting.

UNIT-II:

Accounting Process: Double Entry System of Accounting – Classification of Accounts – Accounting cycle – Journal – Ledger – Trial balance - Manufacturing account - Trading and profit and loss account - Balance sheet with adjustments.

UNIT-III:

Valuation of Tangible Assets Concept of Depreciation – Purpose – Causes – Methods of depreciation – Fixed installment method – Diminishing balance method – Sum of year's digits method - Annuity method.

Valuation of Inventory – Concept - Objectives – Methods of taking inventories - Inventory valuation methods – Simple average method – Weighted average method - FIFO method – LIFO method.

UNIT-IV:

Valuation of Intangible Assets: Concept of Goodwill, Patents, Copyrights, Trademarks, R&D costs – Methods of valuation of goodwill – Average profit method – Super profit method – Capitalization method – Annuity method.

UNIT-V:

Issue of Shares: Meaning – Classification of shares – Equity shares – Preference shares –Issue of Shares for cash – For consideration other than cash - Entries for Issue of shares - Shares issued at par, premium and discount – Forfeiture of Shares.

Reference Books

- S.N. Maheswari, Accounting for Managment, Sultan Chand Publishing House Pvt. Ltd.

- Jain S.P, Narang K.L and Simmi Agarwal, "Accounting For Managers", Kalyani Publishers, New Delhi.
- Wild. J.J., Subramanyam, K.R. Halsey, R.F., Financial Statement analysis, Tata McGraw Hill.
- Narayana Swamy, "Financial Accounting: A Managerial Perspective", Pearson Education.
- Prasad, G. " Financial Accounting and Analysis" Jai Bharat Publishers, Guntur.
- Ramachandran and Kakani, " Finanical Accounting for Management", TMH, New Delhi.
- Prasad, G. "Accounting for Managers", Jai Bharat Publishers, Guntur.

MBA(HRM)12007: INFORMATION TECHNOLOGY FOR MANAGEMENT

Course Objective : The primary objective of this course is to familiarise the student with basic concepts of information technology and their applications to business processes. To elevate students' awareness of information technology and develop an in depth and systematic understanding of key aspects of IT Management.

Learning Outcomes: On successful completion of the course the student will be able to:

- Identify the overall structure and process of computer system and its type and application in management,
- Work withMS-Office tools like MS-Word, Ms-Excel and MS-Powerpoint for personal use and office use,
- Understand the Management Information System concepts and SDLC process and DSS and GDSS concepts
- Familiarise with the Information Technology tools and trends in present day scenario.

UNIT - I

Introduction : Basics of Computers - Major components of a computer system –- Types of Computers – Organisation System of Computer - Operating Systems: Definition, Functions, Types and Classification – Introduction to MS-Office – Features and Applications of MS–Word - – Types of Menus – Home – Insert – Design – Layout – References – Mailing – Review and View menus. (Theory and Practicals)

UNIT - II

MS-PowerPoint : Introduction - Features – Slide Creation – Slide Layouts – Slide Preparation – Slide Sorting – Slide Formatting – Home – Insert – Design – Animation – Slide Show – Review – View menu Options – Slide Show - Applications of MS-PowerPoint - Writing programs using menus. Introduction to MS-Excel : Introduction – Features – Advantages – Limitations. Menus in MS-Excel : Home – Insert – Page Layout – Formulas – Data – Review – View Menu Options. (Theory and Practicals)

UNIT - III

Introduction: System : Definition - Types of System - Information System : Types – Management Information System (MIS) : Meaning – Importance – Need - Characteristics – Organizational Structure of MIS – Role of the Management Information System – Applications of MIS**.** Tools and Techniques for System Development **- System Development Life Cycle (SDLC) :**Stages in developing SDLC.**Concept ofDecision Support System (DSS) :** Meaning – Architecture – Characteristics – Components – Concept of Group Decision Support System (GDSS) – Components. (Theory only)

UNIT - IV

Functional Information Systems : The Major Business Systems – Basic Elements of a Business organization -Marketing Information System – Concept – Components – Architecture - Financial Information System – Concept – Components – Architecture - Human Resource Information System – Concept – Components – Architecture(Theory only)

UNIT - V

Information Technology Tools and Trends : Concepts of IT : Multimedia - Image processing systems and Document Management Systems – Tools of IT - Trends in IT – Techniques of IT –Applications of IT – e-Business and e-Commerce tools and techniques – ERP - Introduction – Advantages and Limitations – EDI Technology. (Theory only)

REFERENCE BOOKS

11. RohitKhurana, Introduction to Information Technology, Pearson Education.
12. ITL education: Introduction to Computer Sciences, Pearson Publishers
13. Hunt and Shelly: Computers and commonsense, PHI publishers.
14. Dhiraj Sharma, Information Technology for Business, Himalaya Publishing House.
15. Kenneth C. Laudon and Jane P. Laudon: Management Information System, Eighth edition Prentice Hall of India.
16. Jawadekar W.S., Management Information System, TaTa McGraw Hill Publishing Company Limited, New Delhi.
17. James A.O Brien: Management Information Systems, TaTa McGraw Hill Publishing Company Limited, New Delhi.
18. Effy OZ, Management Information System, Vikas Publishing House.
19. Gordon B. Davis and Margrethe H. Oison, Management Information System, TaTa McGraw Hill Publishing Company Limited, New Delhi.
20. C.S.V. Murthy: Management Information System, Himalaya publishing House.

MBA(HRM) 12008 – HUMAN VALUES AND PROFESSIONAL ETHICS

Course Objective : To create awareness, Conviction and commitment to Values and Ethics for improving the quality of life through education and for advancing social and human well being.

Learning Outcomes: After completion of the course the students learns about morals, Values, work ethics and learns to respective ethics and develop civic virtue.

UNIT – I

Definition and Nature of Ethics – Its relation to Business and Environment. Need and Importance of Professional Ethics – Goals – Ethical Values in various Professions – Ethical theories about right action.

UNIT –II

Nature of Values – Good and Bad, Ends and Means, Actual and potential Values, Objective and Subjective Values, Analysis of basic moral concepts – right, ought, duty, obligation, justice, responsibility and freedom, Good behavior and respect for elders – moral development theories.

UNIT – III

Value education – definition and its relevance to present days – Concept of human values – self introspection – self esteem – family values – components – structure – and responsibilities of family – neutralization of anger – adjustability – threats of family life-Time allotment for sharing ideas and concerns.

UNIT –IV

Business ethics –Ethical standards of business – Immoral and illegal practices and their solutions – characteristics of ethical problems in management – causes of unethical behavior – ethical abuses and work ethics.

UNIT – V

Environmental and social ethics: ethical theory, man and nature, ecological crisis issues related pollution, waste, climate change, energy and population, social issues – human rights violation and social disparities.

References:

1. R.S. Naagarazan –A TEXT BOOK ON PROFESSIONAL EHICS AND HUMAN VALUES – New age International (p) Ltd.
2. M.Govindarajan, S. Natarajan, V.S. Senthil Kumar – PROFESSIONAL ETHICS & HUMAN VALUES.
3. R.R.Gran, R.Sangal, G.P. Bagania – FOUNDATION COURSE IN HUMAN VALUES & PROFESSIONAL ETHICS.
4. Jayashree Suresh, B.S. Raghavan – HUMAN VALUES AND PROFESSIONAL EHTICS.

II SEMESTER

MBA(HRM)22001: MARKETING MANAGEMENT

Course Objective: The course is designed to obtain knowledge and understanding of the key concepts of marketing and enables to apply to the practical situations in the workplace.

Learning Outcomes: On successful completion of this course, the students would be familiarized with the fundamentals of marketing, nuances and complexities involved in product and pricing decisions, skills needed to take better distribution decisions and promotion-mix decisions and will be able to understand emerging trends in marketing to take proactive measures in the present cutthroat competition.

Unit-I

Introduction to Marketing: Definition, Nature, Scope and importance of Marketing – Marketing Concepts – Marketing Vs. Selling –Marketing Mix- Marketing Environment: Meaning, Significance of Scanning Marketing Environment, Components of Micro environment, Macro environment.

Unit-II

Analysing Marketing opportunities: Consumer behaviour-Meaning- factors influencing buying behaviour-consumer decision making process, Segmentation: Need- Benefits - Bases of segmentation, Target market, Product differentiation, Product Positioning, Marketing Research: Concept - Objectives - types - Process – Merits and Demerits.

Unit-III

Developing Marketing Strategies: Concept of Product- Product Classifications- Product Mix- New Product development - Product Life Cycle, Designing Marketing Strategies for: Market leaders – Challengers - Followers and Nichers – Ansoff matrix, Branding: Essentials of a good brand - types of brands, Packaging and labelling.

Unit-IV

Planning Marketing programs: Objectives - factors affecting pricing decisions- pricing methods- Pricing Strategies for existing products and new products.Channels of Distribution: Definition, Need and Types of Channels, Channel Management Decision – Retailing – Types of Retailers – Retailer Marketing Decisions – Trends in Retailing, Wholesaling.-The growth and types of wholesaling – Wholesaler Marketing Decisions – Trends in Wholesaling, Other forms of distribution.

Unit-V:

Marketing Communication: Concept – importance – Promotional Mix: Advertising - Sales promotion - Personal Selling - Public Relations – Recent trends in Marketing: Social Marketing – Ambush Marketing – Green Marketing – Emotional Marketing – `Digital Marketing.

Reference Books

1. Marketing Management, R.S.N Pillai, Bagavathi, S.Chand
2. Business Marketing Management: B2B, Hutt & Speh, Cengage Publisher
3. Marketing Management Text & Cases, Indian Context Tapan K Panda, Excel Publisher
4. Principles of Marketing Kotler Armstrong PHI Publisher
5. Marketing Management, Rajan Saxena .TMH Publisher

MBA(HRM)22002: PRINCIPLES OF HUMAN RESOURCE MANAGEMENT

Course Objective: To equip the students with basic concepts, methods, techniques and issues of Human Resource Management and the various functions of HRM including Quality of Work Life in the liberalized environment.

Learning Outcomes:

On completion of this course, the students will be able

1.To develop the understanding of the concept of human resource management and to Understand its relevance in organizations.

2. To develop necessary skill set for application of various HR issues.

3. To analyse the strategic issues and strategies required to select and develop manpower resources.

4. To integrate the knowledge of HR concepts to take correct business decisions.

UNIT - I: Human Resource Management Introduction: Concept and Functions of Human Resource Management; Approaches to Human Resource Management; Evolution of HRM in India; HRM and Environment; Organizing the HR Unit; Line and Staff Relationship; Policies and Procedures; Planning HR activities; Controlling HR Function.

UNIT – II: Procurement: Organizational Design and Job Design; Job Analysis; Job description; Job specification; Human Resource Planning ; Recruitment: Sources of Recruitment; Selection Procedure (including e-recruitment and selection procedure) and Induction.

UNIT – III: Training and Development: Workers training; training process; training methods; Management Development Programs; Performance appraisal Methods and Problems; Talent Management; Career Planning and Development.

Unit IV: Employee Compensation: Factors affecting compensation; Equity and Compensation; Job Evaluation; Variable Compensation; Fringe Benefits; Motivation of employees; Quality of work life; Trade Unions; Collective Bargaining; Conflict Management.

Unit V: Maintenance: Communication and Counseling; Employee Welfare; Employee Health and Safety; .Separation: Turnover, Retirement, Lay Off, Retrenchment; Discharge; Dismissal and V.R.S. ;Maintenance of HR Data Base; HR Research; HR Audit; HR Accounting.; Challenges and Opportunities in the Globalized Era; Outsourcing of HR functions.

Suggested Books

1.Personnel Management, Flippo, Edwin B, McGraw Hill Publishing Company..

2.Personnel Manaement Text and Cases C.B. Mamoria, Himalaya publications

3.Human Resource Management text and cases V.S.P. Rao, Excel Books.

4.Human Resource Management Text and cases K. Aswathappa, Tata McGraw-Hill

5.Human Resource Management Garry Dessler, Pearson Education.

6. Human Resource Management - Dr. C.B. Gupta - Sultan and Sons.

7. Personnel & Human Resource Management - P. Subba Rao - Himalaya Publishing House.
8. Personnel Management & Human Resources - C.S. Venkata Rathnam & B.K. Srivastava. Tata McGraw-Hil

MBA(HRM) 22003– FINANCIAL MANAGEMENT

Course Objective: The Course aims at familiarizing the participants with the skills related to basic principles, tools and techniques of Financial Management.
Course Outcomes: Upon Successful completion of the course, students will be able to

- Practically understand and follow day-to-day developments in financial management
- Develop an attitude of integrative thinking while analyzing and interpreting financial statement and accounting information
- Develop the skill of evaluating the projects using capital budgeting techniques
- Construct the optimum capital structure of the organization
- Critically evaluate the working capital requirement of the business firms
- Able to understand dividend theories and its valuation.

UNIT–I
Foundations of Finance: Introduction to Finance - Nature and scope of Financial Management - Functions – Goals - maximizing vs satisfying (School); Profit Vs Wealth Vs Welfare; Agency relationship and costs - Role of financial manager**. (Theory Only)**
UNIT-II
Financial Statement Analysis: Meaning – Classification – Tools - Trend analysis – Comparative statement analysis – Common-size statement analysis – Ratio analysis - Funds flow statement analysis – Cash flow statement analysis. **(Theory & Problems)**
UNIT-III
Financing Decisions: Sources of Finance – Short term sources – Long term sources. Leverage analysis – Operating leverage – Financial leverage – Combined leverage. Capital structure decisions – Factors determining Capital Structure -Tools for designing optimum capital structure – EBIT-EPS analysis – Financial BEP and Indifference Curve analysis – CAPM - Capital Structure theories – Net Income Approach – Net Operating Income Approach – M-M Hypothesis – Traditional Approach. Cost of Capital – Elements of Cost of Capital – Measurement of Cost of Capital – WACC. **(Theory & Problems)**

UNIT-IV
Investment Decisions: Nature and significance of Investment Decision – Estimation of Cash Flows – Steps in Capital Budgeting Process – Evaluation techniques – Traditional techniques – Payback period – ARR - Discounted Cash Flow techniques – NPV – Profitability Index – IRR – Discounted Payback Period - The NPV Vs IRR Debate. **(Theory & Problems)**
Liquidity Decisions: Concepts and characteristics of Working Capital –Approaches of working capital - Factors determining the working capital - Operating cycle –Methods of estimating working capital requirements. **(Theory & Problems)**

UNIT-V

Dividend Decisions: Meaning – Forms of dividends - Concept of relevance and irrelevance theories – Walter's Model – Gordon's Model – MM Hypothesis – Factors determining Dividend Policy. **(Theory Only)**

Reference Books

1. I.M. Pandey, "Financial Management", Vikas Publishing, 2007.
2. M.Y Khan & P.K. Jain, "Financial Managemengt, Text and Problems", TMH, New Delhi.
3. Prasanna Chandra, "Financial Management: Theory and Practice", TMH, New Delhi.
4. Bruner. R.F., "Case Studies in Finance", Tata McGraw Hill, New Delhi.
5. Managerial Finance, Gitman L.J.,11th Edition, Pearson Education 2006.
6. Principles of Corporate Finance, Richard A Brealey etal., Tata McGraw Hill 2007.
7. Corporate Finance: Theory and Practice, Vishwanath.S.R.2007, 2/e, Sage Publications.
8. Financial Management – Text and cases, Bringham & Ehrhardt, Cengage, 2005.
9. Case Studies in Finance, Bruner.R.F.2007, 5th Edition, Tata McGraw Hill, New Delhi.

MBA(HRM) 22004: PRODUCTION MANAGEMENT

Course Objective: The Objective of the course is to enable students to understand the production Planning and Controlling aspects of a typical production and operations organization.

Learning outcomes: Core features of Production Management function, gaining knowledge to run work systems effectively, analyzing various facility alternatives, Plan and implement suitable quality control measures in quality circles, better understanding of modern production tool

Course Layout:

Unit-I

Production System: Types of Production system: Flowshop, Job shop, Batch; Responsibilities of Production Manager; Differences and similarities between manufacturing and service operations; Product design: Characteristics of good product design; Approaches to product design: Quality function deployment, Concurrent engineering, Ergonomics, Value engineering/Value analysis, Productivity: Importance, Measuring productivity, ways of improving productivity; production planning: tactical, operational, strategic; Maintenance management (including problems):functions, types.

Unit-II

Design of Work System: Work study: benefits, work study procedure; Method study: objectives, method study procedure, process charts; Work Measurement (including problems): benefits, techniques of work measurement.

Unit-III

Flow shop scheduling: Shop floor planning (including problems): Johnson's rule, extension of Johnson's rule, CDS Heuristics; Inventory management: objectives, Inventory control techniques (including problems); Facility location: errors in selection, relative importance of location factors; facility layout: factors influencing facility layout, types of layout.

Unit-IV

Quality Management: relevance of quality control, impact of poor quality, statistical process control: acceptance sampling for variables and for attributes, control charts (including problems) for variables and for attributes; Six Sigma: types of six sigma belts, benefits; quality circles; vendor analysis.

Unit-V

Modern production management Tools: Just in time manufacturing: wastes in production process, benefits; push and pull production system, Kanban system; ISO 9000 series: -benefits, steps in ISO 9000 registration; Business process reengineering: characteristics, steps in implementing BPR, advantages; Lean manufacturing: steps, components,

Reference Books

1.Production Management, Martand T. Telsang S. Chand Publishers
2.Production and Operations Management K. Aswathappa, K.Shridhara Bhat Himalaya Publishing House
3.Production and Operations Management R. Pannerselvam PHI publishers
4.Production and Operations Management S.N Chary McGraw Hill
5.Production and Operations Management -Text and cases Upendra Kachru, Excel Books

MBA(HRM)22005: OPERATIONS RESEARCH

Course Objectives: This module aims to impart knowledge to students the concepts and tools of operations research, understand mathematical models used in operations research and apply these techniques constructively to make effective business decisions.

Learning outcomes: On completion of the course the student will be able to:

- Formulate real-world problems as a linear programming model and describe the theoretical working s of the graphical, simplex and Big-M methods, demonstrate the solution process by hand and solver.
- Formulate transportation and assignment problems and describe theoretical workings of the solution methods for transportation and assignment problems, demonstrate solution process by hand and solver.
- Design and solve PERT/CPM.
- Simulate different real life probabilistic situations using Monte Carlo simulation technique.
- Apply the knowledge of game theory concepts to articulate real-world decision situations for identifying, analyzing, and practicing strategic decisions to counter the consequences.

Unit-I

Definition, Importance of Operations Research for Management, Nature of Operations Research, Scientific method in operation research, Characteristics and phases of Operations Research, Classification of models, Principles of modeling, Problem models of Operations Research, scope and limitations. Linear programming: formulation, terminology, applications of LPP, advantages and limitations of LPP Graphical solutions, Simplex method, Big-M method and two phase method.

Unit-II

Transportation problem:- General TP, Transportation table and loops, formulation, optimal solutionof a TP, finding an IBFS, Degeneracy in TP, Transportation algorithm(Modi method),unbalanced transportation problem. Assignment problem:- Mathematical formulation of the assignment problem, Traveling salesman problem, solutions, differences of transportation and assignment problems , Hungarian method, unbalanced assignment problem .

Unit-III

Network Analysis:- Activity, merge event, burst event, looping, dangling, Redundancy, project Management by PERT/CPM, project crashing, PERT analysis and Computations, differences of PERT/CPM.

Unit-IV

Game theory:- concepts, Characteristics, pay off matrix, maximin-minimax principle, saddle point, Dominance, Zero-sum game, two, three and more persons games, analytical method of solving two person zero sum games, mixed strategies of S_A ,S_B and value of the game, graphical solutions for (m×2) and (2× n) games, linear programming method of simplex method in game theory, Iterative method

Unit – V

Simulation:- Meaning – Definition of Simulation – Types of Simulation – Advantages and Disadvantages of Simulation – Event Type of Simulation – Monte – Carlo Simulation – Generation of Random Numbers – Simulation of Queueing System – Simulation of an Inventory System – Simulation Languages.

Reference Books

1, Shenoy, G.V. Srivastava, V. K. and Sharma S.C., "Operations Research for Management".
2. Kantiswaroop, Man Mohan and Gupta, Operations Research.
3. Goel and Mittal, Operations Research.
4. Sharma S.K. k.,Operations Research.
5. Hamdy, A. Taha:Operations Research: An introduction, prentice Hall of India New Delhi, 2007.
6. R.Panneerselvnam PHI 2nd Ed. Operations Research

MBA(HRM) 22006 – BUSINESS ENVIRONMENT

Course Objective: The present course aims at familiarizing the students with various aspects of economic, social, political and cultural environment of India. This will help them in gaining a deeper understanding of the environmental factors influencing Indian business organizations and also the students understand the legal and regulatory framework for doing business in India.

Learning Outcomes: On completion of the course, the student would

- Be aware of dimensions of the Business Environment.
- Analyse the impact of culture and technology on business.
- Explain the economic trends and effect of Government policies as LPG.
- Be acquainting with the various legal frame works in India pertaining to Business.

UNIT – IBusiness Environment: Meaning – Importance – Nature – Environmental Factors – Changing the dimensions of Business environment – monitoring techniques of environmental scanning

UNIT – IISocio – Cultural and Technological Environment: Elements of Socio – Cultural Environment: Impact on Business – Culture and Sub culture pattern – Social responsibility of business – Technology upgradation – technology transfer – Technological Policy.

UNIT – IIIEconomic and Political Environment: Significance and elements of economic environment – economic system – economic planning in India – Industrial Policy – New foreign trade policy – liberalization – privatization and globalization – Demonetization – Monetary and Fiscal policy – EXIM policy – critical elements of political environment.

UNIT –IVLegal Environment of Business: Political Institutions – Legislature, Executive and Judiciary – Changes of Legal Environment in India – Intellectual Property Rights – Major regulations pertaining to business.

UNIT – VBusiness Legislations: Consumer Protection Act 1986 – SICA Act – 1985 – FEMA Act 1999 – IT Act 2000 – Competition Act 2002 – MSME Act 2006.

Suggested Books:

1. Francis Cherunilam, ***Business Environment***, Himalaya Publishing House, Mumbai.
2. Fernando, A.C., ***Business Environment***, Pearson.
3. Suresh Bedi, ***Business Environment,*** Excel Books, New Delhi,
4. Adhikary.M. ***Economic Environment of Business***, Sultan Chand & Sons, New Delhi.
5. Aswathappa.K., ***Essentials of Business Environment***, Himalaya Publishing House, Delhi.
6. Justin Paul, ***Business Environment***, Text and Cases, Tata McGraw Hill.
7. Krishna Rao,P, ***WTO-Text & Cases***, PSG Excel Series.
8. R.S.N. Pillai and Bagavathi, "***Legal Aspects of Business***", S.Chand, New Delhi.
9. H.L.Ahuja, "***Economic Environment of Business"*** S.Chand, New Delhi.
10. G.Prasad, ***Business and Corporate Laws***, Jai Bharathi Publishers.

MBA(HRM) 22007: Dynamics of Leadership

Objective: The course is aimed at equipping the students with necessary concepts and techniques to develop effective leadership skills to attain objectives of the enterprise in a conducive environment.

Outcomes: After completion of the course the student will be able to inspire, influence, guide and lead others to participate and attain the common goal.

Unit -I

Introduction: meaning, nature and importance, impact of leadership on organizational performance, leadership roles, types of leadership, framework for understanding leadership, traits, motives and characteristics of leaders.

Unit -II

Effective Leadership behavior and attitude: Task-related attitudes and behavior, Relationship oriented attitudes and behavior, 360-degree feedback for fine-tuning a leadership approach,

Unit-III

Leadership styles – classical leadership style, boss-centered Vs employee-centered leadership continuum, the autocratic, participative, free-rein continuum, the leadership grid style, the entrepreneurial leadership style, gender difference in leadership style, selecting the best leadership style, Leadership theories

Unit-IV

Developing team work: team leadership vs. solo leadership, advantages and disadvantages of group work and team work, the leader role in the team-based organization, leader actions that foster teamwork, outdoor training and team development, the leader- member exchange model and teamwork.

Unit-V

Leadership development: development through self-awareness and self-discipline, development through education, experience, and mentoring, leadership development programs, evaluation of leadership development efforts, leadership succession.

Text books

1. Andrew J. DuBrin, Leadership, Biztantra, New Delhi.
2. Gary Yukl, Leadership in organizations, Pearson Education, New Delhi.

OPEN ELECTIVE

MBA(HRM) 22008: TALENT AND KNOWLEDGE MANAGEMENT

Course Objective: The main objective of this paper is to enable the students understanding the significance of Talent and Knowledge Management in today's business scenario.

Learning Outcome:

Students will be able to understand

4. Talent Management Process
5. Knowledge management aspects
6. Knowledge management assessment and solutions

Unit – I: Introduction : Meaning and importance of talent management, Designing and building a talent reservoir, Segmenting the Talent Reservoir, Talent Management Grid, Creating a talent management system, Institutional strategies for dealing with talent management.

Unit – II : Competency Management : Meaning, characteristics, types–Steps in developing a valid competency model, Talent management information systems; Developing a talent management information strategy, Role of leaders in talent management.

UNIT-III: Introduction to KM & Role of IT: Meaning & Importance of Knowledge Management, Data–information - Knowledge - Wisdom interrelationship, Organizational knowledge: Characteristics and components of organizational knowledge, Building knowledge societies, Role of Information Technology in Knowledge Management System.

UNIT-IV: Future of Knowledge Management & Industry Perspective: knowledge management in manufacturing and service industries, Knowledge management in finance, Knowledge management in marketing, Business ethics and Knowledge Management, Challenges and future of knowledge management.

UNIT-V: Knowledge Management Process: Stages of Knowledge Management process, Knowledge Capital vs. Physical Capital, Knowledge Management Strategies, Factors influencing Knowledge Management, Web portals, Information architecture – Net banking in India.

Suggested Books

1. Sudhir Warier, "Knowledge Management", Vikas Publishing House Pvt. Ltd.
2. Thorne & Pellant, "The Essential Guide to Managing", Viva Books.
3. Stuart Barnes(Ed) "Knowledge Management Systems". Cengage Learning.\
4. Ed by Lance A. Berger and Dorothy R Berger. "The Talent Management Handbook", 2004, Tata McGraw Hill edition.
5. Ed by Larry Israelite, "Talent Management", ASTD Press.
6. Sajjad M Jasmuddin, "Knowledge Management", 1st ed, 2009, Cambridge.
7. Stuart Barnes, "Knowledge Management Systems", Ed, Cengage Learning
8. Donald Hislop, "Knowledge management in Organizations", 2009, Oxford University Press, Second edition.

MBA(HRM) 22009: FUNDAMENTALS OF BUSINESS MANAGEMENT

Course Objective: The course aims to acquaint with fundamentals of management and various functional areas of management.

Learning Outcome:

- To Apply elements of effective decision making to areas that are central to career development
- To have an understanding of the basic concepts, and processes of communication
- To obtain knowledge and understanding of the key concepts of marketing and enables to apply to the practical situations in workplace
- To strategically plan for the human resources needed to meet organizational goals and objectives
- To aim at familiarizing the participants with the skills related to basic principles, tools and techniques of Financial Management

Unit – I:

Fundamentals of Management: Concept – Significance – Functions – Principles - Role and Responsibilities of a Manager – Management is an Arts Or Science – Concept of MBO – Management vs Administration – Advantages - Limitations.

Unit-II

Introduction to Business: Concept - Nature – Features – Types of Business – Business Vs Trade – Business Communication and its importance – Goal setting – Types of Strategies.

UNIT – III:

Marketing Management: Concept of Marketing –Nature – Scope – Distinction between Marketing and selling – Marketing Mix – Steps in New Product Development – Product life Cycle – Process of Marketing Research – Marketing Strategies – e-Marketing – Social Marketing.

UNIT-IV:

HRM: Concept – Nature – Objectives – Significance - functions – Role of HR Manager – HR Planning – Recruitment Process – Sources of Recruitment – Methods of Recruitment – Job Induction – Job Description - Job Specification – Job Analysis – Job Evacuation Process – Training and Development – Career Planning and Development Methods – Leadership – Motivation – Stress Management.

UNIT- V:

Financial Management: Concept – definitions – Nature – Scope – Objectives – Significance – Financial Decisions – Sources of Finance – concept of Cost of Capital Importance – classifications of costs – Computation of Specific Source of fund cost – WACC Concept of working capital Management – Objectives – Sources of W.C – Kinds of W.C – Components of W.C – Importance – Operating cycle – Cash Conversion cycle – Estimation of working capital – Dividend Policy – Issue of Dividend and Bonus Shares.

Reference Books:

1.Philip Kotler, Marketing Management, Pearson Education.
2.Heinz Weirich and Harold Koontz, Management, TMH.
3.I.M.Pandey, Financial Management, Vikas Publishers.
4.Garry Dessler, Human Resource Management, Pearson Edition.

III SEMESTER

MBA(HRM) 32001: BUSINESS LAW

Course Objective: The course aims to acquaint students with various laws governing business operations in India.

Learning Outcomes: On completion of this course, the students would be able to learn thoroughly about the general contracts, understand the contracts relating to the sale of goods, use negotiable instruments in practical life and familiarize with the legal frame work regarding forms of business association and income taxation.

Unit – I

The Indian Contract Act – 1872: Nature of a Contract - Classification of Contracts - Essentials elements of valid Contract — Capacity of parties – Free Consent – Performance of Contract - Discharge of Contracts – Breach of Contract and its Remedies.

Unit – II

Sale of goods Act – 1930: Meaning of Contract of Sale of Goods- Essential Elements of Contract of Sale, Conditions and Warrantees; Performance of Contract of Sale, Unpaid Seller:Concept - Rights of Unpaid Seller. **Indian Partnership Act – 1932**: Elements of partnership - Constitution of Partnership - Forms of partnership - Types of partners– Rights, Duties and Liabilities of Partners. The LLP Act, 2008: Meaning, formation and LLP vs. partnership firm.

Unit- III

Negotiable Instruments Act – 1881: Meaning - Characteristics– Promissory Note – Definition- Characteristics, Bills of Exchange: Definition – Characteristics – difference between promissory note and Bill of exchange, Cheque: Definition – Characteristics – differences between Cheque and Bill of exchange – Crossing of Cheque - Types of Endorsements, Electronic funds transfer terminology– NEFT, MICR, RTGS, and CTS.

Unit-IV

The Companies Law: Meaning of a company - Characteristics - Types of Companies – Steps and Procedure for incorporation of the Company – Memorandum of Association - Articles of Association – Shares: Meaning- Types of Shares, Directors: appointment- removal -powers, duties and responsibilities- Company management: Meetings – types, kinds of meetings- Resolutions- types-minutes, Winding up of a company.

Unit –V

Income Tax Act – 1961(Theory only):Meaning – Characteristics - Purpose of Income Tax, Terminology of Income Tax: Income- person-Assesse- Assessment Year- Previous year , Gross Total Income , Advance Payment of Tax , Tax Deducted at Source.

Reference Books

1. Bansal, C.L., Business and Corporate laws, 1st Edition, Excel Books, 2006.
2. S.K Maheswari, S.N., Maheswari, A Manual of Business Law, Himalaya Publishing House, 2006.
3. Lal, B.B., & Vashisht, N., Direct Taxes, Latest Edition, Pearson Education, 2009.
4. Kapoor, N.D., Mercantile law, Sultan Chand & Sons, 2006

MBA(HRM) 32002: TOTAL QUALITY MANAGEMENT

Course Objectives: This course is designed to learn the fundamentals of Total Quality Management with emphasis on quality philosophies and tools in the managerial perspective.

Learning Outcomes:
1. Summarize the Total quality principles.
2. Demonstrate the tools utilization for quality improvement.
3. Analyze the various types of techniques are used to measure quality.
4. Describe the dimensional barrier regarding Quality.
5. Apply the various quality systems in implementation of Total quality management.

UNIT- I: Total Quality Management: Meaning & Definitions of quality, Need for quality, quality Evolution, Dimensions of quality, Basic concepts of total quality management, Principles of TQM, Service Quality , Customer Satisfaction , Gurus of TQM, TQM Framework.

UNIT- II: Management Tools: Forced Field Analysis – Affinity Diagram – Just in time –Quality Circles – Cost Benefit Analysis – Flow Charts – Run and Control Charts – Check Sheets – Histograms – Scatter Diagrams – Cause and Effect Analysis – Process Simulation.

UNIT- III: Tools for Quality: Benchmarking – Quality Function Deployment – Quality By Design – Failure Mode and Effect Analysis – Total Productive Maintenance – ISO 9000 – ISO 14000 and ISO 18000.

UNIT- IV: Six Sigma: Definition ---– Competitive Advantage -- Implementation of Six Sigma – Design for Six Sigma and Tools.

UNIT- V: Business Process Reengineering: Introduction, Meaning & Concerpt of Business Process Reengikneering — Principles and applications of Business Process Reengineering – The Reengineering Process –Benefits and Limitations of Business Process Reengineering..

Suggested Books:

1. Besterfiled, D.H. “Total Quality Management”, Pearson Education, Inc. 2003.
2. Zeiri., “Total Quality Management for Engineers”, Wood Head Publishers, 1991.
3. Evans, J. R., and Lidsay, W.M., “The Management and Control of Quality”, 5th Edition, South-Western (Thomson Learning), 2002.
4. Oakland.J.S. “Total Quality Management”, Butterworth – Hcinemann Ltd., Oxford, 1989.
5. Narayana V. and Sreenivasan, N.S., “Quality Management – Concepts and Tasks”, New Age International, 1996.
6. Kanishka Bedi., “Quality Management”, Oxford University Press, 2006.

INTERNAL ELECTIVES

MBA(HRM) 32331. MANAGEMENT OF INDUSTRIAL RELATIONS

Course Objective: To enlighten the students with the Concepts and Practical applications of Industrial Laws and Employee relations.

Learning Objectives: Upon completion of the course, the student would

- Be aware of the concepts of industrial relations.
- Be acquainted with the legal framework stipulated under the Industrial Dispute Act, 1947.
- Be imbibed with the concepts, principles and issues connected with trade unions, collective bargaining and workers participation.
- Understand trade unionism in India and legal frame work under the Trade Union Act, 1926.

Unit – I: Industrial Relations: Scope and Significance – Evolution of Industrial Relations in India and comparative analysis with USA and UK– Recent Trends in Industrial Relations – Approaches to Industrial Relations – Theories of Industrial Relations.

Unit – II: Promotion of Harmonious Relations – Machinery for Prevention and Settlement of Industrial Disputes – Conciliation – Arbitration and Adjudication – Code of Discipline and Code of Conduct; Industrial Disputes Act 1947.

Unit – III: Collective Bargaining (CB) – CB Practices in India – Participative Management Forms and Levels – Schemes of Workers' Participation in Management in India – ILO and its impact.

Unit - IV: Trade Unions: Concept, Growth, functions and Objectives of Trade Unions - Trade Union Movement in India, UK and USA - Changing Role in the Context of Liberalization - Trade Union Act 1926.

Unit-V: Trade Unionism in India: Problems of Trade Union; Recognition, Leadership, Political involvement, Union rivalry; National trade Union Federations; Emerging Trends in Trade Unions in India.

Suggested Books:

1. VenkatRatnam, C.S. – Industrial Relations, Oxford University Press.

2. SC Srivathava, Industrial Relations and Labour Laws, Vikas, New Delhi.

3. M.Arora: Industrial Relations, Excel Publications.

4. P.R.N.Sinha, InduBalaSinha and SeemaPriyadarshiniShekar, "Industrial Relations, Trade Unions and Labour Legislation", Pearson Education, New Delhi.

5. Ramaswamy E.A. – The Strategic Management of Industrial Relations, Oxford University Press.

6. Cowling and James, The Essence of Personnel Management and Industrial Relations, Prentice Hall of India.

7. RatnaSen, "Industrial Relations in India", Macmillan India Ltd. New Delhi.

8. Michael Armstrong, Employee Reward, Universities Press (India) Ltd.

MBA(HRM) 32332 - EMPLOYEE COMPENSATION AND ADMINISTRATION

Course Objective: Explain how perceptions of compensation differ among society, stockholders, managers and employees. Understand the concept of a compensation strategy, where it comes from, how it relates to the organization's situation**.**

Learning Outcomes:
On completion of this course the student will be able to recognize how pay decisions help the organisation and analyze, integrate and apply the knowledge in solving compensation related problem in the organisation.

UNIT I :

Employee compensation: Concept and Significance: Wage Concept: Wage , Salary , Minimum Wage, Living Wage, Need-Based Minimum Wage, Money Wage and Real wage; Wage policy in India ; Theories of wages.

UNIT II :

Wage Administration Principles: Factors influencing Wage Fixation and Methods wage Differentials: Occupational, skill, Sex, Inter-Industry, Regional and Sectional.

UNIT III:

Wage Fixation Mechanisms: Statutory Wage fixation, Wage Boards, Collective Bargaining, Adjudication, Pay Commission; Wage Fixation in Public Sector.

UNIT IV:

Incentives : Principles and procedures for installing incentive system; Types of wage Incentive System, Wage incentive Schemes in India, working of incentive schemes, Linking wage with productivity; Fringe Benefits: Concepts and Types.

UNIT V:

Wage and salary policies in Organization: Role of HR Department in wage and salary Administration, Managerial compensation, Perquisites and special Features; Recent trends in managerial compensation in Indian Organizations, International compensation: Components of International compensation, expatriate and repatriate compensation, approaches to international compensation.

Suggested Books:

1. Subramanian, K.N., Wages in India, Tata Mc Graw Hill Publishing Co. Ltd., New Delhi.
2. Sarma. A.M, Understanding Wages Systems, Himalaya Publishing House, Mumbai.
3. Varma, Promad, Wage Determination: concepts and cases, Oxford IBH publication. Ltd New Delhi.
4. Chatterjee, N.N., Management of Personnel of in Indian Enterprises. Allied Books agency, Culcutta.
5. Aswathappa. K., Human Resource and Personnel Management. Tata Mc Graw Hill Publishing Co.
6. Dipak Kumar Bhattacharyya, Compensation Management, Oxford University press, New Delhi.

MBA(HRM) 32333: EMPLOYEE WELFARE AND LABOUR ADMINISTRATION

Course Objective: To enlighten the students with the Concepts and Practical applications of employee welfare and labour administration.

Learning Outcomes:

- **Employees Welfare measures are in addition to their wages and services.**
- **ILO develop effective standards, fundamental principles, and fundamental rights at work**
- **Implementation of statutory and non-statutory welfare programmes**
- **Social security measures for employees**

Unit – I : LABOUR WELFARE

Labour Welfare : Concept, Definitions, Scope, Aims and Objectives and Philosophy of Lab our Welfare; principles of Lab our Welfare: Indian Constitution and Labour Welfare Historical Development of Lab our Welfare in India:

Unit – II: ILO

Impact of ILO; Structure, Function, Welfare work on labour welfare in India; Agencies of Lab our Welfare and Their roles: State, Management, Trade Unions and Voluntary Agencies.

Unit – III: WELFARE PROGRAMES

Labour Welfare Programmers ; Statutory and Non-Statutory, Extra Mural and Intra Mural: Canteen, Housing, Workers Education Scheme; Welfare Office: Role , Status and Functions.

Unit – IV: SOCIAL SECURITY

Social Security : Definition, Aims and Objectives; Social Assistance and Social Insurance, Financing of Social Security Schemes, Development of Social security in India; Social Security Measures for Industrial Employees.

Unit – V: LABOUR ADMINISTRATION

Labour Administration : Central Lab our Administrative Machinery in India; Chief Lab our Commissioner , Director general of Employment and Training, director general of factory Advice Service, Provident Fund Organization, ESI Scheme : Lab our Administration in AP

Reference Books

1. Moorthy, M.V., Principals of Lab our welfare in India, Sree Ram Centre
2. Sharma, A.M., Aspects of Lab our Welfare and Social Security, Himalaya Pub. House, Mumbai.
3. Ram Chandra P.Singh, Lab our Welfare Administration in Indian, Deep & deep Pub., New Delhi.

MBA(HRM) -32334- ORGNIZATIONAL CHANGE & DEVELOPMENT

Objectives:

• To understand the forces that stimulate change

• To understand the necessity for change

• To understand the resistance to change

• To manage the change process and

• To understand the concept and techniques of OD

• To enable the skills for the application of OD in organizations.

Outcome: After successful completion of the course the student will be able to understand the stimulating forces for change, why employees resist to change and how to manage the change process. Student will be able to know the techniques of OD and acquire the application skills of OD in organizations.

UNIT-I: Change – stimulating forces – planned change – change agents – unplanned change – Model of organizational change – Lewin's three Step Model.

UNIT-II: Resistance to change – individual factors – organizational factors – techniques to overcome change.

UNIT-III: Change programs – effectiveness of change programs – change process – job redesign – sociotechnical systems.

UNIT-IV: OD – basic values – phases of OD – entry – contracting – diagnosis – feedback – change plan – intervention – evaluation – termination.

UNIT-V: OD intervention – human process interventions, structure and technological interventions and strategy interventions – sensitivity training – survey feedback, process consultation – team building – inter-group development – innovations – learning organizations.

TEXT BOOKS:

1. French & Bell: ORGANISATIONAL DEVELOPMENT, McGraw-Hill.

2. Vinayshil Gautham & S.K.Batra: ORGANISATION DEVELOPMENT SYSTEM, Vikas Publishing House.

REFERENCES:

1. Rajiv Shaw: SURVIVING TOMORROW: TURNAROUND STRATEGIES IN ORGANISATIONAL DESIGN AND DEVELOPMENT, Vikas Publishing House.

MBA(HRM) 32335: HUMAN RESOURCE DEVELOPMENT

Course Objective: The course aims to equip students to develop themselves into a critically reflective and capable HRD practitioner, or a manager who can facilitate the learning of others. The major objective of the course tis to explain and demonstrate the contribution of HRD in an organization and enable student to develop an ability to decide learning and training needs and have competence in the design and delivery of learning programmes.

Course Outcomes: On successful completion of the course students will be able to:

- To build an understanding and perspective of HRD as discipline appreciating learning,
- To learn OD as an applied field of change.
- To assess the training needs and competencies in designing and delivery of training programmes,
- To understand the application of HRD practices in various sectors.

Unit – I

Human Resource Development: concept, Origin and Need for HRD; Objectives of HRD,Systems approach to HRD: Approach to Activity Areas of HRD; HRD Interventions ; Performance appraisal, Potential Appraisal, Feedback and Performance coaching, HRD Climate; Challenges and goals of HRD; HRD functions and Staffing; Roles and competencies of HR professionals; Role of Line and Staff Agencies of HRD.

Unit – II

HRD –Trends: Organization Development: OD Concept, Definitions, Characteristics ,Features of OD, OD Interventions, Approaches to OD Change Lewins Three- Steps Model, Experience in Indian Organizations, Future of HRD. Employee Welfare and Quality of Work Life, Career Management; Management of stress and conflict at work place;

Unit – III

Human Resource Training : Concept and Importance: Assessing Training Needs: Process of Training; Designing and Evaluating, Training and Development Programmers, Organizational Culture, Types, Developing Right Culture, Work Place Jealousies and Policies, Developing goals of Managers;

Unit – IV

Application of HRD, HRD for workers (Blue Collar Employees)Types and Methods of Training, Managing Diversity for HRD, Behavior Modeling, Brain Storming Case Study.

Unit – V

HRD in Practice: Quality Circles: HRD in Large, small, Manufacturing and Service Organizations, Global Developments and Implications for HRD in India, HRD outsourcing, BPO, ITES. HRD Audit. Industrial Distributes.

Reference Books

1. Rao, T.V., Human Resource Development, Sage publications, New Delhi.

2. T.V. and Pareek, Udai, designing and managing Human Resource Systems; Oxford and IBR Pub. Ltd., New Delhi.
3. Nadler, Leonard, Corporate Human Resource Development, Van Nostrand Reinhold/ASTD, New York.
4. ILo, Teaching and Training Methods for Management Development Hand Book McGraw Hill, New York.
5. Graig, Robert l. and bittel Lester R.(ed), Training and Development Development Hand Book McGraw Hill,New York.
6. Rao T.V.(et),HRD in the New Economic Environment, TMH ,New Delhi.
7. Dr. D.K.Bhattacharya, HRD, Himalaya Publishing New Delhi
8. T.D.Tiwari and Anjuthakker, Wisdom Publications,
9. A.M.Shakhi, HRD
10, Gupta & Gupta . HRD, Deep & Deep Publications

MBA(HRM)- 32336- STRESS MANAGEMENT

COURSE OBJECTIVE: To provide a broad physical, social and psychological understanding of human stress. The main focus is on presenting a broad background of stress.

OUTCOMES: Students will be able to understand the management of work-related stress at an individual and organizational level and will help them to develop and implement effective strategies to prevent and manage stress at work.

UNIT I UNDERSTANDING STRESS: Meaning – Symptoms – Works Related Stress – Individual Stress – Reducing Stress – Burnout.

UNIT II COMMON STRESS FACTORS TIME & CAREER PLATEAUING: Time Management – Techniques – Importance of planning the day – Time management schedule – Developing concentration – Organizing the Work Area – Prioritizing – Beginning at the start – Techniques for conquering procrastination – Sensible delegation – Taking the right breaks – Learning to say 'No'.

UNIT III CRISIS MANAGEMENT: Implications – People issues – Environmental issues –Psychological fall outs – Learning to keep calm – Preventing interruptions – Controlling crisis – Importance of good communication – Taking advantage of crisis – Pushing new ideas – Empowerment.

UNIT IV WORK PLACE HUMOUR: Developing a sense of Humour – Learning to laugh – Role of group cohesion and team spirit – Using humour at work – Reducing conflicts with humour.

UNIT V SELF DEVELOPMENT: Improving Personality – Leading with Integrity – Enhancing Creativity – Effective decision Making – Sensible Communication – The Listening Game – Managing Self – Meditation for peace – Yoga for Life.

REFERENCES

1. Cooper, Managing Stress, Sage, 2011

2. Waltschafer, Stress Management, Cengage Learning, 4th Edition 2009.

3. Jeff Davidson, Managing Stress, Prentice Hall of India, New Delhi, 2012.

4. Juan R. Alascal, Brucata, Laurel Brucata, Daisy Chauhan. Stress Mastery. Pearson

5. Argyle. The Psychology of Happiness. Tata McGraw Hill. 2012

6. Bartlet. Stress – Perspectives & Process. Tata McGraw Hill. 2014

MBA(HRM) – 32337 - LEADERSHIP

OBJECTIVE: To identify leadership qualities for an effective process of change. What kind of knowledge, skills, talent and competencies are required for a leader to bring a successful organizational change.

OUTCOMES: After successful completion of the course the student will be able to act as a bridge between organization and envisioned change and also be able to lead effectively during change

UNIT – I: INTRODUCTION: Leadership: Concept, Characteristics, roles, motives, skills and functions. Leadership Vs Management. Effective leadership behaviours and attitudes. Impact of Leadership on organizational performance.

UNIT – II: LEADERSHIP STYLES AND THEORIES: Popular Leadership Styles, Entrepreneurial and Super leadership. Transactional Vs Transformational leadership. Triat and Path – Goal theories of leadership.

UNIT – III: ORGANISATIONAL CHANGE: Types and forces of change, Framework for change management. Proactive change and reactive change. Elements of planned change. Action research model. Individual and organisational barriers to change management and overcoming the barriers to change management.

UNIT – IV: INFLUENCE OF CHANGE: Six belief changers that Influence change, organisational change through influencing individual change. Approaches: Kotter's eight step plan, Greiner's Change process model. Four key drivers of organisational change. Factors contributing to resistance to change. Best practices to overcome resistance to change.

UNIT – V: ORGANISATIONAL CULTURE AND CHANGE MANAGEMENT: Organisational Culture and Leadership, Types of Cultures, Primary and Secondary ways to influence culture, elements of organisational culture. Diagnosing, creating and managing organisation culture.

SUGGESTED BOOKS:

1. S. Chandan, "Organisational Behaviour", Vikas Publishing House Pvt. Ltd. 3rd Edition

2. Herbert G. Hicks and C.Ray Gullett, "Theory and Behavior", McGrew Hill.

3. Andrew 1 Dubrin, "Research Findings, Practice and Skills", Houghton Mifflin Company, 3rd Edition.

4. Kavitha Singh, "Organization Change & Development", 2005, Excel Books.

5. Adrainthornhill, Phil Lewis, Mike Millmore, Mark Saunders, "Managing Change – A Human Resource Strategy Approach", Pearson Education, 2006.

6. Nilakant V and Ramnarayan, "Managing Organizational Change", Response Books, 2006

OPEN ELECTIVE
MBA(HRM) 32003: ENTREPRENEURSHIP DEVELOPMENT

Course Objective: The objective of this course is to create conceptual understanding of the topic among the students and comprehend the environment of making of an Entrepreneur and to develop perspective understanding of startups and MSMEs in the Indian context.

Learning Outcomes:
On completion of the course, the student will be able to have conceptual understanding of the concept of entrepreneur and entrepreneurship; growth of women and rural entrepreneurship in Indian context. He would be able to generate ideas and opportunities for business ventures. Student will have through knowledge of MSMEs. He will be able to recognize various institutions like Commercial banks, SSIDC, CII, FICCI and ASSOCHAM.

Unit – I Entrepreneur and Entrepreneurship: Evolution of the Concept of Entrepreneur – Characteristics of an Entrepreneur – Distinction between an Entrepreneur and Intrapreneur and a Manager – Functions of an Entrepreneur – Types of entrepreneurs, Concept of Entrepreneurship – Functions, Problems, Entrepreneurial process – Growth of Entrepreneurship in India – Recent Trends of Women Entrepreneurship – Meaning of and Need for Rural Entrepreneurship – Problems and Development of Rural Entrepreneurship.

Unit II Startup Ideas and Opportunity Assessment: Importance of Ideas – Sources of startup Ideas – Techniques for generating ideas – Steps in potential ideas – Opportunity Recognition- sources and process – Development of Programmes E – Business Ventures – Importance of Financial Management – Project Feasibility Study.

Unit – III MSME Enterprises: Definitions, Characteristics – Relationships of MSME – Relationship with large units – Export Oriented Units - Rationale – Objectives – Scope of Small Enterprises – Opportunities for an Entrepreneurial career – Role of Small Enterprises in Economic Development – Causes and Symptoms of Sickness – Cure for Sickness.

Unit IV Project preparation and Financing Ventures: Meaning of and Preparation of Project – Importance of Report – Content; Guidelines for Report preparation – Network Analysis – PERT and CPM – Sources of Finance – Concept of working Capital and Estimation – Seed Capital – Venture Capital.

Unit V Institutional support to Entrepreneurs: Commercial Banks – Other major financial institutions – Central Level Institutions – KVIC; SIDO; NSIC : National Productivity Council (NPC); EDII – State Level Institutions – DIC – SFC-state Small Industries Development Corporation (SSIDC) – Industry Associations – Confederation of Indian Industry(CII) ; Federation of Indian Chamber of Commerce Industry (FICCI); Associated Chambers of Commerce and Industry of India (ASSOCHAM)

Suggested Books:

1. Vijay Sathe, “Corporate Entrepreneurship” 1st edition, 2009, Cambridge
2. S.S. Khanka, “Entrepreneurial Development”, 2007, S. Chand & Co. Ltd.
3. Vasanth Desai, “Dynamics of Entrepreneurial Development and Management”, 2007, HPH,Millenium Edition.

4. Dr. Vasant Desai, "Small Scale Industries and Entrepreneurship", 2006, HPH.
5. P. Narayana Reddy, "Entrepreneurship – Text and Cases", 2010, 1st Ed. Cengage Lerning.
6. David H. Hott, "Entrepreneurship New Venture Creation", 2004, PHI.
7. E – Book, MSME at a glance – English version, Ministry of MSME.
8. Jaynal Ud – Din Ahmed and Abdul Rashid, MSME in India, New Century Publications.

MBA(HRM) 32004: BUSINESS RESEARCH METHODS

Course Objective: The objectives of this course is to provide the students the knowledge of doing research and basicStatistical tools to apply for solving business related problems.

Learning outcomes: On successful completion of the course the student will be able to:

- Identify the overall process of designing a research study from its inception to its report.
- Apply appropriate analytical methods to find solutions to business problems that achieve stated objectives.
- Calculate and interpret the correlation between two variables.
- Calculate the linear regression equation for a set of data and know basic assumptions behind regression analysis.
- Explore small and large sample data to create testable hypothesis and identify appropriate statistical tools.

Unit-I

Introductionto Business Research Method:Concept of Business Research Method, Nature of Business Research Method, Scope of Business Research Method, Need and the role of Business Research, Characteristics of Research, Types of Research, The Research Process, Steps involved in preparing Business Research Planan Overview.

Unit- II

Research Design: Meaning of Research Design, Need for Research Design, Features of a good Design, Types of Research Design: Exploratory, Descriptive and Casual Research Exploratory Research, Experimental Designs, Types of Errors effecting Research Design, Research Design process.

Unit- III

Data Collection: Primary and Secondary Data-Sources-Advantages / Disadvantages, Data Collection Methods - Observations, Survey, Interview, Concept of Questionnaire and Schedule, Principles of Design Questionnaire and Schedule, Limitations of Questionnaire, Qualitative Techniques of Data Collection. Measurement and Scaling Techniques - Nominal Scale, Ordinal Scale, Interval Scale, Rating Scale.

Unit – IV

Sampling Theory: Meaning, Need and Importance of Sampling, Steps in Sampling Process, Types of Sampling Methods, Sampling and Non-Sampling Errors, Sample Design, Determinants of Sample Size,Steps in Designing the Sample.

Unit – V

DataAnalysis: Measures of Central Tendency and Dispersion, Correlation Analysis, Regression Analysis.
Hypothesis Testing:- Introduction, Types of hypothesis, procedure for testing of hypothesis, Types of Errors in testing of hypothesis-Tests of significance for small samples: - application, t-test, Z- Test, F-Test, Chi-square test and ANOVA- one way and two-way classifications.

Reference Books
1. N.D. Yohra,2001, Quantitative Techniques in management, Tata McGraw Hill, 2ndnedition.
2. Barry Render, Ralph M. Stair, Jr. and Michael E. Hanna, 2007, Quantitative analysisfor management, 9th Edition, Pearson publication
3. Gupta S.P. Statistical Methods. Sultan Chand and sons, New Delhi.2005
4. C.R. Kothari, Research Methodology: Methods and Techniques,2/e,VishwaPrakashan 2006
5. William G. Zikmund, Business Research Methods, Thomson, 2006.

IV SEMESTER

MBA(HRM) 42001-STRATEGIC MANAGEMENT

Course Objective: The objective of this course is to analyze the main structural features of an industry and develop strategies that position the firm most favorably in relation to competition and influence industry structure to enhance industry attractiveness, to recognize the different stages of industry evolution and recommend strategies appropriate to each stage and to appraise the resources and capabilities of the firm in terms of their ability to confer sustainable competitive advantage and formulate strategies that leverage a firm's core competencies.

Learning Outcomes: On completion of the course the student will be able to understand the importance of strategies in the organizations in the midst of the tough and turbulent competitive market environment. He will have deep knowledge on the processes of strategy formulation, strategic analysis, strategy implementation and strategic control.

Unit-I: **Introduction:** Concepts in Strategic Management, Strategic Management as a process –Developing a strategic vision, Mission, Objectives, Policies – Factors that shape a company's strategy – Crafting a strategy – Industry and Competitive Analysis, Porter's Five Forces Model.

Unit-II: **Environmental Scanning and leadership**: Methods. SWOT Analysis – Strategies and competitive advantages in diversified companies and its evaluation. Strategic Analysis and Choice: Tools and techniques- BCG Matrix, Space Matrix, GE Model, Grand Strategy Matrix -Strategic Leadership: Leadership and Style – Key Strategic Leadership Actions - Developing Human Capital and Social Capital – Balanced Scorecard.

Unit-III: **Strategy Formulation** : Strategy Framework For Analyzing Competition, Porter's Value Chain Analysis, Competitive Advantage of a Firm, Exit and Entry Barriers - Formulation of strategy at corporate, business and functional levels. Types of Strategies – Tailoring strategy to fit specific industry – restructuring and diversification strategies – different methods Turnaround strategy and diversification strategies.

Unit-IV: **Strategy Implementation** : Strategy and Structure, Leadership, culture connection - Strategies for competing in Globalizing markets and internet economy – Organizational Values and Their Impact on Strategy – Resource Allocation – Planning systems for implementation.

Unit-V: **Strategy Evaluation and control** – Establishing strategic controls - Measuring performance – appropriate measures- Role of the strategist – using qualitative and quantitative benchmarking to evaluate performance - strategic information systems – problems in measuring performance – Strategic surveillance - strategic audit.

REFERENCES:

1 .Vijaya Kumar P,.HittA : Strategic Management, Cengage learning, New Delhi,2010.
2. John A PearceII, AmitaMital: "Strategic Management", TMH, New Delhi, 2012.
3. Sanjay Mohapatra: "Cases Studies in Strategic Management", Pearson, New Delhi,2012.
4. Adrian Haberberg&Alison: Strategic Management, Oxford University Press, New Delhi, 2010.
5 .P.Subba Rao: "Business Policy and Strategic Management" Text and Cases, Himalaya Publishing House, New Delhi, 2011.
6. Appa Rao, Parvatheshwar Rao, Shiva Rama Krishna: "Strategic Management and Business Policy", Excel Books, New Delhi, 2012.

MBA(HRM) 42002: ENTREPRENEURSHIP DEVELOPMENT

Course Objective: The objective of this course is to create conceptual understanding of the topic among the students and comprehend the environment of making of an Entrepreneur and to develop perspective understanding of startups and MSMEs in the Indian context.

Learning Outcomes:
On completion of the course, the student will be able to have conceptual understanding of the concept of entrepreneur and entrepreneurship; growth of women and rural entrepreneurship in Indian context. He would be able to generate ideas and opportunities for business ventures. Student will have through knowledge of MSMEs. He will be able to recognize various institutions like Commercial banks, SSIDC, CII, FICCI and ASSOCHAM.

Unit – I Entrepreneur and Entrepreneurship: Evolution of the Concept of Entrepreneur – Characteristics of an Entrepreneur – Distinction between an Entrepreneur and Intrapreneur and a Manager – Functions of an Entrepreneur – Types of entrepreneurs, Concept of Entrepreneurship – Functions, Problems, Entrepreneurial process – Growth of Entrepreneurship in India – Recent Trends of Women Entrepreneurship – Meaning of and Need for Rural Entrepreneurship – Problems and Development of Rural Entrepreneurship.

Unit II Startup Ideas and Opportunity Assessment: Importance of Ideas – Sources of startup Ideas – Techniques for generating ideas – Steps in potential ideas – Opportunity Recognition- sources and process – Development of Programmes E – Business Ventures – Importance of Financial Management – Project Feasibility Study.

Unit – III MSME Enterprises: Definitions, Characteristics – Relationships of MSME – Relationship with large units – Export Oriented Units - Rationale – Objectives – Scope of Small Enterprises – Opportunities for an Entrepreneurial career – Role of Small Enterprises in Economic Development – Causes and Symptoms of Sickness – Cure for Sickness.

Unit IV Project preparation and Financing Ventures: Meaning of and Preparation of Project – Importance of Report – Content; Guidelines for Report preparation – Network Analysis – PERT and CPM – Sources of Finance – Concept of working Capital and Estimation – Seed Capital – Venture Capital.

Unit V Institutional support to Entrepreneurs: Commercial Banks – Other major financial institutions – Central Level Institutions – KVIC; SIDO; NSIC : National Productivity Council (NPC); EDII – State Level Institutions – DIC – SFC-state Small Industries Development Corporation (SSIDC) – Industry Associations – Confederation of Indian Industry(CII) ; Federation of Indian Chamber of Commerce Industry (FICCI); Associated Chambers of Commerce and Industry of India (ASSOCHAM)

Suggested Books:

1. Vijay Sathe, “Corporate Entrepreneurship” 1st edition, 2009, Cambridge
2. S.S. Khanka, “Entrepreneurial Development”, 2007, S. Chand & Co. Ltd.

3. Vasanth Desai, "Dynamics of Entrepreneurial Development and Management", 2007, HPH,Millenium Edition.
4. Dr. Vasant Desai, "Small Scale Industries and Entrepreneurship", 2006, HPH.
5. P. Narayana Reddy, "Entrepreneurship – Text and Cases", 2010, 1st Ed. Cengage Lerning.
6. David H. Hott, "Entrepreneurship New Venture Creation", 2004, PHI.
7. E – Book, MSME at a glance – English version, Ministry of MSME.
8. Jaynal Ud – Din Ahmed and Abdul Rashid, MSME in India, New Century Publications.

INTERNAL ELECTIVES

MBA(HRM) 42431: INTERNATIONAL HUMAN RESOURCE MANAGEMENT

Course Objective: The course is designed to enhance the potentials of the student to manage Human Resource in Multi National Organizations to achieve Business Standards.

Learning Outcomes: On successful completion of the course, the students would be able to demonstrate the issues related to host, home and third country nationals, assess the international culture and diversities, understand the Human Resource Management activities with respect to Multinational corporations and capture the issues in international industrial relations.

Unit - I

Introduction to International Human Resource Management: Concept, Scope and Significance - Expatriate- Approaches to International Human Resource Management, Differences between Domestic and International HR Activities; Role of International HR Department - Issues and Challenges of IHRM, Organizational structure of multinational corporations,

Unit- II

Socio – Culture Contexts: Cultural Factors - Cultural Sensitivity - Culture affects Management approaches - Cross-cultural Communication - Cross Culture Differences in the Work Place – Hofstede Cross-Culture theory.

Unit – III

Recruitment and Selection: Concept – sources of Human Resources: Micro level, Macro level, Modern Sources, Techniques of Recruitment – Centralized Vs Decentralized recruitment – Selection: The Expatriate System, Reasons for Expatriate failure in foreign assignment - Selection Techniques for International Assignment: Adaptability to cultural change, Motivation for a foreign assignment and Leadership ability.

Unit – IV

Training and Development: Need for Global training - Areas of Global Training & Development, Compensation : Objectives of International Compensation Management - Complexities in International Compensation Management- - Factors Affecting International Compensation Management - Approaches to International Compensation Management, Performance Management: System of performance appraisal – Problems of Performance Appraisal – Measures for effective Performance Appraisal.

Unit -V

Introduction to International Industrial Relations: Key Issues in International Industrial Relations - Trade Unions and International Industrial Relations - Conflict Resolution in Multinational Corporations; Forms of Industrial Democracy to Multinational Corporations – Regional Integration – NAFTA, EU.

Reference Books

1. Dowling Welch, Schuler, International Human Resource Management Thomson, New Delhi.
2. Anne WilHarzing et al., International Human Resource Management., sage, New Delhi
3. P.SubbaRao, International Human Resource Management, HPH, New Delhi
4. Briscoe, Dennis R., International HRM , Prentice Hall NJ.
5. Torrington, D., International HRM : Think Globally and Act Locally, Hemal Hempstead, Prentice Hall.

MBA(HRM) 42432: STRATEGIC HUMAN RESOURCE MANAGEMENT

Course Objective: The Objective of this course is to appreciate how human resource is emerging as a key resource for competitive advantage and understanding the role of HRM in organizational performance.

Course Outcome:

On completion of this course the students will be able to develop the understand of the concept of Strategic Human Resource Management and to understand it's relevance in organisation and to analyse the strategic issues and strategies required to select and to develop manpower resources.

UNIT I : Strategic Human Resource Management: Strategy meaning**,** Types of strategies, Human Resource Strategy, Human resource as assets, Evolution of SHRM, Distinctive Human Resource Practices, SHRM approaches, alternative HR strategies..

UNIT II : Human Resource Environment: Technology and Organization Structure; Worker Values and Attitudinal Trends; Management Trends, Demographic Trends: Trend's in the utilization of human resources and international developments.

UNIT III : Strategic International Human Resource contributions: Strategic Human Resource Activity Typology; Classifying Human Resource Types : Integration of strategy and human resource planning: The Human Resource manager and Strategic Planning. Strategic, Human Resource Planning**.**

UNIT IV: Strategic Human Resource Processes: Workforce Utilization and Employment Practices; Efficient Utilization of Human Resources; Dealing with employee shortages: Selection of employees; Dealing with employee surpluses and special implementation challenges. Reward and development systems: Strategically Oriented Performance Management Systems: Strategically oriented compensation systems and employee development.

UNIT V: Impact of Human Resource Practices: Individual high performance practices; Systems of high – performance human resource practices: individual Best practices vs. Systems of Practices and Universal Practices vs. Contingency Perspectives. Human Resource Evaluation: Over view of the Evaluation: Approaches to Evaluation: Evaluation Strategic Contributions of Traditional Areas: and Evaluation Strategic Contributions in Emerging Areas.

Suggested Books :

1. Greer, Charles R. (2003) Strategic Human Resource Management – A General Managerial Approach New Delhi: Pearson Education (Singapore) Ple. Ltd.
2. Mabey, Chrisopher and Salaman, Graeme, Strategic Human Resource management, Beacon, New Delhi.
3. Salaman, Graeme, Human Resource Strategies, Sage Publications, New Delhi.
4. Porter, Michael S., Competitive Advantage: Creating and Sustainig Superior Performance, Free Press, New York.
5. TanujaAgarwala, Strategic Human Resource Management, Oxford Univesrsity Press, New Delhi.

MBA(HRM) 42433 : LABOUR LEGISLATIONS

Course Objective: To have a broad understanding of the legal principles governing the employment relationship at individual and collective level. To familiarize the students to the practical problems inherent in the implementation of labour statutes.

Learning outcomes:
After going through various labour laws, students will be conversant regarding conflict management in legal perspective and judicial system pertaining to labour management relations.

Unit – I: Industrial Jurisprudence: Meaning and Definitions, Sources of Industrial Jurisprudence, Industrial Jurisprudence Principles Social Justice, Natural Justice, Equity, National Economy, Dynamism, Constitutional Norms, Welfare, Res Judicata, Laches, Vicarious Liability.

Unit – II: Labour Legislations:Growth, Specific Objectives of labour legislations in India and Classification of labour legislations, International Labour Organisation (ILO) Writs and appeals under the Indian Constitution.

Unit – III: The Factories Act, 1948. The Contract Labour (Regulation and Abolition) Act 1970. The mines Act 1952

Unit – IV: The Plantations Labour Act, 1951, The Dock Workers (Regulation of Employment) Act 1948, The A.P Shops and Establishments Act 1988.

Unit – V: The Child Labour (Prohibition and Regulation) Act 1986. The Apprentices Act 1961.

Suggested Books

1. Malik, P.L Industrial Law, Eastern Book Company, Lucknow
2. Sharma A.M. Industrial Jurisprudence, Himalaya Publishing House, New Delhi
3. Mishra P.N., Labour and Industrial Laws, Central Law Publishing, Allahabad
4. Vaidyanathan, N, IOL Conventions and India, Minverva Associates, Calcutta
5. Goswami, V.G. Labour and Industrial Relations Law, Central Law Agency, Allahabad
6. Agarwal, S.L, Labour Relations Law in India, Mc Milan Company of India Ltd., New Delhi
7. Sinha, P.R.N, Industrial Relations and Labour Legislations, Oxford and I.B.H Publishing Co., New Delhi

MBA(HRM) 42434: PERFORMANCE MANAGEMENT AND EMPLOYEE COUNSELLING

Course Objective: This course is designed to assist Human Resources professionals and operational managers in giving effective performance appraisals that help motivate employees to achieve higher productivity.

Learning Outcomes:

1.To identification of the Potentials of the Employees skills and abilities.
2.Provides an opportunities the supervisor to give feedback on the performance and its related behavior.
3. To build/booster morale among the employees And to identified the training needs.
4.To help, define career paths and increase Job satisfaction.
5. To increase Employee retention and accountability

Unit – I

Formats for Scaling and Measurement, Designing Appraisal Form; Potential Assessment, Performance Planning. Performance Management: Concept and Objectives; Goal setting and Expectancy Theory; Performance Management Models; Designing Performance Management System; Designing of PMS in MNC – Aims and Role of PMS, Characteristics of an Ideal PMS, Linking of Performance Management.

Unit – II

Designing Training Needs Assessment(TNA), Tools, Effective Delivery of Training. Developing Training Modules including Training Objectives, Lesson plan, and Training Climate, Effective Delivery of Training; Monitoring Performance; Performance Feedback Performance Review; Coaching; Mentoring: Performance Management Reward Systems in MNC.

Unit – III

Quality Performance Management- Concept, Definitions and Mechanics; Elements of Team Building, Team Characteristics and Behaviors , Team Concepts and Norms, Cross Functional Teams, Coaching.

Unit – IV

Organizational Structure and Employee Motivation and Morale; Learning organizations; Counseling: Meaning, Need for counseling; Functions of Counseling; Forms of Counseling; Counseling Process; Counseling Variables; Pre-requisites for Effective Counseling; Skills of an Effective Counseling.

Unit – V

Quality Circles- Feature Process, Pre-requisites for their Efficiency. Quality Performance Management in Indian and Western Thought in a Market Era. Performance Management and Motivation from Global Scenario – Application of Expectancy Model, Reward and Recognition from Global Perspective.

Reference Books

1.Prem Chand, Performance Management, Macmillin, New Delhi
2.T.V.Rao, Performance Management and Appraisal System Response
3.Dave, Indu, The Basic Essentials of Counseling, Sterling Pub. Pvt., Ltd., New Delhi
4.Carroll, Michal and Watso, Michael, Hand Book of Counseling in Organizations, Sage Pub., New Delhi
5.Mabey, Chirstopher and Salamanm Graeme, Stgrategic HRM, Beacon Books, New Delhi
6.Rao T.V., and PAreek, Udai(ed)., Redesigning Performance Appraisal System, Tata McGrew Hill Pub., New Delhi
7.Neale, Frances, Handbook of Performance Management, Jaico Pub., House, New Delhi
8.Benson, Gray, Stepping Up Performance, Jaico Pu., House, New Delhi
9.Walters, Mike, The Performance Management Handbook, Jaico Pub., House, New Delhi
10.Murphy, Kerin R., and Cleveland, Jeanette N., Understanding Performance Appraisal, Sage, London
11.David Wade and Ronald Recardo, Corporate Performance Management, Butterworth Heinemann, New Delhi
12.Kur Verweire etal, Integrated Performance Management, Sage, New Delhi.
Text Book : Perforamance Management Herm……..nnis Pearson Education ,2007
13. Performance Management Systems , UK Sahu,Excel Books

14.The Tale …..Management Hand Book A Berger & Dorothy R.Berger, Tata Mc-Graw Hill

MBA(HRM) 42435- HUMAN RESOURCE MANAGEMENT IN SERVICE SECTOR

Course Objective: The objective is to understand the maintaining and improving the service quality and performance in service sectors.

Course Outcome:

On completion of this course the students will be able to understand the concept of Service and application of Human Resource Management in different service sectors.

UNIT I :

Concept of Service: Types of Service, Service Management, Evolving Environment of Services, Myths about Service, Service as a System, Attitudes towards Service Sector, Reasons for growth of the Service sector.

UNIT II :

Nature of Service sector: Characteristics of Services, Elements of Customer Service, Components of Service, Identifying customer Groups, Service Process, Classification of Servicing operating systems, Balancing Supply and Demand, Challenges for service managers, People and service, Maintaining and Improving Service Quality and performance.

UNIT III :

Human Resource Management in Service Organizations: Concept, Functions, Utilization, Development, Environment, Organising HRM Functions in Service Sector, Competencies and service organizations, Performance Measurement, Empowerment in service organizations, Managing services across Boundries.

UNIT IV :

Application in HRM in service sector: HRM in Hospitals, Hotels, Insurance and Banking, other Financial Institutions, Ports and Docks, Managing Salary Levels, Working Conditions, Legal provisions, Unionism, Problems and Challenges.

UNIT V :

HRM in IT Sector: Software Industry and BPO Sector, Wage Salary Levels, Working Conditions, Legal Provisions, Unionization, Distribution of Male and Female Workers, Gender Bias, Problems and Challenges.

Suggested Books

1. Balaji. B., Services Marketing and Management, S. Chand & Co. Ltd., New Delhi.
2. Haksever, Cengiz, Barry Pender, Roberta S.Russel and Robert G.Murdik, Service Management and Operations, Pearson Education (pte)ltd., New York.
3. Van Dierdonck van woy, Service Management An Integrated Approach, Financial Times/ Prentice hall of India, New Delhi.

4. Goyal.R.C., Human Resource Management in Hospitals. Prentice hall of India, New Delhi.

MBA(HRM) – 42436 – Management of Unorganized Labour

Objective: The course is designed to enable the students to understand the size and role of unorganized workers in Indian economy, to know various types of unorganized workers, to understand the problems of unorganized labor and to know the role played by the different actors for the welfare of the unorganized workers.

Outcome: After successful completion of the course the student will be able to organize the unorganized workers and create awareness among them for their wellbeing.

UNIT I: Unorganized Labour: Concept; Nature Size and Structure; its Role in the National Economy; Size, causes and Problems.

UNIT II: Unorganized Labour : in Different Sectors; Nature; Employment Status, Wage Levels and Problems of Home Based Workers – Domestic Workers-Sex Workers- Plantation Workers- Scavengers- Casual Labour, Agriculture Labour, Forest Labour; Bonded Labour, Contract Workers. Relevant Acts and Legal Provisions for all sectors.

UNIT III: Construction Workers, Mines and Quay Workers; Fisheries, Beedi Workers; Inter-State Migrant Workers; Workers in Shops and Commercial Establishments, Employees in Small and Medium Enterprises. Relevant acts and Legal Provisions. Accident Risk at Work – Social security and welfare measures – Unorganized workers depending on common prosperity resources.

UNIT IV:Human Rights and Unorganized Labour; Employment of Women and Children; Patten of Women Employment Wages; Legal Provisions; Social Status; Problems; Women and Trade Unions; Employment of Children; nature and Extent; Legal Provisions; Problems of Girl Child; ILO Conventions.

UNITV: HRD Interventions for Unorganized Labour; Skill and Knowledge Up gradation; Leadership Development; Creating Awareness for Cooperative Organization; Involvement of Community Leaders; Non Governmental Organizations; Government Schemes; Organizing the Unorganized Labour; Role of Trade Union; Role of ILO., CBWE and Jana Sikshan Samsthan

Suggested Readings:

Government of India, Report of the First National Commission on Labour, New Delhi.
Government of India, Report of the Second National Commission on Labour, New Delhi.
Government of India, Report of the Royal Commission on Labour , New Delhi.
Dutt, Rudra. Organizing the Unorganised Workers, Vikas Pub. House Pvt. Ltd., New Delhi.
Singh, I.S.(ED)., Women as a Workforce in the Organized Sector Empirical Perspectives, Oxford and IBH Pub. Co., Ltd., New Delhi.
Jhabrala, Renana and RKA Subrahmanya, The Unorganised Sector Work Security and Social Protection, Sage Publications, New Delhi,
Holmstrom, M ark, Industry and Inequality, Orient Longman, Hyderabad
Gangrade, K.D., Gathia, J.A., Women & Child Workers in Unorganised Sector; Non –Government Organisation, Perspective, Concept Pub. Co., New Delhi.
Siva Ramakrishna, K., Ramesh, K.,and Gangadhara Rao, M., HRM in Agriculture, Discovery Pub. House, New Delhi.

Neera, Burra; Burra to Work; Child Labour in India, Oxford University Press, New Delhi.
Government of India Agricultural Labour Enquiry Reports, Labour Bureau, Simla.
Radhakrishna, R., and Sharma, Alak N.(ed), Empowering Rural Labour in India- Market State and Mobilisation, Institute for Human Development, New Delhi.

MBA(HRM) – 42437 -TRAINING AND DEVELOPMENT

Objectives:

• To appreciate the significances of training and development

• To introduce the basic concepts in training and development

• To understand the methods of training and development and

• To expose to the HRD practices in organizations.

Outcomes: After completion of the course the student will be able to learn the basic concepts of training and development, methods of training and development and gain the knowledge of HRD practices followed in India.

UNIT-I: Job analysis – manpower planning – at the start of the business and as ongoing process – performance appraisal – standards, methods, errors.

UNIT-II: Learning Objectives – domains of learning – methods of learning – importance of teaching techniques – instruction technology – instructor behavior – attention versus involvement.

UNIT-III: Need for Training and Development – Role of Development officers – administrators, consultants, designers and instructors – determining training needs – potential macro needs – usefulness of training – development of competency-based training programs – Evaluation of training programs.

UNIT-IV: Methods of training – on the job training – off the job training – choosing optimum method – the lecture – field trips – panel discussion – behavior modeling – interactive demonstrations – brain storming – case studies – action mazes, incident process, in-baskets, team tasks, buzz-groups and syndicates, agenda setting, role-plays – reverse role plays, rotational role plays, finding metaphors, simulations, business games, clinics, critical incidents, fish bowls, T groups, data gathering, grouping methods, transactional analysis, exception analysis.

UNIT-V: Need for development – differences between training and development – management development program – career development program – counseling – evaluation of programs – job evaluation – methods and techniques.

REFERENCES:

1. B. Taylor & G.Lippitt: MANAGEMENT DEVELOPMENT AND TRAINING HANDBOOK.

2. William E.Blank, HANDBOOK FOR DEVELOPING COMPETENCY BASED TRAINING PROGRAMMES, Prentice-Hall, New Jersey, 1982.

MBA & MBA(HRM)

I Semester

MBA 12001: PRINCIPLES OF MANAGEMENT

Course Objective: On successful completion of the course the students should have :

c. To familiarize the students with management theory, functions, principles and practices of management.

d. Learnt the scientific decision making process and problems and solving techniques and also learn the modern trends in management.

Learning Outcomes;

- Management principles deal with human traits and, hence, are employed creatively.
- Planning functions of management provide a very useful way of classifying the activities of managers engaged in as they attempt to achieve organizational goals
- Understand the role of top, middle and lower levels of management
- Describe the qualities of a good leader
- A good management control system stimulates action by spotting the significant variations from the original plan and highlighting them *for* the people who can set things right

Unit-I : INTRODUCTION Management-Concept, Significance, Principles and Functions-Management and Administration, Managerial Roles –Managerial Skills- social responsibility of business, Management by Objectives(MBO) Management Thought.

Unit-II: PLANNING AND ORGANIZATION

Planning-Nature and Process of Planning- Types of Planning - Characteristics of sound plan-Decision Making-Nature of Decision Making-Process and Techniques-Organization-Levels -Organization Structures-Staffing Policies-Line and Staff Relations–Delegation, Centralisation and Decentralisation.

Unit-III : STAFFING

Nature and Importance of Staffing – Man power Planning, requirement and Selection – Personal Characteristics needed by Managers

Unit –IV: DIRECTING

Directing Techniques of Direction –Leadership-Leadership styles, Functions of a Leader, Qualities of Leader - Communication-Types of Communication-Motivation-Need Theories.

Unit-V: CONTROL

Controlling-System of controlling- Methods, Tools and Techniques of control-Making Controlling Effective-Organising process-Departmentation Types-Making Organising Effective.

Reference Books

1. Agarwal R D Organisation and management – Tata McGrawhill.
2. Koontz and Weichrich Essentials of management – Tata McGrawhill
3. Aswathappa K. Human Resource and personnel Management, Text and cases-Tata McGrahills.
4. Sherlekar- S.A Management – Himalaya publishing house.
5. Robbins Stephen.p and Mary coulter – management – PH1 publisher.

MBA 12002 - ORGANISATIONAL BEHAVIOUR

Course Objective: This course is designed to enable the students to understand the concepts, theories, processes and dynamics of human behavior in Organizations.

Learning outcomes: On completion of the course, the student will be able to understand the concepts and theories of organisation behaviour. He will be able to understand the importance and role of group dynamics, motivational theorems, organisational culture, organizational change and organisational development.

UNIT – I Organisational Behaviour: Meaning – Importance – Nature and Scope – Approaches – Key elements – Challenges and opportunities for O.B. – Contributing disciplines to O.B. – O.B. Models.

UNIT – II Individual: Individual Behaviour - Perception – Process, factors influencing perception – barriers in perceptual Accuracy – enhancing perceptual skills – Attribution - Learning – characteristics, theories and principles of Learning. Motivation – Theories of Motivation – Maslow, Herzberg, David Mcclelland and Porter and Lawler - Personality – Stages of Development, determinants of Personality.

UNIT – III Group Dynamics: Meaning, Determinants of group behaviour and types of groups – Group Dynamics – frame work of group behaviour. Developing inter – personal relations, Transactional Analysis – Johari Window.

UNIT – IV Organisational Culture: Organization Design, culture and climate. Creating an ethical organizational culture – Conflicts – Meaning, conflicts at individual, group and organisational level – sources of conflicts – functional and dysfunctional aspects – Strategies for conflict resolution.

UNIT – V Organisational Change: Organisational Change – change management and its dimensions, process. Pressures for change – resistance to change – overcoming resistance to change. Approaches to manage Organizational Change – Lewin's and Kotter's Plan for Implementing Change. – Organisational Development.

Suggested Books:

1. Fred Luthans, ***Organisational Behaviour,*** Tata McGraw Hill.
2. Stephen P.Robbins, ***Organisational Behaviour,*** Pearson Education, New Delhi, 2006.
3. Aswathappa.K., ***Organisational Behaviour*** , Himalaya Publishing House, New Delhi.
4. Donald R.Brown& Don Harwey, ***An Experimental Approach to Organisational Development,*** Pearson Education.
5. Sarma V. s. Veluri, Organisational Behavour, Jaico Publishing House.
6. Paton McCalman, ***"Change Management"***, Sage Publications.
7. VenkataRatnam, ***"Negotiaed Change",*** Sage Publications.
8. Jai, B.P.Sinha, ***"Culture and Organisational Behaviour"***, Sage Publications.
9. Arun Kumar N Meenakshi., Organisational Behavour, Vikas Publishing House.
10. Keith Davis & John Newstrom, *Human Behaviour at work*, Mc-Graw Hill.

MBA 12003 – BUSINESS COMMUNICATION

Course objective: To train students to enhance their skills in written as well as oral Communication. This course will help students in understanding the principles & techniques of business communication.

Outcome: after completion of the course, students will be able to knowledge on written ond oral communication, role of communication in business, models of communication, presentations etc.,

Unit - 1: Fundamentals of Communication : communication definition - Objective of Communication – The process of Human communication, Types of Communication – formal and in formal communication –verbal and non verbal communication- types of verbal communication; Communication barriers –Overcoming Barriers; Understanding Cultural Effects of Communication -Listening Skills- Role of communication in Business

Unit- 2: Managing Organizational Communication – Formal and Informal Communication – Intra and Personal Communication – Models for Inter personal Communication – Exchange theory – Johari window and Transactional Analysis.

Unit - 3: Business writing skills – Significance of Business Correspondence, Essentials of Effective Business Correspondence – Business Letter and Forms- E-mail – Memo – Reports and Proposals; Oral Presentations – Meetings- Minutes of Meeting, Media management; Use of Technology in Business Communication, Seminars, workshop, conferences, Business etiquettes.

Unit- 4: Managing motivation to influence interpersonal communication – Inter-personal perception – role of emotion in inter personal communication – gateways to effective interpersonal communication; Emotional intelligence- charecteristics

Unit-5: Time Management – Goal Setting – Time log – Self Awareness – Self Motivation Effective presentation and Interview Skills: Art of giving interviews in relation to placement appraisal interviews in selection and placement – Appraisal interviews – Exit Interviews – Web/ video conferencing and Tele-Conferencing.

Suggested Books:

19. K. Bhardwaj, Professional Communication, IK Int. Pub. House, New Delhi.
20. Krizan, Merrier, Logan and Williams, Effective Business Communication, Cengage, New Delhi.
21. HC Gupta, SG Telang, Business Communication, Wisdom, Delhi
22. Penrose, Business Communication for Managers, Cengage , New Delhi
23. McGrath, Basic Managerial Skills for All 5thEdtion, Prentice Hall of India.
24. Urmila Rai & S.M. Rai, Business Communication, Himalaya Publishers
25. Meenalshi Raman – Business Communication Oxford University Press
26. Lesikar I Flatley, Basic Business Communication, Tata McGrw Hill.
27. Bovee and Thill: Business Communication Today, MacGraw-Hill, Second Edition
10. Guffey M. E.: Business Communication Process & Product, Thompson, South – Western

MBA 12004: MANAGERIAL ECONOMICS

Course objectives:

The course is designed to impart knowledge of the concepts and principles of Economics, which govern the functioning of a firm/organization under different market conditions. The course aims at enhancing the understanding capabilities of students about macro-economic principles and decision making by business and government. This course will enlighten the students to apply various techniques of economics in embracing business challenges

Learning outcomes: Relation of Managerial Economics with other disciplines and its relationship with management; understand the demand for and supply of the firm's products; Managerial decision under different market conditions; Importance of Production function; Causes and consequences of Inflation

Course Layout:

Unit- I

Introduction: Nature, scope, uses, relation with traditional economics, operations research, Mathematics, Statistics, Accounting; responsibilities of a managerial economist, objectives of a firm, Basic tools in Managerial Economics: Opportunity cost principle, Incremental principle, principle of time perspective, discounting principle, Equi marginal principle.

Unit-II

Demand and Supply: Law of demand: Demand determinants, assumptions, exceptions, demand schedule, demand curve, demand function, types of demand, demand foresting methods; elasticity of demand: price, income, cross, promotional; Law of supply: determinants of supply, kinds of supply elasticity.

Unit-III

Market Structure and Pricing Practices: Market structure: perfect, monopoly, Duopoly, monopolistic, oligopoly, monopsony, oligopsony; profit: role of profit, theories of profit; break even analysis (theory & Problems): assumptions, managerial uses, limitations, margin of safety, profit-volume analysis; pricing methods, dumping

Unit-IV

Production and Cost analysis: Production function: with one, two and all variable inputs, Cobb-Douglas, CES production functions, managerial uses of production function; Economies of scale: internal, external; types of cost.

Unit-V

Capital Management & Business Decisions: Techniques of traditional and modern investment appraisal (theory &Problems); Business Cycles: characteristics, phases, Inflation types, causes, effects, National income: measures, concepts; The multiplier, Acceleration principle, Fiscal policy: objectives, tools, monetary policy: objectives, instruments.

Reference Books

1. Managerial Economics Theory and Applications. Dr D.M. Mithani, Himalaya publishers

2. Managerial Economics R.L Varshny, K.L Maheshwari, sultan Chand publishers

3. Managerial Economics analysis, problems P.L Mehatha, sultan Chand publishers

4. Managerial Economics D.N Dwivedi, Vikas Publishers

MBA 12005: RESEARCH METHODOLOGY AND BUSINESS ANALYTICS

Course Objective: On successful completion of the course the students should familiarize with doing research work and analysing big data which helps management in taking decisions.

Learning outcomes: On successful completion of the course the student will be able to:

- Identify the overall process of designing a research study from its inception to its report.
- Apply appropriate analytical methods to find solutions to business problems that achieve stated objectives.
- Calculate and interpret the correlation between two variables.
- Calculate the linear regression equation for a set of data and know basic assumptions behind regression analysis.
- Explore small and large sample data to create testable hypothesis and identify appropriate statistical tools.

Unit-I

Introduction: Meaning and Definition of Research, Nature and importance of research the role of business research, aims of social research, research process, Quantitative and Qualitative Research, Types of Research, Research design, Importance of Research Planning, Meaning of research design, Functions and goals of research design, Pilot study and case study, Concepts of a Research plan, Induction and Deduction method, Snapshot studies, cross sectional and longitudinal studies. Sources of data, Sampling techniques, Report writing.

Unit- II

Measures of Central Tendency and Dispersion, Skewness and Kurtosis-Correlation Analysis: Types of correlation, scatter diagram, limits for coefficient of correlation, Karl Pearson's coefficient of correlation, Spearman's rank correlation, Properties of Correlation, Regression analysis: concept, least square fit of a linear regression, two lines of regression, Multiple Regression, Properties of regression coefficients.

Unit- III

Statistical Inference: Hypothesis Testing:- Introduction, Types of hypothesis, procedure for testing of hypothesis, Types of Errors in testing of hypothesis- One tailed and Two tailed tests of hypothesis. Tests of significance for small samples: - application, t-test, F-Test, Chi-square test, ANOVA one way and two-way classifications.

Unit – IV

Business Analytics : Introduction, Evolution of Business Analytics – Differences between Business Intelligence and Analytics – Business Analytics Life Cycle, Process – Business Analytics as Solution for Business Challenges; Introduction to Excel, SPSS, R and Python.

Unit – V

Master Data Management: Data Warehousing – Data Mining – Meta Data – Data Marts - Data Integration – Concept of OLTP and OLAP.

Reference Books

1. N.D. Yohra,2001, Quantitative Techniques in management, Tata McGraw Hill, 2ndnedition.
2. Barry Render, Ralph M. Stair, Jr. and Michael E. Hanna, 2007, Quantitative analysis for management, 9th Edition, Pearson publication
3. Gupta S.P. Statistical Methods. Sultan chand and sons, New Delhi.2005
4.C.R.Kothari, Research Methodology: Methods and Techniques,2/e,Vishwa Prakashan, 2006.
5. William G. Zikmund, Business Research Methods, Thomson, 2006.
6. Carver & Nash, Data Analysis with SPSS, Cengage, New Delhi
7. James R. Evans, Business Analytics Methods, Models and Decision, Pearson, 2015

8. Shashi K. Gupta & Praneet Rangi Kalyani Pub. Business Analytics
9. Sahil Raj, Business Analytics, Cengage Learning India Pvt.Ltd., 2015.

MBA 12006 – ACCOUNTING FOR MANAGERS

Course Objective: The Objective of the course is to provide the basic knowledge of book keeping and accounting and enable the students to understand the Financial Statements and make analysis financial accounts of a company.

Course Outcomes: Upon Successful completion of the course, students will be able to

- Understand the fundamentals of financial accounting, the principles and concepts underlying them.
- Construct the financial statements viz., the Income Statement and Balance Sheet
- Gain practical knowledge on valuation tangible and intangible assets
- Exploit the issue and forfeiture of shares.

UNIT-I:

Introduction: Book-Keeping – Branches of Accounting – Systems of Accounting –Objectives of Accounting – Importance of Accounting - Users of Accounting Information - Principles of Accounting – Accounting concepts – Accounting conventions – Role of computers in Accounting.

UNIT-II:

Accounting Process: Double Entry System of Accounting – Classification of Accounts – Accounting cycle – Journal – Ledger – Trial balance - Manufacturing account - Trading and profit and loss account - Balance sheet with adjustments.

UNIT-III:

Valuation of Tangible Assets Concept of Depreciation – Purpose – Causes – Methods of depreciation – Fixed installment method – Diminishing balance method – Sum of year's digits method - Annuity method.

Valuation of Inventory – Concept - Objectives – Methods of taking inventories - Inventory valuation methods – Simple average method – Weighted average method - FIFO method – LIFO method.

UNIT-IV:

Valuation of Intangible Assets: Concept of Goodwill, Patents, Copyrights, Trademarks, R&D costs – Methods of valuation of goodwill – Average profit method – Super profit method – Capitalization method – Annuity method.

UNIT-V:

Issue of Shares: Meaning – Classification of shares – Equity shares – Preference shares –Issue of Shares for cash – For consideration other than cash - Entries for Issue of shares - Shares issued at par, premium and discount – Forfeiture of Shares.

Reference Books

- S.N. Maheswari, Accounting for Managment, Sultan Chand Publishing House Pvt. Ltd.

- Jain S.P, Narang K.L and Simmi Agarwal, "Accounting For Managers", Kalyani Publishers, New Delhi.
- Wild. J.J., Subramanyam, K.R. Halsey, R.F., Financial Statement analysis, Tata McGraw Hill.
- Narayana Swamy, "Financial Accounting: A Managerial Perspective", Pearson Education.
- Prasad, G. " Financial Accounting and Analysis" Jai Bharat Publishers, Guntur.
- Ramachandran and Kakani, " Finanical Accounting for Management", TMH, New Delhi.
- Prasad, G. "Accounting for Managers", Jai Bharat Publishers, Guntur.

MBA 12007: INFORMATION TECHONOLOGY FOR MANAGEMENT

Course Objective : The primary objective of this course is to familiarise the student with basic concepts of information technology and their applications to business processes. To elevate students' awareness of information technology and develop an in depth and systematic understanding of key aspects of IT Management.

Learning Outcomes: On successful completion of the course the student will be able to:

- Identify the overall structure and process of computer system and its type and application in management,
- Work withMS-Office tools like MS-Word, Ms-Excel and MS-Powerpoint for personal use and office use,
- Understand the Management Information System concepts and SDLC process and DSS and GDSS concepts
- Familiarise with the Information Technology tools and trends in present day scenario.

UNIT - I

Introduction : Basics of Computers - Major components of a computer system –- Types of Computers – Organisation System of Computer - Operating Systems: Definition, Functions, Types and Classification – Introduction to MS-Office – Features and Applications of MS–Word - – Types of Menus – Home – Insert – Design – Layout – References – Mailing – Review and View menus. (Theory and Practicals)

UNIT - II

MS-PowerPoint : Introduction - Features – Slide Creation – Slide Layouts – Slide Preparation – Slide Sorting – Slide Formatting – Home – Insert – Design – Animation – Slide Show – Review – View menu Options – Slide Show - Applications of MS-PowerPoint - Writing programs using menus. Introduction to MS-Excel : Introduction – Features – Advantages – Limitations. Menus in MS-Excel : Home – Insert – Page Layout – Formulas – Data – Review – View Menu Options. (Theory and Practicals)

UNIT - III

Introduction: System : Definition - Types of System - Information System : Types – Management Information System (MIS) : Meaning – Importance – Need - Characteristics – Organizational Structure of MIS – Role of the Management Information System – Applications of MIS**.** Tools and Techniques for System Development **- System Development Life Cycle (SDLC) :**Stages in developing SDLC.**Concept ofDecision Support System (DSS) :** Meaning – Architecture – Characteristics – Components – Concept of Group Decision Support System (GDSS) – Components. (Theory only)

UNIT - IV

Functional Information Systems : The Major Business Systems – Basic Elements of a Business organization -Marketing Information System – Concept – Components – Architecture - Financial Information System – Concept – Components – Architecture - Human Resource Information System – Concept – Components – Architecture(Theory only)

UNIT - V

Information Technology Tools and Trends : Concepts of IT : Multimedia - Image processing systems and Document Management Systems – Tools of IT - Trends in IT – Techniques of IT –Applications of IT – e-Business and e-Commerce tools and techniques – ERP - Introduction – Advantages and Limitations – EDI Technology. (Theory only)

REFERENCE BOOKS

21. RohitKhurana, Introduction to Information Technology, Pearson Education.
22. ITL education: Introduction to Computer Sciences, Pearson Publishers
23. Hunt and Shelly: Computers and commonsense, PHI publishers.
24. Dhiraj Sharma, Information Technology for Business, Himalaya Publishing House.
25. Kenneth C. Laudon and Jane P. Laudon: Management Information System, Eighth edition Prentice Hall of India.
26. Jawadekar W.S., Management Information System, TaTa McGraw Hill Publishing Company Limited, New Delhi.
27. James A.O Brien: Management Information Systems, TaTa McGraw Hill Publishing Company Limited, New Delhi.
28. Effy OZ, Management Information System, Vikas Publishing House.
29. Gordon B. Davis and Margrethe H. Oison, Management Information System, TaTa McGraw Hill Publishing Company Limited, New Delhi.
30. C.S.V. Murthy: Management Information System, Himalaya publishing House.

MBA 12008 – HUMAN VALUES AND PROFESSIONAL ETHICS

Course Objective : To create awareness, Conviction and commitment to Values and Ethics for improving the quality of life through education and for advancing social and human well being.

Learning Outcomes: After completion of the course the students learns about morals, Values, work ethics and learns to respective ethics and develop civic virtue.

UNIT – I

Definition and Nature of Ethics – Its relation to Business and Environment. Need and Importance of Professional Ethics – Goals – Ethical Values in various Professions – Ethical theories about right action.

UNIT –II

Nature of Values – Good and Bad, Ends and Means, Actual and potential Values, Objective and Subjective Values, Analysis of basic moral concepts – right, ought, duty, obligation, justice, responsibility and freedom, Good behavior and respect for elders – moral development theories.

UNIT – III

Value education – definition and its relevance to present days – Concept of human values – self introspection – self esteem – family values – components – structure – and responsibilities of family – neutralization of anger – adjustability – threats of family life-Time allotment for sharing ideas and concerns.

UNIT –IV

Business ethics –Ethical standards of business – Immoral and illegal practices and their solutions – characteristics of ethical problems in management – causes of unethical behavior – ethical abuses and work ethics.

UNIT – V

Environmental and social ethics: ethical theory, man and nature, ecological crisis issues related pollution, waste, climate change, energy and population, social issues – human rights violation and social disparities.

References:

5. R.S. Naagarazan –A TEXT BOOK ON PROFESSIONAL EHICS AND HUMAN VALUES – New age International (p) Ltd.
6. M.Govindarajan, S. Natarajan, V.S. Senthil Kumar – PROFESSIONAL ETHICS & HUMAN VALUES.

7. R.R.Gran, R.Sangal, G.P. Bagania – FOUNDATION COURSE IN HUMAN VALUES & PROFESSIONAL ETHICS.
8. Jayashree Suresh, B.S. Raghavan – HUMAN VALUES AND PROFESSIONAL EHTICS.

II SEMESTER

MBA 22001: MARKETING MANAGEMENT

Course Objective: The course is designed to obtain knowledge and understanding of the key concepts of marketing and enables to apply to the practical situations in the workplace.

Learning Outcomes: On successful completion of this course, the students would be familiarized with the fundamentals of marketing, nuances and complexities involved in product and pricing decisions, skills needed to take better distribution decisions and promotion-mix decisions and will be able to understand emerging trends in marketing to take proactive measures in the present cutthroat competition.

Unit-I

Introduction to Marketing: Definition, Nature, Scope and importance of Marketing – Marketing Concepts – Marketing Vs. Selling –Marketing Mix- Marketing Environment: Meaning, Significance of Scanning Marketing Environment, Components of Micro environment, Macro environment.

Unit-II

Analysing Marketing opportunities: Consumer behaviour-Meaning- factors influencing buying behaviour-consumer decision making process, Segmentation: Need- Benefits - Bases of segmentation, Target market, Product differentiation, Product Positioning, Marketing Research: Concept - Objectives - types - Process – Merits and Demerits.

Unit-III

Developing Marketing Strategies: Concept of Product- Product Classifications- Product Mix- New Product development - Product Life Cycle, Designing Marketing Strategies for: Market leaders – Challengers - Followers and Nichers – Ansoff matrix, Branding: Essentials of a good brand - types of brands, Packaging and labelling.

Unit-IV

Planning Marketing programs: Objectives - factors affecting pricing decisions- pricing methods- Pricing Strategies for existing products and new products.Channels of Distribution: Definition, Need and Types of Channels, Channel Management Decision – Retailing – Types of Retailers – Retailer Marketing Decisions – Trends in Retailing, Wholesaling.-The growth and types of wholesaling – Wholesaler Marketing Decisions – Trends in Wholesaling, Other forms of distribution.

Unit-V:

Marketing Communication: Concept – importance – Promotional Mix: Advertising - Sales promotion - Personal Selling - Public Relations – Recent trends in Marketing: Social Marketing – Ambush Marketing – Green Marketing – Emotional Marketing – `Digital Marketing.

Reference Books

1. Marketing Management, R.S.N Pillai, Bagavathi, S.Chand
2. Business Marketing Management: B2B, Hutt & Speh, Cengage Publisher
3. Marketing Management Text & Cases, Indian Context Tapan K Panda, Excel Publisher
4. Principles of Marketing Kotler Armstrong PHI Publisher

5. Marketing Management, Rajan Saxena .TMH Publisher

MBA 22002: PRINCIPLES OF HUMAN RESOURCE MANAGEMENT

Course Objective: To equip the students with basic concepts, methods, techniques and issues of Human Resource Management and the various functions of HRM including Quality of Work Life in the liberalized environment.

Learning Outcomes:

On completion of this course, the students will be able

1.To develop the understanding of the concept of human resource management and to Understand its relevance in organizations.

2. To develop necessary skill set for application of various HR issues.

3. To analyse the strategic issues and strategies required to select and develop manpower resources.

4. To integrate the knowledge of HR concepts to take correct business decisions.

UNIT - I: Human Resource Management Introduction: Concept and Functions of Human Resource Management; Approaches to Human Resource Management; Evolution of HRM in India; HRM and Environment; Organizing the HR Unit; Line and Staff Relationship; Policies and Procedures; Planning HR activities; Controlling HR Function.

UNIT – II: Procurement: Organizational Design and Job Design; Job Analysis; Job description; Job specification; Human Resource Planning ; Recruitment: Sources of Recruitment; Selection Procedure (including e-recruitment and selection procedure) and Induction.

UNIT – III: Training and Development: Workers training; training process; training methods; Management Development Programs; Performance appraisal Methods and Problems; Talent Management; Career Planning and Development.

Unit IV: Employee Compensation: Factors affecting compensation; Equity and Compensation; Job Evaluation; Variable Compensation; Fringe Benefits; Motivation of employees; Quality of work life; Trade Unions; Collective Bargaining; Conflict Management.

Unit V: Maintenance: Communication and Counseling; Employee Welfare; Employee Health and Safety; .Separation: Turnover, Retirement, Lay Off, Retrenchment; Discharge; Dismissal and V.R.S. ;Maintenance of HR Data Base; HR Research; HR Audit; HR Accounting.; Challenges and Opportunities in the Globalized Era; Outsourcing of HR functions.

Suggested Books

1.Personnel Management, Flippo, Edwin B, McGraw Hill Publishing Company..

2.Personnel Manaement Text and Cases C.B. Mamoria, Himalaya publications

3.Human Resource Management text and cases V.S.P. Rao, Excel Books.

4.Human Resource Management Text and cases K. Aswathappa, Tata McGraw-Hill

5.Human Resource Management Garry Dessler, Pearson Education.

6. Human Resource Management - Dr. C.B. Gupta - Sultan and Sons.

7. Personnel & Human Resource Management - P. Subba Rao - Himalaya Publishing House.
8. Personnel Management & Human Resources - C.S. Venkata Rathnam & B.K. Srivastava. Tata McGraw-Hil

203– FINANCIAL MANAGEMENT

Course Objective: The Course aims at familiarizing the participants with the skills related to basic principles, tools and techniques of Financial Management.

Course Outcomes: Upon Successful completion of the course, students will be able to

- Practically understand and follow day-to-day developments in financial management
- Develop an attitude of integrative thinking while analyzing and interpreting financial statement and accounting information
- Develop the skill of evaluating the projects using capital budgeting techniques
- Construct the optimum capital structure of the organization
- Critically evaluate the working capital requirement of the business firms
- Able to understand dividend theories and its valuation.

UNIT–I

Foundations of Finance: Introduction to Finance - Nature and scope of Financial Management - Functions – Goals - Profit Vs Wealth; Agency Conflict- Role of financial manager**. (Theory Only)**

UNIT-II

Financial Statement Analysis: Meaning – Classification – Tools - Trend analysis – Comparative statement analysis – Common-size statement analysis – Ratio analysis - Funds flow statement analysis . **(Theory & Problems)**

UNIT-III

Financing Decisions: Sources of Finance – Short term sources – Long term sources. Leverage analysis – Operating leverage – Financial leverage – Combined leverage. Capital structure decisions – Factors determining Capital Structure -Tools for designing optimum capital structure – EBIT-EPS analysis – Financial BEP and Indifference Curve analysis – CAPM - Capital Structure theories – Net Income Approach – Net Operating Income Approach – M-M Hypothesis – Traditional Approach. Cost of Capital – Elements of Cost of Capital – Measurement of Cost of Capital – WACC. **(Theory & Problems)**

UNIT-IV

Investment Decisions: Nature and significance of Investment Decision – Estimation of Cash Flows – Steps in Capital Budgeting Process – Evaluation techniques – Traditional techniques – Payback period – ARR - Discounted Cash Flow techniques – NPV – Profitability Index – IRR – Discounted Payback Period - The NPV Vs IRR Debate. **(Theory & Problems)**

Liquidity Decisions: Concepts and characteristics of Working Capital –Approaches of working capital - Factors determining the working capital - Operating cycle –Methods of estimating working capital requirements. **(Theory & Problems)**

UNIT-V

Dividend Decisions: Meaning – Forms of dividends - Concept of relevance and irrelevance theories – Walter's Model – Gordon's Model – MM Hypothesis – Factors determining Dividend Policy. **(Theory Only)**

Reference Books

1. I.M. Pandey, "Financial Management", Vikas Publishing, 2007.
2. M.Y Khan & P.K. Jain, "Financial Managemengt, Text and Problems", TMH, New Delhi.
3. Prasanna Chandra, "Financial Management: Theory and Practice", TMH, New Delhi.
4. Bruner. R.F., "Case Studies in Finance", Tata McGraw Hill, New Delhi.
5. Managerial Finance, Gitman L.J.,11th Edition, Pearson Education 2006.
6. Principles of Corporate Finance, Richard A Brealey etal., Tata McGraw Hill 2007.
7. Corporate Finance: Theory and Practice, Vishwanath.S.R.2007, 2/e, Sage Publications.
8. Financial Management – Text and cases, Bringham & Ehrhardt, Cengage, 2005.
9. Case Studies in Finance, Bruner.R.F.2007, 5th Edition, Tata McGraw Hill, New Delhi.

MBA 22004: PRODUCTION MANAGEMENT

Course Objective: The Objective of the course is to enable students to understand the production Planning and Controlling aspects of a typical production and operations organization.

Learning outcomes: Core features of Production Management function, gaining knowledge to run work systems effectively, analyzing various facility alternatives, Plan and implement suitable quality control measures in quality circles, better understanding of modern production tool.

Course Layout:

Unit I

Production System: Meaning, Classification of Production system: Intermittent(project,job,batch),continuous(mass,process);Responsibilities of Production Manager; Differences and similarities between manufacturing and service operations; Product design: Characteristics of good product design; Approaches to product design (Quality function deployment, Concurrent engineering, Ergonomics, Value engineering); Productivity: types, importance, influencing factors; production planning: tactical, operational, strategic; Maintenance management (including problems):objectives, types.

Unit II

Design of Work System: Work study: benefits, work study procedure; Method study: objectives, method study procedure, process charts; Work Measurement (including problems): benefits, techniques of work measurement.

Unit III

Flow shop scheduling: Shop floor planning (including problems): Johnson's rule, extension of Johnson's rule, CDS Heuristics; Inventory management: objectives, Inventory control techniques (including problems); Facility location: errors in selection, relative importance of location factors; facility layout: factors influencing facility layout, types of layout.

Unit IV

Quality Management: relevance of quality control, impact of poor quality, statistical process control: acceptance sampling for variables and for attributes, control charts (including problems) for variables and for attributes; Six Sigma: types of six sigma belts, benefits; quality circles; vendor analysis.

Unit V

Modern production management Tools: Just in time manufacturing: wastes in production process, benefits; push and pull production system, Kanban system; ISO 9000 series: -benefits, steps in ISO 9000 registration; Business process reengineering: characteristics, steps in implementing BPR, advantages; Lean manufacturing: steps, components,

Reference Books

1.Production Management, Martand T. Telsang S. Chand Publishers

2.Production and Operations Management K. Aswathappa, K.Shridhara Bhat Himalaya Publishing House

3.Production and Operations Management R. Pannerselvam PHI publishers

4.Production and Operations Management S.N Chary McGraw Hill

5.Production and Operations Management -Text and cases Upendra Kachru, Excel Books

MBA 22005: OPERATIONS RESEARCH

Course Objectives: This module aims to impart knowledge to students the concepts and tools of operations research, understand mathematical models used in operations research and apply these techniques constructively to make effective business decisions.

Learning outcomes: On completion of the course the student will be able to:

- Formulate real-world problems as a linear programming model and describe the theoretical working s of the graphical, simplex and Big-M methods, demonstrate the solution process by hand and solver.
- Formulate transportation and assignment problems and describe theoretical workings of the solution methods for transportation and assignment problems, demonstrate solution process by hand and solver.
- Design and solve PERT/CPM.
- Simulate different real life probabilistic situations using Monte Carlo simulation technique.
- Apply the knowledge of game theory concepts to articulate real-world decision situations for identifying, analyzing, and practicing strategic decisions to counter the consequences.

Unit-I

Definition, Importance of Operations Research for Management, Nature of Operations Research, Scientific method in operation research, Characteristics and phases of Operations Research, Classification of models, Principles of modeling, Problem models of Operations Research, scope and limitations. Linear programming: formulation, terminology, applications of LPP, advantages and limitations of LPP Graphical solutions, Simplex method, Big-M method and two phase method.

Unit-II

Transportation problem:- General TP, Transportation table and loops, formulation, optimal solutionof a TP, finding an IBFS, Degeneracy in TP, Transportation algorithm(Modi method),unbalanced transportation problem. Assignment problem:- Mathematical formulation of the assignment problem, Traveling salesman problem, solutions, differences of transportation and assignment problems , Hungarian method, unbalanced assignment problem .

Unit-III

Network Analysis:- Activity, merge event, burst event, looping, dangling, Redundancy, project Management by PERT/CPM, project crashing, PERT analysis and Computations, differences of PERT/CPM.

Unit-IV

Game theory:- concepts, Characteristics, pay off matrix, maximin- minimax principle, saddle point, Dominance, Zero-sum game, two, three and more persons games, analytical method of solving two person zero sum games, mixed strategies of S_A ,S_B and value of the game, graphical solutions for (m×2) and (2× n) games, linear programming method of simplex method in game theory, Iterative method

Unit – V

Simulation:- Meaning – Definition of Simulation – Types of Simulation – Advantages and Disadvantages of Simulation – Event Type of Simulation – Monte – Carlo Simulation – Generation of Random Numbers – Simulation of Queuing System – Simulation of an Inventory System – Simulation Languages.

Reference Books

1, Shenoy, G.V. Srivastava, V. K. and Sharma S.C., "Operations Research for Management".
2. Kantiswaroop, Man Mohan and Gupta, Operations Research.
3. Goel and Mittal, Operations Research.
4. Sharma S.K. k.,Operations Research.
5. Hamdy, A. Taha:Operations Research: An introduction, prentice Hall of India New Delhi, 2007.
6. R.Panneerselvnam PHI 2nd Ed. Operations Research

MBA 22006 – BUSINESS ENVIRONMENT

Course Objective: The present course aims at familiarizing the students with various aspects of economic, social, political and cultural environment of India. This will help them in gaining a deeper understanding of the environmental factors influencing Indian business organizations and also the students understand the legal and regulatory framework for doing business in India.

Learning Outcomes: On completion of the course, the student would

- Be aware of dimensions of the Business Environment.
- Analyse the impact of culture and technology on business.
- Explain the economic trends and effect of Government policies as LPG.
- Be acquainting with the various legal frame works in India pertaining to Business.

UNIT – I Business Environment: Meaning – Importance – Nature – Environmental Factors – Changing the dimensions of Business environment – monitoring techniques of environmental scanning

UNIT – II Socio – Cultural and Technological Environment: Elements of Socio – Cultural Environment: Impact on Business – Culture and Sub culture pattern – Social responsibility of business – Technology up gradation – technology transfer – Technological Policy.

UNIT – III Economic and Political Environment: Significance and elements of economic environment – economic system – economic planning in India – Industrial Policy – New foreign trade policy – liberalization – privatization and globalization – Demonetization – Monetary and Fiscal policy – EXIM policy – critical elements of political environment.

UNIT –IV Legal Environment of Business: Political Institutions – Legislature, Executive and Judiciary – Changes of Legal Environment in India – Intellectual Property Rights – Major regulations pertaining to business.

UNIT – V Business Legislations: Consumer Protection Act 1986 – SICA Act – 1985 – FEMA Act 1999 – IT Act 2000 – Competition Act 2002 – MSME Act 2006.

Suggested Books:

1. Francis Cherunilam, ***Business Environment***, Himalaya Publishing House, Mumbai.
2. Fernando, A.C., ***Business Environment***, Pearson.
3. Suresh Bedi, ***Business Environment,*** Excel Books, New Delhi,
4. Adhikary.M. ***Economic Environment of Business***, Sultan Chand & Sons, New Delhi.
5. Aswathappa.K., ***Essentials of Business Environment***, Himalaya Publishing House, Delhi.
6. Justin Paul, ***Business Environment***, Text and Cases, Tata McGraw Hill.
7. Krishna Rao,P, ***WTO-Text & Cases***, PSG Excel Series.
8. R.S.N. Pillai and Bagavathi, "***Legal Aspects of Business***", S.Chand, New Delhi.
9. H.L.Ahuja, "***Economic Environment of Business"*** S.Chand, New Delhi.
10. G.Prasad, ***Business and Corporate Laws***, Jai Bharathi Publishers.

MBA 22007: DYNAMICS OF LEADERSHIP

Objectives: The course is aimed at equipping the students with necessary concepts and techniques to develop effective leadership skills to attain objectives of the enterprise in a conducive environment.

Outcomes: After completion of the course the student will be able to inspire, influence, guide and lead others to participate and attain the common goal.

Unit -I

Introduction: meaning, nature and importance, impact of leadership on organizational performance, leadership roles, types of leadership, framework for understanding leadership, traits, motives and characteristics of leaders.

Unit -II

Effective Leadership behavior and attitude: Task-related attitudes and behavior, Relationship oriented attitudes and behavior, 360-degree feedback for fine-tuning a leadership approach,

Unit-III

Leadership styles – classical leadership style, boss-centered Vs employee-centered leadership continuum, the autocratic, participative, free-rein continuum, the leadership grid style, the entrepreneurial leadership style, gender difference in leadership style, selecting the best leadership style, Leadership theories

Unit-IV

Developing team work: team leadership vs. solo leadership, advantages and disadvantages of group work and team work, the leader role in the team-based organization, leader actions that foster teamwork, outdoor training and team development, the leader- member exchange model and teamwork.

Unit-V

Leadership development: development through self-awareness and self-discipline, development through education, experience, and mentoring, leadership development programs, evaluation of leadership development efforts, leadership succession.

Text books

7. Andrew J. DuBrin, Leadership, Biztantra, New Delhi.
8. Gary Yukl, Leadership in organizations, Pearson Education, New Delhi.

OPEN ELECTIVE

MBA 22008: TALENT AND KNOWLEDGE MANAGEMENT

Course Objective: The main objective of this paper is to enable the students understanding the significance of Talent and Knowledge Management in today's business scenario.

Learning Outcome:

Students will be able to understand

4. Talent Management Process
5. Knowledge management aspects
6. Knowledge management assessment and solutions

Unit – I: Introduction : Meaning and importance of talent management, Designing and building a talent reservoir, Segmenting the Talent Reservoir, Talent Management Grid, Creating a talent management system, Institutional strategies for dealing with talent management.

Unit – II : Competency Management : Meaning, characteristics, types–Steps in developing a valid competency model, Talent management information systems; Developing a talent management information strategy, Role of leaders in talent management.

UNIT-III: Introduction to KM & Role of IT: Meaning & Importance of Knowledge Management, Data–information - Knowledge - Wisdom interrelationship, Organizational knowledge: Characteristics and components of organizational knowledge, Building knowledge societies, Role of Information Technology in Knowledge Management System.

UNIT-IV: Future of Knowledge Management & Industry Perspective: knowledge management in manufacturing and service industries, Knowledge management in finance, Knowledge management in marketing, Business ethics and Knowledge Management, Challenges and future of knowledge management.

UNIT-V: Knowledge Management Process: Stages of Knowledge Management process, Knowledge Capital vs. Physical Capital, Knowledge Management Strategies, Factors influencing Knowledge Management, Web portals, Information architecture – Net banking in India.

Suggested Books

1. Sudhir Warier, "Knowledge Management", Vikas Publishing House Pvt. Ltd.
2. Thorne & Pellant, "The Essential Guide to Managing", Viva Books.
3. Stuart Barnes(Ed) "Knowledge Management Systems". Cengage Learning.\
4. Ed by Lance A. Berger and Dorothy R Berger. "The Talent Management Handbook", 2004, Tata McGraw Hill edition.
5. Ed by Larry Israelite, "Talent Management", ASTD Press.
6. Sajjad M Jasmuddin, "Knowledge Management", 1st ed, 2009, Cambridge.
7. Stuart Barnes, "Knowledge Management Systems", Ed, Cengage Learning
8. Donald Hislop, "Knowledge management in Organizations", 2009, Oxford University Press, Second edition.

MBA 22009: FUNDAMENTALS OF BUSINESS MANAGEMENT

Course Objective: The course aims to acquaint with fundamentals of management and various functional areas of management.

Learning Outcome:

- To Apply elements of effective decision making to areas that are central to career development
- To have an understanding of the basic concepts, and processes of communication
- To obtain knowledge and understanding of the key concepts of marketing and enables to apply to the practical situations in workplace
- To strategically plan for the human resources needed to meet organizational goals and objectives
- To aim at familiarizing the participants with the skills related to basic principles, tools and techniques of Financial Management

Unit – I:

Fundamentals of Management: Concept – Significance – Functions – Principles - Role and Responsibilities of a Manager – Management is an Arts Or Science – Concept of MBO – Management vs Administration – Advantages - Limitations.

Unit-II
Introduction to Business: Concept - Nature – Features – Types of Business – Business Vs Trade – Business Communication and its importance – Goal setting – Types of Strategies.

UNIT – III:
Marketing Management: Concept of Marketing –Nature – Scope – Distinction between Marketing and selling – Marketing Mix – Steps in New Product Development – Product life Cycle – Process of Marketing Research – Marketing Strategies – e-Marketing – Social Marketing.

UNIT-IV:
HRM: Concept – Nature – Objectives – Significance - functions – Role of HR Manager – HR Planning – Recruitment Process – Sources of Recruitment – Methods of Recruitment – Job Induction – Job Description - Job Specification – Job Analysis – Job Evacuation Process – Training and Development – Career Planning and Development Methods – Leadership – Motivation – Stress Management.

UNIT- V:
Financial Management: Concept – definitions – Nature – Scope – Objectives – Significance – Financial Decisions – Sources of Finance – concept of Cost of Capital Importance – classifications of costs – Computation of Specific Source of fund cost – WACC Concept of working capital Management – Objectives – Sources of W.C – Kinds of W.C – Components of W.C – Importance – Operating cycle – Cash Conversion cycle – Estimation of working capital – Dividend Policy – Issue of Dividend and Bonus Shares.

Reference Books:
1.Philip Kotler, Marketing Management, Pearson Education.
2.Heinz Weirich and Harold Koontz, Management, TMH.
3.I.M.Pandey, Financial Management, Vikas Publishers.
4.Garry Dessler, Human Resource Management, Pearson Edition.

III SEMESTER

MBA 32001: BUSINESS LAW

Course Objective: The course aims to acquaint students with various laws governing business operations in India.

Learning Outcomes: On completion of this course, the students would be able to learn thoroughly about the general contracts, understand the contracts relating to the sale of goods, use negotiable instruments in practical life and familiarize with the legal frame work regarding forms of business association and income taxation.

Unit – I

The Indian Contract Act – 1872: Nature of a Contract - Classification of Contracts - Essentials elements of valid Contract — Capacity of parties – Free Consent – Performance of Contract - Discharge of Contracts – Breach of Contract and its Remedies.

Unit – II

Sale of goods Act – 1930: Meaning of Contract of Sale of Goods- Essential Elements of Contract of Sale, Conditions and Warrantees; Performance of Contract of Sale, Unpaid Seller: Concept - Rights of Unpaid Seller. **Indian Partnership Act – 1932**: Elements of partnership - Constitution of Partnership - Forms of partnership - Types of partners– Rights, Duties and Liabilities of Partners. The LLP Act, 2008: Meaning, formation and LLP vs. partnership firm.

Unit- III

Negotiable Instruments Act – 1881: Meaning - Characteristics– Promissory Note – Definition- Characteristics, Bills of Exchange: Definition – Characteristics – difference between promissory note and Bill of exchange, Cheque: Definition – Characteristics – differences between Cheque and Bill of exchange – Crossing of Cheque - Types of Endorsements, Electronic funds transfer terminology– NEFT, MICR, RTGS, and CTS.

Unit-IV

The Companies Law: Meaning of a company - Characteristics - Types of Companies – Steps and Procedure for incorporation of the Company – Memorandum of Association - Articles of Association – Shares: Meaning- Types of Shares, Directors: appointment- removal -powers, duties and responsibilities- Company management: Meetings – types, kinds of meetings- Resolutions- types-minutes, Winding up of a company.

Unit –V

Income Tax Act – 1961(Theory only):Meaning – Characteristics - Purpose of Income Tax, Terminology of Income Tax: Income- person-Assesse- Assessment Year- Previous year , Gross Total Income , Advance Payment of Tax , Tax Deducted at Source.

Reference Books

1. Bansal, C.L., Business and Corporate laws, 1st Edition, Excel Books, 2006.
2. S.K Maheswari, S.N., Maheswari, A Manual of Business Law, Himalaya Publishing House, 2006.
3. Lal, B.B., & Vashisht, N., Direct Taxes, Latest Edition, Pearson Education, 2009.
4. Kapoor, N.D., Mercantile law, Sultan Chand & Sons, 2006

MBA 32002: TOTAL QUALITY MANAGEMENT

Course Objectives: This course is designed to learn the fundamentals of Total Quality Management with emphasis on quality philosophies and tools in the managerial perspective.

Learning Outcomes:
1. Summarize the Total quality principles.
2. Demonstrate the tools utilization for quality improvement.
3. Analyze the various types of techniques are used to measure quality.
4. Describe the dimensional barrier regarding Quality.
5. Apply the various quality systems in implementation of Total quality management.

UNIT- I: Total Quality Management: Meaning & Definitions of quality, Need for quality, quality Evolution, Dimensions of quality, Basic concepts of total quality management, Principles of TQM, Service Quality , Customer Satisfaction , Gurus of TQM, TQM Framework.

UNIT- II: Management Tools: Forced Field Analysis – Affinity Diagram – Just in time –Quality Circles – Cost Benefit Analysis – Flow Charts – Run and Control Charts – Check Sheets – Histograms – Scatter Diagrams – Cause and Effect Analysis – Process Simulation.

UNIT- III: Tools for Quality: Benchmarking – Quality Function Deployment – Quality By Design – Failure Mode and Effect Analysis – Total Productive Maintenance – ISO 9000 – ISO 14000 and ISO 18000.

UNIT- IV: Six Sigma: Definition --– Competitive Advantage -- Implementation of Six Sigma – Design for Six Sigma and Tools.

UNIT- V: Business Process Reengineering: Introduction, Meaning & Concerpt of Business Process Reengikneering — Principles and applications of Business Process Reengineering – The Reengineering Process –Benefits and Limitations of Business Process Reengineering..

Suggested Books:

1. Besterfiled, D.H. “Total Quality Management”, Pearson Education, Inc. 2003.
2. Zeiri., “Total Quality Management for Engineers”, Wood Head Publishers, 1991.
3. Evans, J. R., and Lidsay, W.M., “The Management and Control of Quality”, 5th Edition, South-Western (Thomson Learning), 2002.
4. Oakland.J.S. “Total Quality Management”, Butterworth – Hcinemann Ltd., Oxford, 1989.
5. Narayana V. and Sreenivasan, N.S., “Quality Management – Concepts and Tasks”, New Age International, 1996.
6. Kanishka Bedi., “Quality Management”, Oxford University Press, 2006.

INTERNAL ELECTIVE

Marketing Specializations (From 311 to 313)

MBA 32311: SERVICES MARKETING

Course Objectives: After successfully completing this course, students will be able to explain the unique challenges of services marketing, including the elements of product, price, place, promotion, processes, physical evidence, and people. Design service quality measurements to build customer loyalty and evaluate the effectiveness and efficiency of customer service offerings.

Learning Outcomes: On successful completion of the course students will be able to;

- Demonstrate an extended understanding of the similarities and differences in service based and physical product based marketing activities,
- Demonstrate knowledge of the extended marketing mix for services,
- Develop and justify marketing planning and control systems appropriate to service-based activities,
- Familiarize with the steps in new service development process
-

Unit-I

Services Marketing : Concept – Characteristics - Classification of Services – Difference between services and goods – Contribution of services sector to the Economy; Trends in service Marketing ; Consumer behavior: Consumer purchase behaviors ; Evaluation of service alternatives –Customer satisfaction – Past purchase evaluation by customer.

Unit-II

Focus on the Consumer: Consumer Perception of Service, Building Customer Relationship, Service Recovery, Developing Services Marketing Mix: Service Product – Pricing in services – Service Promotion - Place in service – Role of People in Service Marketing – Physical Evidence of Service.

Unit-III

Service Quality: Meaning – Dimensions in Service Quality – Measurement of Service quality – Gap analysis in service quality – Benefits of Service quality; Customer Retention and customer loyality, Claim Settlement, reinsurance

Unit-IV

Marketing Planning for Services : Strategic Planning process; Bebefits of Marketing Planning for Services; Problems in Marketing Planning, Managing demand supply – Forecasting Demand and Measurement – Reshapping the demand – Ques and the associated Problems- Yield Management.

Unit – V

Aligning Service Design and Standards: Service Innovation and Design – Challenges, types of Service Innovations, Stages in Service Innovation and Development, Service Blueprinting, High performance service innovations, new Service Development Processes, Customer defined service standards –factors, types end development.

Reference Books

1. Christopher Lovelock, services marketing People, Technology, Strategy, Pearson Education.
2. RajendraNargundher, Services Marketing, McGraw Hill Publications.
3. Adrian Payne, The Essence of Service Marketing, Prentice Hall of India.
4. Ram Mohan Rao, Services marketing, Pearson Education.
5. Roland T. Rust, Anthony J. Zahorick and timothy i. Keilninghan, Services Marketing, Addison Wesley.
6. Bhatacharya, Services Marketing, Excel Publications.
7. VasanthiVenugopal& Raghu V.N.Services Marketing Himalaya Publishing House.
8. GovindApte, Services Marketing, Oxford University Press.

9.ValarieA.Zeithaml&mary Jo-Bitner; Service Marketing – Integrating Customer focus across the firm, TMH , Fifth Ed.2011
10.VinnieJauhari, KirtiDutta: Services-Marketing, Operations and Management, Oxford University Press 2012.

MBA 32312: SALES AND DISTRIBUTION MANAGEMENT

Course Objective: The Objective of the course is to enable students to understand sales aspects of a company and its effective distribution levels

Learning outcomes: Students with Marketing Specialization start their career in sales, business development, retailers, whole salers and distributors handling, it is essential to study basics of personal selling, sales management, distribution dynamics, various channels of distribution etc. Through this course, students will be equipped with basic skills required in sales and distribution management.

Course Layout:

UNIT 1

Nature and Scope of Sales Management; Objectives and functions of Sales management; Modes of sales presentation, Designing and delivering of sales presentation; Managing of sales territory, Objectives and Types of Quotas, Quota setting procedure; Recruiting and selecting Sales Personnel

UNIT 2

Developing Sales Training Programmes, Executing and Evaluating sales training programmes; Motivating Sales Personnel; Compensating sales personnel, Designing and Administering various Compensation Plans

UNIT 3

Buyer-Seller Dyads, Diversity of Personal-selling Situations, Theories of Selling; The Sales Budget

UNIT 4

Structure, Functions of Distribution channels and Relationships of channels of Distribution; Retailing, wholesaling, Franchising; Channel Design Process and Channel Management Decisions

UNIT 5

Market Logistics objectives, Components of logistics – warehousing decisions, Transportation decision, Inventory management decisions; Concept of EOQ, ROP, JIT.

Reference Books:

1. Sales Management: Decisions, Strategies & Cases, Richard R. Still, Edward W. Cundiff, Norman A.P. Govoni, Pearson Education, Latest Edition

2. Sales Management: Concepts Practice, and Cases, Johnson F.M., Kurtz D.L., Scheuing E.E., Tata McGraw- Hill, Latest Edition

3. Selling & Sales Management, David Jobber, Geoffrey Lancaster, Pearson Education, Latest Edition

4. Sales Management, Tanner, Honeycutt, Erffmeyer, Pearson Education, Latest Edition

5. Sales Force Management, Mark W. Johnston, Greg W. Marshall, Tata McGraw-Hill, Latest Edition

6. Still, R R. & Cundiff; Sales Management, Englewood Cliff, New Jersey, Printice Hall Inc.,

MBA 32313: RURAL MARKETING

Course Objectives: To help the students understand and appreciate the differences and similarities between urban and rural Indian markets. To make them understand and develop marketing strategies those are unique to rural India

Learning outcomes:
As a subject it will fulfill the needs of the students in understanding the process of activating factors of production, dispersal of economic activities, development of rural and tribal areas, and active involvement in the process of growth. It helps in understanding variety of challenges and strategies to satisfy the rural consumers.

Unit-I

Rural Marketing – Definitions, Scope and Significance – rural Vs Urban Marketing – Growth of Urban and rural Areas – Role of rural Marketing in Economic Development.

Unit – II

Consumer Profile and Behavior Patterns – Rural Consumer Characteristics and influences – Buying Models – Segmentation – Positioning –

Unit - III

Marketing Research Techniques in Rural Marketing. Product Strategy – Decisions with Rural Orientations and Branding – Packaging Decisions

Unit – IV

Spurious products – Innovation, Diffusion and Adoption – launching of Ne

w Product in rural Areas – Pricing Strategies.

Unit – V

Promotion Strategy – Promotional Mix with Rural Orientation – Strategies of Product Selling, Sales promotion and Publicity – Rural Advertising.

Reference Books

1. C.S.G. Krishnamacharyulu and R. Lalitha, Rural Marketing: Text and Cases, Pearson Education.

2. Sukupal Singh, Rural Marketing Management, Vikas Publications.

3. Bide & Badi, Rural Marketing, Himalaya Publications.

Finance Specializations (From 321 to 323)

MBA 32321: COST ACCOUNTING FOR MANAGEMENT

Course Objective: The primary objective of this course is to familiarize the student with basic concepts, practical experience of Cost Accounting and it's support to Management in decision making process. To elevate the students' knowledge in practicing the problems of cost Accounting and it's relevance to cost control system in any organisation**.**

Learning Outcomes: On successful completion of the course the student will be able to:

- Understand the Cost concepts, classification, advantages and limitations cost accounting,
- Analyse the methods and techniques of costing,
- Comprehend the applications of Operating costing and
- Familiarise with the cost management techniques and reports.

UNIT - I

Single/ Output/ Unit Costing: Introduction - Cost Concepts – Nature and Significance – Objectives –Need - Classification of Costs – Elements of Cost – Direct Material – Direct Labor – Overheads – Preparation of Cost Sheet and Tender – Advantages of Cost Accounting – Limitations of Cost Accounting –Differentiate Cost Accounting with Management Accounting and Financial Accounting - Process of Installing Cost Accounting System - Scope of Cost Accounting. (Theory and Problems)

UNIT - II

Methods of Costing: Introduction - Types; **Process Costing:** Meaning – features – Applications – Normal and Abnormal Losses – Process Accounts with Stocks; **Contract Costing** : Features – Procedure for preparation of Accounts in Contract costing – Calculation of profit on Contracts. (Theory and Problems)

UNIT - III

Techniques of Costing : Introduction - Decisions involving Alternative Choices : Make or Buy Decisions – Replacement Decisions - Shutdown or Continue Decision ; **Standard Costing** : Concept and Need – Types of Standards – Advantages of Standard Costing; **Variance Analysis** - Types of Variances – Problems on Materials Variance andLabour Variance. (Theory and Problems)

UNIT – IV

Operating Costing : Concept – Applications – **Transport Costing** : Concept, Applications and Problems – **Power House Costing** : Concept, Applications and Problems – **Hotel Costing** : Problems and Applications.

UNIT – V

Uniform Costing : Meaning – Need and Objectives – Scope –Areas of Uniform Costing – Pre-requisites for installation of Uniform Costing - Applications ; Uniform Costing manual – Procedure for Inter-firm Comparison – Advantages and limitations; **Cost Management Techniques** : Cost Control and Reduction – Meaning - Cost Control Techniques – Cost Reduction Tools and Techniques – Cost Reporting : General Principles – Classification of Reports – Forms of Reports (Theory only).

REFERENCE BOOKS

6. Ravi M. Kishore, Cost and Management Accounting, Taxmann Allied Services Pvt. Ltd., New Delhi
7. Saxena V.K. and Vashist C.D., Advanced Cost and Management Accounting, Sultanchand and sons, New Delhi
8. Arora M.N, Cost and Management Accounting:, Himalaya Publishing House Pvt. Ltd., Hyderabad.
9. Maheswari S.N, Accounting For Management, Sultan Chand Publications Pvt Ltd., New Delhi.
10. PrashantaAthma, Cost and Management Accounting, Himalaya Publishing House.

MBA 32322: TAXATION MANAGEMENT

Course Objective: To acquire conceptual and legal knowledge about Income Tax provisions relating to computation of Income from different heads with reference to an Individual Assessee

Course Outcomes: At the end of the course, the student will able to;

- Acquire the complete knowledge of the tax evasion, tax avoidance and tax planning.
- Understand the provisions and compute income tax for various sources.
- Grasp amendments made from time to time in Finance Act.
- Compute total income and define tax complicacies and structure.
- Prepare and File IT returns of individual on his own

Unit-I:

Introduction to Income Tax Act-1961: Concept of Income, Agricultural Income, Casual Income, Gross Total Income , Total Income, Person, Assessee - Assessment Year, Previous Year, Rates of Tax, Residential Status of an Individual - Incidence of Tax – Incomes Exempt from Tax **(Theory only).**

Unit-II:

Income from Salaries: Basis of Charge, Tax Treatment of Different Types of Salaries, Allowances, Perquisites, Profits in Lieu of Salary, Deductions from Salary Income, Computation of Salary Income of an individual assessee. **(Theory & Problems)**

Unit-III:

Income from House Property: Basis of charge - Annual Value, Let-out/Self occupied/Deemed to be let-out house - Deductions from Annual Value - Computation of income from House Property. **(Theory & Problems)**

Income from Business and Profession – Procedure for computation of income from business – Revenue and Capital Nature of Incomes and Expenses – Allowable Expenses – Expenses Expressly Disallowed – Computation. **(Theory & Problems)**

Unit-IV:

Income from Capital Gains: Meaning of Capital Asset – Types – Procedure for Computation of long-term and short-term capital gains/losses. **(Theory only)**

Computation of taxable income under the head 'Income from other sources' - General Incomes – Specific Incomes. **(Theory only)**

Unit-V:

Tax Assessment of an Individual: Deductions under Section 80. Tax Rates in respect of individuals, Computation of Tax Liability of an individual. **(Theory only)**

Tax Management: Tax deduction at source - Advance payment of tax - Tax evasion- Tax avoidance and tax planning. Preparation and filing of income tax return - Manually and on-line. **(Theory only)**

Reference Books:

1. Dr. Vinod; K. Singhania; Direct Taxes – Law and Practice, Taxman Publications
2. T. S. Reddy and Dr. Y. Hari Prasad Reddy - Taxation , by Margham publications
3. Premraj and Sreedhar, Income Tax, Hamsrala Publications
4. B.B. Lal - Direct Taxes; Konark Publications
5. Dr. Mehrotra and Dr. Goyal -Direct Taxes, Law and Practice, Sahitya Bhavan Publication.
6. Balachandran&Thothadri- Taxation Law and Practice, PHI Learning.
7. V.P. Gaur and D.B. Narang - Income Tax, Kalyani Publications
8. Dr Y Kiranmayi - Taxation, Jai Bharath Publishers, Guntur.
9. Income Tax, Seven Lecture Series, Himalaya Publications

Suggested Co-Curricular Activities:

- Seminar on different topics of Income tax
- Quiz programs
- Problem Solving Exercises

- Debate on Tax Evasion and Avoidance
- Practice of provisions of Taxation
- Visit a Tax firm
- Talk on Finance Bill at the time of Union Budget
- Guest lecture by Chartered Accountant
- Presentation of tax rates
- Practice of filing IT Returns online
- Group Discussions on problems relating to topics covered by syllabus
- Examinations (Scheduled and surprise tests)

MBA 32323: FINANCIAL MARKETS AND DERIVATIVES

Course Objective: The objective of this course is to make students efficient in the area of financial markets and derivatives, giving them the knowledge of basics in derivatives, future markets, option strategies to enlighten the students with the concepts and practical application of derivatives.

Course Outcomes: Upon Successful completion of the course, students will be able to

- Understand the role and functions of financial markets
- Evaluate the working of stock exchanges
- Understand conceptual framework of the Derivative Markets.
- Familiar with forward and future contracts and its valuation
- Determine options pricing using Binomial and Black schools options pricing Models.
- Analyze various types Swaps.

UNIT-I

Financial Markets: Meaning – Classification – Money market – Money market instruments – Capital market – Primary market – Capital market versus money market. **(Theory Only)**

Stock Exchanges: Meaning – Importance – Functions – Advantages – Limitations – BSE – NSE – Listing of securities – Objectives – Speculation in stock exchanges – Classification of speculators – Types of speculation – Role of SEBI – Securities trading system – Types of orders – Stock market operations – Trading settlements – Stock market quotations – On-line broking. **(Theory Only)**

UNIT-II

Financial Derivatives: Meaning – Definitions – Features –- Functions – Participants in financial derivatives market - Classification of derivatives – Types of derivative contract. **(Theory Only)**

UNIT-III

Forwards and Futures Contracts: Concept – Uses – Types of forwards and futures – Forwards and futures trading mechanisms – Forwards versus futures – Valuation of forward contracts – Models for determining future prices. **(Theory Only)**

UNIT-IV

Options: Concept – Types – Difference between options and futures – Option pricing models – The Binomial option pricing model – One step and two step models – The Black scholes option pricing model. **(Theory & Problems)**

UNIT-V

Swap Markets: Meaning – Features – Need – Types of swaps - Applications of swaps. **(Theory Only)**

REFERENCE BOOKS:

10. Gupta S.L., 'Financial Derivatives', PHI, New Delhi.
11. Krishnan Bal & Natra, 'Securities Market in India', Kanughkal Publisher, New Delhi.
12. Tumbull & Jarrow, 'Derivatives Securities', Thomson Publications.
13. Sananatian, 'Derivatives', TMH, New Delhi.
14. Vohra N.D., & Bagri B.R., 'Futures and Options', TMH, Second Edition, New Delhi.
15. David Dubofsky, *Option and Financial Futures – Valuation and Uses,* McGraw Hill International Edition
16. Kumar S.S.S., 'Financial Derivatives', PHI, New Delhi.
17. Hull, John C, Options, *Futures and other Derivatives,* Prentice Hall of India 7./e 2008.
18. Keith Redhead, *Financial Derivatives – An Introduction to Futures, Forwards, Options and SWAPs*,– Prentice Hall India Pvt., Ltd.,

P.Vijaya Bhaskar and B.Mahapatra, *Derivatives simplified – An Introduction to Risk Management*, Response Books, Sage Publication Pvt., Ltd,.

HRM Specializations (From 331 to 333)

MBA 32331. MANAGEMENT OF INDUSTRIAL RELATIONS

Course Objective: To enlighten the students with the Concepts and Practical applications of Industrial Laws and Employee relations.

Learning Objectives: Upon completion of the course, the student would

- Be aware of the concepts of industrial relations.
- Be acquainted with the legal framework stipulated under the Industrial Dispute Act, 1947.
- Be imbibed with the concepts, principles and issues connected with trade unions, collective bargaining and workers participation.
- Understand trade unionism in India and legal frame work under the Trade Union Act, 1926.

Unit – I: Industrial Relations: Scope and Significance – Evolution of Industrial Relations in India and comparative analysis with USA and UK– Recent Trends in Industrial Relations – Approaches to Industrial Relations – Theories of Industrial Relations.

Unit – II: Promotion of Harmonious Relations – Machinery for Prevention and Settlement of Industrial Disputes – Conciliation – Arbitration and Adjudication – Code of Discipline and Code of Conduct; Industrial Disputes Act 1947.

Unit – III: Collective Bargaining (CB) – CB Practices in India – Participative Management Forms and Levels – Schemes of Workers' Participation in Management in India – ILO and its impact.

Unit - IV: Trade Unions: Concept, Growth, functions and Objectives of Trade Unions - Trade Union Movement in India, UK and USA - Changing Role in the Context of Liberalization - Trade Union Act 1926.

Unit-V: Trade Unionism in India: Problems of Trade Union; Recognition, Leadership, Political involvement, Union rivalry; National trade Union Federations; Emerging Trends in Trade Unions in India.

Suggested Books:

1. VenkatRatnam, C.S. – Industrial Relations, Oxford University Press.

2. SC Srivathava, Industrial Relations and Labour Laws, Vikas, New Delhi.

3. M.Arora: Industrial Relations, Excel Publications.

4. P.R.N.Sinha, InduBalaSinha and SeemaPriyadarshiniShekar, "Industrial Relations, Trade Unions and Labour Legislation", Pearson Education, New Delhi.

5. Ramaswamy E.A. – The Strategic Management of Industrial Relations, Oxford University Press.

6. Cowling and James, The Essence of Personnel Management and Industrial Relations, Prentice Hall of India.

7. RatnaSen, "Industrial Relations in India", Macmillan India Ltd. New Delhi.

8. Michael Armstrong, Employee Reward, Universities Press (India) Ltd.

MBA 32332 - Employee Compensation and Administration

Course Objective: Explain how perceptions of compensation differ among society, stockholders, managers and employees. Understand the concept of a compensation strategy, where it comes from, how it relates to the organization's situation**.**

Learning Outcomes:
On completion of this course the student will be able to recognize how pay decisions help the organisation and analyze, integrate and apply the knowledge in solving compensation related problem in the organisation.

UNIT I :

Employee compensation: Concept and Significance: Wage Concept: Wage , Salary , Minimum Wage, Living Wage, Need-Based Minimum Wage, Money Wage and Real wage; Wage policy in India ; Theories of wages.

UNIT II :

Wage Administration Principles: Factors influencing Wage Fixation and Methods wage Differentials: Occupational, skill, Sex, Inter-Industry, Regional and Sectional.

UNIT III:

Wage Fixation Mechanisms: Statutory Wage fixation, Wage Boards, Collective Bargaining, Adjudication, Pay Commission; Wage Fixation in Public Sector.

UNIT IV:

Incentives : Principles and procedures for installing incentive system; Types of wage Incentive System, Wage incentive Schemes in India, working of incentive schemes, Linking wage with productivity; Fringe Benefits: Concepts and Types.

UNIT V:

Wage and salary policies in Organization: Role of HR Department in wage and salary Administration, Managerial compensation, Perquisites and special Features; Recent trends in managerial compensation in Indian Organizations, International compensation: Components of International compensation, expatriate and repatriate compensation, approaches to international compensation.

Suggested Books:

7. Subramanian, K.N., Wages in India, Tata Mc Graw Hill Publishing Co. Ltd., New Delhi.
8. Sarma. A.M, Understanding Wages Systems, Himalaya Publishing House, Mumbai.
9. Varma, Promad, Wage Determination: concepts and cases, Oxford IBH publication. Ltd New Delhi.
10. Chatterjee, N.N., Management of Personnel of in Indian Enterprises. Allied Books agency, Culcutta.
11. Aswathappa. K., Human Resource and Personnel Management. Tata Mc Graw Hill Publishing Co.

12. Dipak Kumar Bhattacharyya, Compensation Management, Oxford University press, New Delhi.

MBA 32333: EMPLOYEE WELFARE AND LABOUR ADMINISTRATION

Course Objective: To enlighten the students with the Concepts and Practical applications of employee welfare and labour administration.

Learning Outcomes:

- **Employees Welfare measures are in addition to their wages and services.**
- **ILO develop effective standards, fundamental principles, and fundamental rights at work**
- **Implementation of statutory and non-statutory welfare programmes**
- **Social security measures for employees**

Unit – I : LABOUR WELFARE

Labour Welfare : Concept, Definitions, Scope, Aims and Objectives and Philosophy of Lab our Welfare; principles of Lab our Welfare: Indian Constitution and Labour Welfare Historical Development of Lab our Welfare in India:

Unit – II: ILO

Impact of ILO; Structure, Function, Welfare work on labour welfare in India; Agencies of Lab our Welfare and Their roles: State, Management, Trade Unions and Voluntary Agencies.

Unit – III: WELFARE PROGRAMES

Labour Welfare Programmers ; Statutory and Non-Statutory, Extra Mural and Intra Mural: Canteen, Housing, Workers Education Scheme; Welfare Office: Role , Status and Functions.

Unit – IV: SOCIAL SECURITY

Social Security : Definition, Aims and Objectives; Social Assistance and Social Insurance, Financing of Social Security Schemes, Development of Social security in India; Social Security Measures for Industrial Employees.

Unit – V: **LABOUR ADMINISTRATION**

Labour Administration : Central Lab our Administrative Machinery in India; Chief Lab our Commissioner , Director general of Employment and Training, director general of factory Advice Service, Provident Fund Organization, ESI Scheme : Lab our Administration in AP

Reference Books

1. Moorthy, M.V., Principals of Lab our welfare in India, Sree Ram Centre
2. Sharma, A.M., Aspects of Lab our Welfare and Social Security, Himalaya Pub. House, Mumbai.

9.Ram Chandra P.Singh, Lab our Welfare Administration in Indian, Deep & deep Pub., New Delhi.

OPEN ELECTIVE
MBA 32003: ENTREPRENEURSHIP DEVELOPMENT

Course Objective: The objective of this course is to create conceptual understanding of the topic among the students and comprehend the environment of making of an Entrepreneur and to develop perspective understanding of startups and MSMEs in the Indian context.

Learning Outcomes:
On completion of the course, the student will be able to have conceptual understanding of the concept of entrepreneur and entrepreneurship; growth of women and rural entrepreneurship in Indian context. He would be able to generate ideas and opportunities for business ventures. Student will have through knowledge of MSMEs. He will be able to recognize various institutions like Commercial banks, SSIDC, CII, FICCI and ASSOCHAM.

Unit – I Entrepreneur and Entrepreneurship: Evolution of the Concept of Entrepreneur – Characteristics of an Entrepreneur – Distinction between an Entrepreneur and Intrapreneur and a Manager – Functions of an Entrepreneur – Types of entrepreneurs, Concept of Entrepreneurship – Functions, Problems, Entrepreneurial process – Growth of Entrepreneurship in India – Recent Trends of Women Entrepreneurship – Meaning of and Need for Rural Entrepreneurship – Problems and Development of Rural Entrepreneurship.

Unit II Startup Ideas and Opportunity Assessment: Importance of Ideas – Sources of startup Ideas – Techniques for generating ideas – Steps in potential ideas – Opportunity Recognition- sources and process – Development of Programmes E – Business Ventures – Importance of Financial Management – Project Feasibility Study.

Unit – III MSME Enterprises: Definitions, Characteristics – Relationships of MSME – Relationship with large units – Export Oriented Units - Rationale – Objectives – Scope of Small Enterprises – Opportunities for an Entrepreneurial career – Role of Small Enterprises in Economic Development – Causes and Symptoms of Sickness – Cure for Sickness.

Unit IV Project preparation and Financing Ventures: Meaning of and Preparation of Project – Importance of Report – Content; Guidelines for Report preparation – Network Analysis – PERT and CPM – Sources of Finance – Concept of working Capital and Estimation – Seed Capital – Venture Capital.

Unit V Institutional support to Entrepreneurs: Commercial Banks – Other major financial institutions – Central Level Institutions – KVIC; SIDO; NSIC : National Productivity Council (NPC); EDII – State Level Institutions – DIC – SFC-state Small Industries Development Corporation (SSIDC) – Industry Associations – Confederation of Indian Industry(CII) ; Federation of Indian Chamber of Commerce Industry (FICCI); Associated Chambers of Commerce and Industry of India (ASSOCHAM)

Suggested Books:

1. Vijay Sathe, “Corporate Entrepreneurship” 1st edition, 2009, Cambridge
2. S.S. Khanka, “Entrepreneurial Development”, 2007, S. Chand & Co. Ltd.
3. Vasanth Desai, “Dynamics of Entrepreneurial Development and Management”, 2007, HPH,Millenium Edition.
4. Dr. Vasant Desai, “Small Scale Industries and Entrepreneurship”, 2006, HPH.
5. P. Narayana Reddy, “Entrepreneurship – Text and Cases”, 2010, 1st Ed. Cengage Lerning.
6. David H. Hott, “Entrepreneurship New Venture Creation”, 2004, PHI.
7. E – Book, MSME at a glance – English version, Ministry of MSME.
8. Jaynal Ud – Din Ahmed and Abdul Rashid, MSME in India, New Century Publications.

MBA 32004: BUSINESS RESEARCH METHODS

Course Objective: The objectives of this course is to provide the students the knowledge of doing research and basicStatistical tools to apply for solving business related problems.

Learning outcomes: On successful completion of the course the student will be able to:

- Identify the overall process of designing a research study from its inception to its report.
- Apply appropriate analytical methods to find solutions to business problems that achieve stated objectives.
- Calculate and interpret the correlation between two variables.
- Calculate the linear regression equation for a set of data and know basic assumptions behind regression analysis.
- Explore small and large sample data to create testable hypothesis and identify appropriate statistical tools.

Unit-I

Introductionto Business Research Method:Concept of Business Research Method, Nature of Business Research Method, Scope of Business Research Method, Need and the role of Business Research, Characteristics of Research, Types of Research, The Research Process, Steps involved in preparing Business Research Planan Overview.

Unit- II

Research Design: Meaning of Research Design, Need for Research Design, Features of a good Design, Types of Research Design: Exploratory, Descriptive and Casual Research Exploratory Research, Experimental Designs, Types of Errors effecting Research Design, Research Design process.

Unit- III

Data Collection: Primary and Secondary Data-Sources-Advantages / Disadvantages, Data Collection Methods - Observations, Survey, Interview, Concept of Questionnaire and Schedule, Principles of Design Questionnaire and Schedule, Limitations of Questionnaire, Qualitative Techniques of Data Collection. Measurement and Scaling Techniques - Nominal Scale, Ordinal Scale, Interval Scale, Rating Scale.

Unit – IV

Sampling Theory: Meaning, Need and Importance of Sampling, Steps in Sampling Process, Types of Sampling Methods, Sampling and Non-Sampling Errors, Sample Design, Determinants of Sample Size,Steps in Designing the Sample.

Unit – V

DataAnalysis: Measures of Central Tendency and Dispersion, Correlation Analysis, Regression Analysis.
Hypothesis Testing:- Introduction, Types of hypothesis, procedure for testing of hypothesis, Types of Errors in testing of hypothesis-Tests of significance for small samples: - application, t-test, Z- Test, F-Test, Chi-square test and ANOVA- one way and two-way classifications.

Reference Books

1. N.D. Yohra,2001, Quantitative Techniques in management, Tata McGraw Hill, 2ndnedition.
2. Barry Render, Ralph M. Stair, Jr. and Michael E. Hanna, 2007, Quantitative analysisfor management, 9th Edition, Pearson publication
3. Gupta S.P. Statistical Methods. Sultan Chand and sons, New Delhi.2005
4. C.R. Kothari, Research Methodology: Methods and Techniques,2/e,VishwaPrakashan 2006
5. William G. Zikmund, Business Research Methods, Thomson, 2006.

IV SEMESTER

MBA 42001-STRATEGIC MANAGEMENT

Course Objective: The objective of this course is to analyze the main structural features of an industry and develop strategies that position the firm most favorably in relation to competition and influence industry structure to enhance industry attractiveness, to recognize the different stages of industry evolution and recommend strategies appropriate to each stage and to appraise the resources and capabilities of the firm in terms of their ability to confer sustainable competitive advantage and formulate strategies that leverage a firm's core competencies.

Learning Outcomes: On completion of the course the student will be able to understand the importance of strategies in the organizations in the midst of the tough and turbulent competitive market environment. He will have deep knowledge on the processes of strategy formulation, strategic analysis, strategy implementation and strategic control.

Unit-I: **Introduction:** Concepts in Strategic Management, Strategic Management as a process –Developing a strategic vision, Mission, Objectives, Policies – Factors that shape a company's strategy – Crafting a strategy – Industry and Competitive Analysis, Porter's Five Forces Model.

Unit-II: **Environmental Scanning and leadership**: Methods. SWOT Analysis – Strategies and competitive advantages in diversified companies and its evaluation. Strategic Analysis and Choice: Tools and techniques- BCG Matrix, Space Matrix, GE Model, Grand Strategy Matrix -Strategic Leadership: Leadership and Style – Key Strategic Leadership Actions - Developing Human Capital and Social Capital – Balanced Scorecard.

Unit-III: **Strategy Formulation** : Strategy Framework For Analyzing Competition, Porter's Value Chain Analysis, Competitive Advantage of a Firm, Exit and Entry Barriers - Formulation of strategy at corporate, business and functional levels. Types of Strategies – Tailoring strategy to fit specific industry – restructuring and diversification strategies – different methods Turnaround strategy and diversification strategies.

Unit-IV: **Strategy Implementation** : Strategy and Structure, Leadership, culture connection - Strategies for competing in Globalizing markets and internet economy – Organizational Values and Their Impact on Strategy – Resource Allocation – Planning systems for implementation.

Unit-V: **Strategy Evaluation and control** – Establishing strategic controls - Measuring performance – appropriate measures- Role of the strategist – using qualitative and quantitative benchmarking to evaluate performance - strategic information systems – problems in measuring performance – Strategic surveillance - strategic audit.

REFERENCES:

1 .Vijaya Kumar P,.HittA : Strategic Management, Cengage learning, New Delhi,2010.
2. John A PearceII, AmitaMital: "Strategic Management", TMH, New Delhi, 2012.
3. Sanjay Mohapatra: "Cases Studies in Strategic Management", Pearson, New Delhi,2012.

4. Adrian Haberberg&Alison: Strategic Management, Oxford University Press, New Delhi, 2010.
5 .P.Subba Rao: "Business Policy and Strategic Management" Text and Cases, Himalaya Publishing House, New Delhi, 2011.
6. Appa Rao, Parvatheshwar Rao, Shiva Rama Krishna: "Strategic Management and Business Policy", Excel Books, New Delhi, 2012.

MBA 42002:: ENTREPRENEURSHIP DEVELOPMENT

Course Objective: The objective of this course is to create conceptual understanding of the topic among the students and comprehend the environment of making of an Entrepreneur and to develop perspective understanding of startups and MSMEs in the Indian context.

Learning Outcomes:
On completion of the course, the student will be able to have conceptual understanding of the concept of entrepreneur and entrepreneurship; growth of women and rural entrepreneurship in Indian context. He would be able to generate ideas and opportunities for business ventures. Student will have through knowledge of MSMEs. He will be able to recognize various institutions like Commercial banks, SSIDC, CII, FICCI and ASSOCHAM.

Unit – I Entrepreneur and Entrepreneurship: Evolution of the Concept of Entrepreneur – Characteristics of an Entrepreneur – Distinction between an Entrepreneur and Intrapreneur and a Manager – Functions of an Entrepreneur – Types of entrepreneurs, Concept of Entrepreneurship – Functions, Problems, Entrepreneurial process – Growth of Entrepreneurship in India – Recent Trends of Women Entrepreneurship – Meaning of and Need for Rural Entrepreneurship – Problems and Development of Rural Entrepreneurship.

Unit II Startup Ideas and Opportunity Assessment: Importance of Ideas – Sources of startup Ideas – Techniques for generating ideas – Steps in potential ideas – Opportunity Recognition- sources and process – Development of Programmes E – Business Ventures – Importance of Financial Management – Project Feasibility Study.

Unit – III MSME Enterprises: Definitions, Characteristics – Relationships of MSME – Relationship with large units – Export Oriented Units - Rationale – Objectives – Scope of Small Enterprises – Opportunities for an Entrepreneurial career – Role of Small Enterprises in Economic Development – Causes and Symptoms of Sickness – Cure for Sickness.

Unit IV Project preparation and Financing Ventures: Meaning of and Preparation of Project – Importance of Report – Content; Guidelines for Report preparation – Network Analysis – PERT and CPM – Sources of Finance – Concept of working Capital and Estimation – Seed Capital – Venture Capital.

Unit V Institutional support to Entrepreneurs: Commercial Banks – Other major financial institutions – Central Level Institutions – KVIC; SIDO; NSIC : National Productivity Council (NPC); EDII – State Level Institutions – DIC – SFC-state Small Industries Development Corporation (SSIDC) – Industry Associations – Confederation of Indian Industry(CII) ; Federation of Indian Chamber of Commerce Industry (FICCI); Associated Chambers of Commerce and Industry of India (ASSOCHAM)

Suggested Books:

1. Vijay Sathe, “Corporate Entrepreneurship” 1st edition, 2009, Cambridge
2. S.S. Khanka, “Entrepreneurial Development”, 2007, S. Chand & Co. Ltd.

3. Vasanth Desai, “Dynamics of Entrepreneurial Development and Management”, 2007, HPH,Millenium Edition.
4. Dr. Vasant Desai, “Small Scale Industries and Entrepreneurship”, 2006, HPH.
5. P. Narayana Reddy, “Entrepreneurship – Text and Cases”, 2010, 1st Ed. Cengage Lerning.
6. David H. Hott, “Entrepreneurship New Venture Creation”, 2004, PHI.
7. E – Book, MSME at a glance – English version, Ministry of MSME.
8. Jaynal Ud – Din Ahmed and Abdul Rashid, MSME in India, New Century Publications.

INTERNAL ELECTIVES

MARKETING Specializations (From 411 to 413)

MBA 42411 : INTERNATIONAL MARKETING

Course Objectives: The objective of this course is to introduce the student to Marketing Strategy Planning for International Markets. Specifically, when the student has completed this course, he/she should, Understand the various ways that businesses can get into international marketing , Understand about multinational corporations.

Learning outcomes:

Understand the kinds of opportunities in international markets, and the international environment, Understand the market dimensions that may be useful in segmenting international markets, entry strategies, building brand, communication decisions and export marketing.

UNIT – I

International Marketing – Definition and Scope – Significance of International Marketing, Differences between International and Domestic Marketing, International Marketing Environment.

UNIT – II

International Market Entry Strategy : Entering International Markets – Product Strategy for International Markets

UNIT-III

Building Brands for International Markets – Global Advertising.Pricing for International Markets : Environmental Influences on Pricing Decisions

UNIT – IV

, Distribution Channels & Structures – Communication Decisions for International Markets – international marketing of Services.

UNIT – V

Export Marketing : International Trade, Finance and Risk Management, export Costing and Pricing, Export Procedures and Export Documentation, Export Assistance and Incentives in India.

Reference Books

1.Wawen J. Keegan, Global marketing Management, Pearson Education.
2.Philip R. catera, John L. Grahan, International Marketing, TMH.

3.Rakesh Mohan Joshi, international Marketing, Oxford.
4. R.L. Varshney and B. Bhattacharya, International Marketing Management : An Indian perspective, Sultan Chand Publications.

MBA 42412: Advertising and Sales Promotion

Course Objective: The objective of the course is to provide students with detailed knowledge on marketing mix.

Outcomes: Understand the concept and process of advertising, impact of varied advertising tools, think about effective media, Analyzeand evaluate sales promotion strategies, Effectiveness of Direct Marketing to capture the information of target customers

Unit-I

Advertising: Advertisingimportance, weakness as a promotion tool, types of advertising; Communication goals: AIDA Model, DAGMAR; advertising agency:Functions,Selecting an Advertising Agency;advertising budget: objectives, methods

Unit-II

Advertising agencies: Word of mouth advertising, advertising planning, creativity of advertisement copy, employing the internet for advertising, advertising research, agency-client interface, functions and types of agencies

Unit-III

Media Management and planning: Types of media, media scheduling decisions, media mix decisions, media evaluation and selection, media effectiveness, social and ethical aspects of media

Unit-IV

Sales promotion and sales force management: Sales promotion: objectives, types of sales promotion tools, personal selling: sales personality, retail salesman's duties, responsibilities and problems, types of salesmen, AIDAS, training sales personnel, motivating the sales force, compensating sales personnel

Unit-V

Direct marketing and Public Relations:advantages, techniques, public relations objectives, tools of public relations, event marketing : Importance, promotion of events.

Reference Books

1. Foundations of Advertising theory and practice S.A Chunawalla, K.C Sethia, Himalaya Publishing House
2. Sales & Advertisement Management, S.Rajkumar, V.Raja Gopalan, S.Chand Publisher
3. Advertising Management, Jeth Waney, Jain Oxford Publisher
4. Integrated Advertising, Promotion and Marketing communications, Krusti shah, Lon D Souza, TMH Publisher
5. Salesmanship and Publicity, Rustom S Davar, Sohrab R Davar, Nusli R Davar
6. Marketing Management, R.S.N Pillai BagavathiS.Chand Publisher

MBA 42413: RETAILING MARKETING

Course Objectives: Understand the key elements in planning, managing, and executing the retail marketing mix as they relate to the product, price, distribution, and promotion. Identify the approaches to and guidelines used to analyze and solve retailers' problems and make decisions in retail organizations.

Outcome: After completion of the syllabus for retail marketing the students will be able to have a complete idea on retailing, retail establishments, maintenance of retail establishments, retail store structure, retailing financial and HR strategies etc.

UNIT-I

Introduction to Retailing: Retailing – Meaning functions – Types of retailers – Services of retailers – significance of retailing – Multichannel retailing;

UNIT-II

Customer buying behavior – Buying process – Types of buying decisions – Factors influencing the buying process; Retailing in India - emerging Trends in retailing.

UNIT-III

Retail store locations: Evaluation of specific areas and sites for location – Site Characteristics - Trade area Characteristics – Estimating Potential sales for a store site; Store design and layout – Objectives – Space management – Visual merchandising – Atmospherics – Website design - Elements of store design – Exterior and interior.

UNIT-IV

Retail Marketing strategy: Definition Building a sustainable competitive advantage – Growth strategies – Strategic retail planning process; Financial strategy: Objectives – Strategic Profit Model – Setting and measuring performance objectives; Human Resource management in retailing- significance and strategies.

Unit-V

Retail Pricing – setting retail prices – Price adjustments – Pricing strategies; Retail communication Mix; Customer relationship Management: The CRM Process – colleting customer data – Addressing customer data and identifying target customers – developing CRM Programmes; International retailing – Opportunities and challenges.

Reference Books

5. David Gilbert, Retail Marketing Management, Pearson Education
6. A J Lamba, The Art of Retailing, TMH
7. Hasty and Reardon: Retail Management, McGraw-Hill
8. Diamond ,jay and Gerland Pimtel: Retailing, PHI

Finance Specializations (From421 to 423)

MBA 42421 – SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT

Course Objective: Investment analysis and portfolio management course objective is to help entrepreneurs and practitioners to understand the investments field as it is currently understood and practiced for sound investment decisions making.

Course Outcomes: Upon Successful completion of the course, students will be able to

- Gain knowledge of Investment,
- Evaluate Risk and return of Financial Securities
- Apply fundamental analysis and technical analysis for financial securities for decision making
- Construct the portfolios and compare the portfolio return and risk with individual securities return and risk.
- Become aware of the modern portfolio approach to portfolio construction
- Evaluate the portfolio performance.

Unit-I:

Investment Environment: Concepts of Investment, speculation and Gambling - Types of investors - Avenues of investment – Objectives of Investment – Investment Process - Financial Assets – Classification – Shares – Debentures –Innovative Financial Assets. **(Theory only)**

Unit-II:

Risk and Return:. Meaning and Types of Security Risks: Systematic Vs Non-systematic Risk. Concept of Return - Measurement of Security Returns – Valuation of fixed income Securities. **(Theory and simple problems)**

Unit-III:

Fundamental Analysis: Meaning of Fundamental analysis, Economy, Industry and Company analysis – Technical analysis. Technical analysis Vs Fundamental analysis. **(Theory only)**

Unit-IV:

Modern Portfolio Theory: Markowitz Theory – William Sharpe's Single Index Model – Capital Asset Pricing Model (CAPM) – Arbitrage Pricing Theory (APT). **(Theory and simple problems)**

Unit-V:

Portfolio Evaluation: Methods of Portfolio Evaluation – Sharpe's, Treynor's and Jensen's measures of portfolio performance evaluation. **(Theory and simple problems)**

Reference Books:

5. Bhalla, V.K., INVESTMENT MANAGEMENT, Sultanchand and Company, New Delhi.
6. Preeti Sing., INVESTMENT MANAGEMENT, Himalaya Publishing House, Mumbai.
7. Ranganathan, INVESTMENT ANALYSIS AND PORTFOLIO MANAGEMENT, (Pearson).
8. Dhanesh Kumar Khatri, INVESTMENT MANAGEMENT AND SECURITY ANALYSIS, (Macmillan)
5. Chandra P, *Managing Investments*, TMH.
6. Sharpe, Alexander, *Investments*, PHI.
7. Alexander, *Fundamentals of Investments*, Pearson education.

MBA 42422 :FINANCIAL RISK MANAGEMENT

Course Objective : To understand the operational practices and credit environment and to expose the students to pricing of loans and mechanism of credit risk in Banks and Insurance organisations.

Learning Outcomes: On successful completion of the course the student will be able to:

- Identify the risk and understand risk concepts, process and methods of handling risk.
- Analyse the methods and techniques of costing,
- Comprehend the applications of Operating costing and
- Familiarise with the cost management techniques and reports

UNIT - I

Meaning and Definition of Risk – Concepts of Risks : Definition of Perils and Hazards – Meaning of Uncertainty – Difference between Risk and Uncertainty – Risk Attitude : Causes or sources of Risks – Classification of Risks – Methods of Handling the Risk – Measuring the cost of Pure Risk – Risk Management : Definition – Features – Objectives – Significance – Principles – **Process :** Planning of Risk – Risk Identification – Risk Ananlysis – Evaluation Process - Assessment – Advantages – Limitations (**Theory and Problems**).

UNIT - II

Business Risks : Definition – Causes – Methods of Handling Business Risks – Risk Management by Individuals – Risk Management by Companies; **Entrepreneurial Risk Management** – Concept – Process - Methods of Handling Risk – Environmental Risk Management – Causes- Process (**Theory only).**

UNIT - III

Meaning and Definition of Insurance – History of Insurance Business in India – Framework of Insurance Business - Features of Insurance Contract – Functions – Importance – Essential Elements of Insurance Business - – Benefits of Insurance – **Kinds of Insurance:** Life Insurance : Definition – Classification of Life Insurance Policies – Organisation structure of LIC – Role of LIC – Calculation of Premium in Life Insurance Policies; History and Growth of GIC : Objectives – Kinds of Policies – Functions of GIC – Concept of Reinsurance - Impact of Privatisation of Insurance - IRDA : Role- Powers – Functions and Regulations (**Theory and Problems**).

Unit – IV

Meaning and Definition of Commercial Banks : History and Growth - Features – Functions – Regulations – Classification of Banks - Benefits – Limitations – Impact of Privatisation of Banks. (**Theory only**).

Unit – V

Risk Management in Insurance and Banks – Operational risks : Principles – Causes – Credit risk: : Objectives – Causes – Dimensions - BASEL I Committee : Objectives - Benefits – BASEL II and Three-Pillar Approach : Minimum capital requirement – Supervisory Review Process – Market Discipline – Key Factors for implementation of BASEL II. (**Theory only**).

REFERENCE BOOKS

6. Harrington : Risk Management and Insurance, TaTa McGraw Hill publishing House, New Delhi.
7. George : Principles of Risk Management and Insurance, Pearson Education
8. James Triesehmann, Risk Management and Insurance, Thomson Publications.
9. P.K.Gupta, Insurance and Risk Management, Himalaya Publishing House.
10. Periaswamy, P and Veeraselvam, M., Risk Management and Insurance, Himalaya Publishing House.

MBA 42423: FINANCIAL SERVICES

Course Objective: To provide conceptual understanding of financial services and in-depth knowledge of banking, mutual funds and lease financing services.

Learning Outcomes: On successful completion of the course the student will be able to:

- Understand the meaning, types and growth of Financial Services,
- Analyse the functions, issues and SEBI guidelines for Merchant banking and Mutual Funds,
- Familiarise with the lease finance, hire purchase and venture capital concepts.

Unit – I

Financial Services : Concept – Definitions – Evolution of Financial Services Sector in India – Features – Functions – Constituents of Financial Services – Significance – Types of Financial Services Sector – Regulating Authorities of Financial Services Sector- Problems of Financial Services Industry – Growth of Financial Services Industry – Recent trends in Financial Service Sector.(Theory Only)

Unit – II

Merchant Banking Services : Meaning – Origin – Scope – Functions – Registration of Merchant Banker – Issue Management – SEBI Guidelines for Merchant Banking – Problems and Prospects. (Theory Only)

Unit-III

Mutual Funds: Meaning – Evolution – Growth –Types – Advantages – Mutual Fund Organisation – Regulatory Aspects - Limitations.(Theory Only).

Unit - IV

Lease Financing: Meaning – Evolution – Classification of Lease – Advantages – Disadvantages. **Hire Purchase:** Meaning – Features – Evolution – Lease Finance Vs Hire Purchase – Sources of Law on Hire Purchase – Problems. **Factoring:** Meaning – Types – Significance – Advantages – Disadvantages (Theory Only).

Unit – V

Venture Capital : Evolution – Mechanism –Types - Problems – Benefits - Housing Finance :Housing Policy – Housing Finance Organizations – Types of Housing Loans. **Credit Rating:** Evolution – Scope of Rating – Process of Rating – Framework- Credit Rating Agencies – Regulation of CRAS. (Theory Only).

Reference Books

6. Gordon and Natrajan.,Financial Markets and Services, Himalaya Publishing House, Mumbai.
7. Madura.,Financial Institutions and Markets, Thomson.
8. M.Y. Khan, Financial Services, Tata Mc Graw Hill, New Delhi.
9. Varma, J.C., Merchant Banking, Tata Mc Graw Hill, New Delhi.
10. Vastsara& Nigam, Management of Indian Financial Institutions, Himalaya Publishing House, Mumbai.

Human Resource Management Specializations(431 to 433)

MBA 42431: INTERNATIONAL HUMAN RESOURCE MANAGEMENT

Course Objective: The course is designed to enhance the potentials of the student to manage Human Resource in Multi National Organizations to achieve Business Standards.

Learning Outcomes: On successful completion of the course, the students would be able to demonstrate the issues related to host, home and third country nationals, assess the international culture and diversities, understand the Human Resource Management activities with respect to Multinational corporations and capture the issues in international industrial relations.

Unit - I

Introduction to International Human Resource Management: Concept, Scope and Significance - Expatriate- Approaches to International Human Resource Management, Differences between Domestic and International HR Activities; Role of International HR Department - Issues and Challenges of IHRM, Organizational structure of multinational corporations,

Unit- II

Socio – Culture Contexts: Cultural Factors - Cultural Sensitivity - Culture affects Management approaches - Cross-cultural Communication - Cross Culture Differences in the Work Place – Hofstede Cross-Culture theory.

Unit – III

Recruitment and Selection: Concept – sources of Human Resources: Micro level, Macro level, Modern Sources, Techniques of Recruitment – Centralized Vs Decentralized recruitment – Selection: The Expatriate System, Reasons for Expatriate failure in foreign assignment - Selection Techniques for International Assignment: Adaptability to cultural change, Motivation for a foreign assignment and Leadership ability.

Unit – IV

Training and Development: Need for Global training - Areas of Global Training & Development, Compensation : Objectives of International Compensation Management - Complexities in International Compensation Management- - Factors Affecting International Compensation Management - Approaches to International Compensation Management, Performance Management: System of performance appraisal – Problems of Performance Appraisal – Measures for effective Performance Appraisal.

Unit -V

Introduction to International Industrial Relations: Key Issues in International Industrial Relations - Trade Unions and International Industrial Relations - Conflict Resolution in Multinational Corporations; Forms of Industrial Democracy to Multinational Corporations – Regional Integration – NAFTA, EU.

Reference Books

1. Dowling Welch, Schuler, International Human Resource Management Thomson, New Delhi.
2. Anne WilHarzing et al., International Human Resource Management., sage, New Delhi
3. P.SubbaRao, International Human Resource Management, HPH, New Delhi
4. Briscoe, Dennis R., International HRM , Prentice Hall NJ.
5. Torrington, D., International HRM : Think Globally and Act Locally, Hemal Hempstead, Prentice Hall.

MBA 42432: STRATEGIC HUMAN RESOURCE MANAGEMENT

Course Objective: The Objective of this course is to appreciate how human resource is emerging as a key resource for competitive advantage and understanding the role of HRM in organizational performance.

Course Outcome:

On completion of this course the students will be able to develop the understand of the concept of Strategic Human Resource Management and to understand it's relevance in organisation and to analyse the strategic issues and strategies required to select and to develop manpower resources.

UNIT I : Strategic Human Resource Management: Strategy meaning**,** Types of strategies, Human Resource Strategy, Human resource as assets, Evolution of SHRM, Distinctive Human Resource Practices, SHRM approaches, alternative HR strategies..

UNIT II : Human Resource Environment: Technology and Organization Structure; Worker Values and Attitudinal Trends; Management Trends, Demographic Trends: Trend's in the utilization of human resources and international developments.

UNIT III : Strategic International Human Resource contributions: Strategic Human Resource Activity Typology; Classifying Human Resource Types : Integration of strategy and human resource planning: The Human Resource manager and Strategic Planning. Strategic, Human Resource Planning**.**

UNIT IV: Strategic Human Resource Processes: Workforce Utilization and Employment Practices; Efficient Utilization of Human Resources; Dealing with employee shortages: Selection of employees; Dealing with employee surpluses and special implementation challenges. Reward and development systems: Strategically Oriented Performance Management Systems: Strategically oriented compensation systems and employee development.

UNIT V: Impact of Human Resource Practices: Individual high performance practices; Systems of high – performance human resource practices: individual Best practices vs. Systems of Practices and Universal Practices vs. Contingency Perspectives. Human Resource Evaluation: Over view of the Evaluation: Approaches to Evaluation: Evaluation Strategic Contributions of Traditional Areas: and Evaluation Strategic Contributions in Emerging Areas.

Suggested Books :

6. Greer, Charles R. (2003) Strategic Human Resource Management – A General Managerial Approach New Delhi: Pearson Education (Singapore) Ple. Ltd.
7. Mabey, Chrisopher and Salaman, Graeme, Strategic Human Resource management, Beacon, New Delhi.
8. Salaman, Graeme, Human Resource Strategies, Sage Publications, New Delhi.
9. Porter, Michael S., Competitive Advantage: Creating and Sustainig Superior Performance, Free Press, New York.
10. TanujaAgarwala, Strategic Human Resource Management, Oxford Univesrsity Press, New Delhi.

MBA 42433 : LABOUR LEGISLATIONS

Course Objective: To have a broad understanding of the legal principles governing the employment relationship at individual and collective level. To familiarize the students to the practical problems inherent in the implementation of labour statutes.

Learning outcomes:
After going through various labour laws, students will be conversant regarding conflict management in legal perspective and judicial system pertaining to labour management relations.

Unit – I: Industrial Jurisprudence: Meaning and Definitions, Sources of Industrial Jurisprudence, Industrial Jurisprudence Principles Social Justice, Natural Justice, Equity, National Economy, Dynamism, Constitutional Norms, Welfare, Res Judicata, Laches, Vicarious Liability.

Unit – II: Labour Legislations:Growth, Specific Objectives of labour legislations in India and Classification of labour legislations, International Labour Organisation (ILO) Writs and appeals under the Indian Constitution.

Unit – III: The Factories Act, 1948. The Contract Labour (Regulation and Abolition) Act 1970. The mines Act 1952

Unit – IV: The Plantations Labour Act, 1951, The Dock Workers (Regulation of Employment) Act 1948, The A.P Shops and Establishments Act 1988.

Unit – V: The Child Labour (Prohibition and Regulation) Act 1986. The Apprentices Act 1961.

Suggested Books

8. Malik, P.L Industrial Law, Eastern Book Company, Lucknow
9. Sharma A.M. Industrial Jurisprudence, Himalaya Publishing House, New Delhi
10. Mishra P.N., Labour and Industrial Laws, Central Law Publishing, Allahabad
11. Vaidyanathan, N, IOL Conventions and India, Minverva Associates, Calcutta
12. Goswami, V.G. Labour and Industrial Relations Law, Central Law Agency, Allahabad
13. Agarwal, S.L, Labour Relations Law in India, Mc Milan Company of India Ltd., New Delhi
14. Sinha, P.R.N, Industrial Relations and Labour Legislations, Oxford and I.B.H Publishing Co., New Delhi

MBA(HRM) SYLLABUS

MBA(HRM)

I Semester

MBA(HRM) 12001: PRINCIPLES OF MANAGEMENT

Course Objective: On successful completion of the course the students should have :

c. To familiarize the students with management theory, functions, principles and practices of management.
d. Learnt the scientific decision making process and problems and solving techniques and also learn the modern trends in management.

Learning Outcomes;

- Management principles deal with human traits and, hence, are employed creatively.
- Planning functions of management provide a very useful way of classifying the activities of managers engaged in as they attempt to achieve organizational goals
- Understand the role of top, middle and lower levels of management
- Describe the qualities of a good leader
- A good management control system stimulates action by spotting the significant variations from the original plan and highlighting them *for* the people who can set things right

Unit-I : INTRODUCTION Management-Concept, Significance, Principles and Functions-Management and Administration, Managerial Roles –Managerial Skills- social responsibility of business, Management by Objectives(MBO) Management Thought.

Unit-II: PLANNING AND ORGANIZATION

Planning-Nature and Process of Planning- Types of Planning - Characteristics of sound plan-Decision Making-Nature of Decision Making-Process and Techniques-Organization-Levels -Organization Structures-Staffing Policies-Line and Staff Relations–Delegation, Centralisation and Decentralisation.

Unit-III : STAFFING

Nature and Importance of Staffing – Man power Planning, requirement and Selection – Personal Characteristics needed by Managers

Unit –IV: DIRECTING

Directing Techniques of Direction –Leadership-Leadership styles, Functions of a Leader, Qualities of Leader - Communication-Types of Communication-Motivation-Need Theories.

Unit-V: CONTROL

Controlling-System of controlling- Methods, Tools and Techniques of control-Making Controlling Effective-Organising process-Departmentation Types-Making Organising Effective.

Reference Books

1. Agarwal R D Organisation and management – Tata McGrawhill.

2. Koontz and Weichrich Essentials of management – Tata McGrawhill

3. Aswathappa K. Human Resource and personnel Management, Text and cases-Tata McGrahills.

4. Sherlekar- S.A Management – Himalaya publishing house.

5. Robbins Stephen.p and Mary coulter – management – PH1 publisher.

MBA(HRM)12002 - ORGANISATIONAL BEHAVIOUR

Course Objective: This course is designed to enable the students to understand the concepts, theories, processes and dynamics of human behavior in Organizations.

Learning outcomes: On completion of the course, the student will be able to understand the concepts and theories of organisation behaviour. He will be able to understand the importance and role of group dynamics, motivational theorems, organisational culture, organizational change and organisational development.

UNIT – I Organisational Behaviour: Meaning – Importance – Nature and Scope – Approaches – Key elements – Challenges and opportunities for O.B. – Contributing disciplines to O.B. – O.B. Models.

UNIT – II Individual: Individual Behaviour - Perception – Process, factors influencing perception – barriers in perceptual Accuracy – enhancing perceptual skills – Attribution - Learning – characteristics, theories and principles of Learning. Motivation – Theories of Motivation – Maslow, Herzberg, David Mcclelland and Porter and Lawler - Personality – Stages of Development, determinants of Personality.

UNIT – III Group Dynamics: Meaning, Determinants of group behaviour and types of groups – Group Dynamics – frame work of group behaviour. Developing inter – personal relations, Transactional Analysis – Johari Window.

UNIT – IV Organisational Culture: Organization Design, culture and climate. Creating an ethical organizational culture – Conflicts – Meaning, conflicts at individual, group and organisational level – sources of conflicts – functional and dysfunctional aspects – Strategies for conflict resolution.

UNIT – V Organisational Change: Organisational Change – change management and its dimensions, process. Pressures for change – resistance to change – overcoming resistance to change. Approaches to manage Organizational Change – Lewin's and Kotter's Plan for Implementing Change. – Organisational Development.

Suggested Books:

1. Fred Luthans, ***Organisational Behaviour,*** Tata McGraw Hill.
2. Stephen P.Robbins, ***Organisational Behaviour,*** Pearson Education, New Delhi, 2006.
3. Aswathappa.K., ***Organisational Behaviour*** , Himalaya Publishing House, New Delhi.
4. Donald R.Brown& Don Harwey, ***An Experimental Approach to Organisational Development,*** Pearson Education.
5. Sarma V. s. Veluri, Organisational Behavour, Jaico Publishing House.
6. Paton McCalman, ***"Change Management"***, Sage Publications.
7. VenkataRatnam, ***"Negotiaed Change",*** Sage Publications.
8. Jai, B.P.Sinha, ***"Culture and Organisational Behaviour"***, Sage Publications.
9. Arun Kumar N Meenakshi., Organisational Behavour, Vikas Publishing House.
10. Keith Davis & John Newstrom, *Human Behaviour at work*, Mc-Graw Hill.

MBA(HRM)12003 – BUSINESS COMMUNICATION

Course objective: To train students to enhance their skills in written as well as oral Communication. This course will help students in understanding the principles & techniques of business communication.

Outcome: after completion of the course, students will be able to knowledge on written ond oral communication, role of communication in business, models of communication, presentations etc.,

Unit - 1: Fundamentals of Communication : communication definition - Objective of Communication – The process of Human communication, Types of Communication – formal and in formal communication –verbal and non verbal communication- types of verbal communication; Communication barriers –Overcoming Barriers; Understanding Cultural Effects of Communication -Listening Skills- Role of communication in Business

Unit- 2: Managing Organizational Communication – Formal and Informal Communication – Intra and Personal Communication – Models for Inter personal Communication – Exchange theory – Johari window and Transactional Analysis.

Unit - 3: Business writing skills – Significance of Business Correspondence, Essentials of Effective Business Correspondence – Business Letter and Forms- E-mail – Memo – Reports and Proposals; Oral Presentations – Meetings- Minutes of Meeting, Media management; Use of Technology in Business Communication, Seminars, workshop, conferences, Business etiquettes.

Unit- 4: Managing motivation to influence interpersonal communication – Inter-personal perception – role of emotion in inter personal communication – gateways to effective interpersonal communication; Emotional intelligence- charecteristics

Unit-5: Time Management – Goal Setting – Time log – Self Awareness – Self Motivation Effective presentation and Interview Skills: Art of giving interviews in relation to placement appraisal interviews in selection and placement – Appraisal interviews – Exit Interviews – Web/ video conferencing and Tele-Conferencing.

Suggested Books:

28. K. Bhardwaj, Professional Communication, IK Int. Pub. House, New Delhi.
29. Krizan, Merrier, Logan and Williams, Effective Business Communication, Cengage, New Delhi.
30. HC Gupta, SG Telang, Business Communication, Wisdom, Delhi
31. Penrose, Business Communication for Managers, Cengage , New Delhi
32. McGrath, Basic Managerial Skills for All 5thEdtion, Prentice Hall of India.
33. Urmila Rai & S.M. Rai, Business Communication, Himalaya Publishers
34. Meenalshi Raman – Business Communication Oxford University Press
35. Lesikar I Flatley, Basic Business Communication, Tata McGrw Hill.
36. Bovee and Thill: Business Communication Today, MacGraw-Hill, Second Edition
10. Guffey M. E.: Business Communication Process & Product, Thompson, South – Western

MBA(HRM)12004: MANAGERIAL ECONOMICS

Course objectives:

The course is designed to impart knowledge of the concepts and principles of Economics, which govern the functioning of a firm/organization under different market conditions. The course aims at enhancing the understanding capabilities of students about macro-economic principles and decision making by business and government. This course will enlighten the students to apply various techniques of economics in embracing business challenges

Learning outcomes: Relation of Managerial Economics with other disciplines and its relationship with management; understand the demand for and supply of the firm's products; Managerial decision under different market conditions; Importance of Production function; Causes and consequences of Inflation

Course Layout:

Unit- I

Introduction: Nature, scope, uses, relation with traditional economics, operations research, Mathematics, Statistics, Accounting; responsibilities of a managerial economist, objectives of a firm, Basic tools in Managerial Economics: Opportunity cost principle, Incremental principle, principle of time perspective, discounting principle, Equi marginal principle.

Unit-II

Demand and Supply: Law of demand: Demand determinants, assumptions, exceptions, demand schedule, demand curve, demand function, types of demand, demand foresting methods; elasticity of demand: price, income, cross, promotional; Law of supply: determinants of supply, kinds of supply elasticity.

Unit-III

Market Structure and Pricing Practices: Market structure: perfect, monopoly, Duopoly, monopolistic, oligopoly, monopsony, oligopsony; profit: role of profit, theories of profit; break even analysis (theory & Problems): assumptions, managerial uses, limitations, margin of safety, profit-volume analysis; pricing methods, dumping

Unit-IV

Production and Cost analysis: Production function: with one, two and all variable inputs, Cobb-Douglas, CES production functions, managerial uses of production function; Economies of scale: internal, external; types of cost.

Unit-V

Capital Management & Business Decisions: Techniques of traditional and modern investment appraisal (theory &Problems); Business Cycles: characteristics, phases, Inflation types, causes, effects, National income: measures, concepts; The multiplier, Acceleration principle, Fiscal policy: objectives, tools, monetary policy: objectives, instruments.

Reference Books

1. Managerial Economics Theory and Applications. Dr D.M. Mithani, Himalaya publishers

2. Managerial Economics R.L Varshny, K.L Maheshwari, sultan Chand publishers

3. Managerial Economics analysis, problems P.L Mehatha, sultan Chand publishers
4. Managerial Economics D.N Dwivedi, Vikas Publishers

MBA(HRM)12005: RESEARCH METHODOLOGY AND BUSINESS ANALYTICS

Course Objective: On successful completion of the course the students should familiarize with doing research work and analysing big data which helps management in taking decisions.

Learning outcomes: On successful completion of the course the student will be able to:

- Identify the overall process of designing a research study from its inception to its report.
- Apply appropriate analytical methods to find solutions to business problems that achieve stated objectives.
- Calculate and interpret the correlation between two variables.
- Calculate the linear regression equation for a set of data and know basic assumptions behind regression analysis.
- Explore small and large sample data to create testable hypothesis and identify appropriate statistical tools.

Unit-I

Introduction: Meaning and Definition of Research, Nature and importance of research the role of business research, aims of social research, research process, Quantitative and Qualitative Research, Types of Research, Research design, Importance of Research Planning, Meaning of research design, Functions and goals of research design, Pilot study and case study, Concepts of a Research plan, Induction and Deduction method, Snapshot studies, cross sectional and longitudinal studies. Sources of data, Sampling techniques, Report writing.

Unit- II

Measures of Central Tendency and Dispersion, Skewness and Kurtosis-Correlation Analysis: Types of correlation, scatter diagram, limits for coefficient of correlation, Karl Pearson's coefficient of correlation, Spearman's rank correlation, Properties of Correlation, Regression analysis: concept, least square fit of a linear regression, two lines of regression, Multiple Regression, Properties of regression coefficients.

Unit- III

Statistical Inference: Hypothesis Testing:- Introduction, Types of hypothesis, procedure for testing of hypothesis, Types of Errors in testing of hypothesis- One tailed and Two tailed tests of hypothesis. Tests of significance for small samples: - application, t-test, F-Test, Chi-square test, ANOVA one way and two-way classifications.

Unit – IV

Business Analytics : Introduction, Evolution of Business Analytics – Differences between Business Intelligence and Analytics – Business Analytics Life Cycle, Process – Business Analytics as Solution for Business Challenges; Introduction to Excel, SPSS, R and Python.

Unit – V

Master Data Management: Data Warehousing – Data Mining – Meta Data – Data Marts - Data Integration – Concept of OLTP and OLAP.

Reference Books

1. N.D. Yohra,2001, Quantitative Techniques in management, Tata McGraw Hill, 2ndnedition.
2. Barry Render, Ralph M. Stair, Jr. and Michael E. Hanna, 2007, Quantitative analysis for management, 9th Edition, Pearson publication
3. Gupta S.P. Statistical Methods. Sultan chand and sons, New Delhi.2005
4.C.R.Kothari, Research Methodology: Methods and Techniques,2/e,Vishwa Prakashan, 2006.
5. William G. Zikmund, Business Research Methods, Thomson, 2006.
6. Carver & Nash, Data Analysis with SPSS, Cengage, New Delhi

7. James R. Evans, Business Analytics Methods, Models and Decision, Pearson, 2015
8. Shashi K. Gupta & Praneet Rangi Kalyani Pub. Business Analytics
9. Sahil Raj, Business Analytics, Cengage Learning India Pvt.Ltd., 2015.

MBA(HRM) 12006 – ACCOUNTING FOR MANAGERS

Course Objective: The Objective of the course is to provide the basic knowledge of book keeping and accounting and enable the students to understand the Financial Statements and make analysis financial accounts of a company.

Course Outcomes: Upon Successful completion of the course, students will be able to

- Understand the fundamentals of financial accounting, the principles and concepts underlying them.
- Construct the financial statements viz., the Income Statement and Balance Sheet
- Gain practical knowledge on valuation tangible and intangible assets
- Exploit the issue and forfeiture of shares.

UNIT-I:

Introduction: Book-Keeping – Branches of Accounting – Systems of Accounting –Objectives of Accounting – Importance of Accounting - Users of Accounting Information - Principles of Accounting – Accounting concepts – Accounting conventions – Role of computers in Accounting.

UNIT-II:

Accounting Process: Double Entry System of Accounting – Classification of Accounts – Accounting cycle – Journal – Ledger – Trial balance - Manufacturing account - Trading and profit and loss account - Balance sheet with adjustments.

UNIT-III:

Valuation of Tangible Assets Concept of Depreciation – Purpose – Causes – Methods of depreciation – Fixed installment method – Diminishing balance method – Sum of year's digits method - Annuity method.

Valuation of Inventory – Concept - Objectives – Methods of taking inventories - Inventory valuation methods – Simple average method – Weighted average method - FIFO method – LIFO method.

UNIT-IV:

Valuation of Intangible Assets: Concept of Goodwill, Patents, Copyrights, Trademarks, R&D costs – Methods of valuation of goodwill – Average profit method – Super profit method – Capitalization method – Annuity method.

UNIT-V:

Issue of Shares: Meaning – Classification of shares – Equity shares – Preference shares –Issue of Shares for cash – For consideration other than cash - Entries for Issue of shares - Shares issued at par, premium and discount – Forfeiture of Shares.

Reference Books

- S.N. Maheswari, Accounting for Managment, Sultan Chand Publishing House Pvt. Ltd.

- Jain S.P, Narang K.L and Simmi Agarwal, "Accounting For Managers", Kalyani Publishers, New Delhi.
- Wild. J.J., Subramanyam, K.R. Halsey, R.F., Financial Statement analysis, Tata McGraw Hill.
- Narayana Swamy, "Financial Accounting: A Managerial Perspective", Pearson Education.
- Prasad, G. " Financial Accounting and Analysis" Jai Bharat Publishers, Guntur.
- Ramachandran and Kakani, " Finanical Accounting for Management", TMH, New Delhi.
- Prasad, G. "Accounting for Managers", Jai Bharat Publishers, Guntur.

MBA(HRM)12007: INFORMATION TECHNOLOGY FOR MANAGEMENT

Course Objective : The primary objective of this course is to familiarise the student with basic concepts of information technology and their applications to business processes. To elevate students' awareness of information technology and develop an in depth and systematic understanding of key aspects of IT Management.

Learning Outcomes: On successful completion of the course the student will be able to:

- Identify the overall structure and process of computer system and its type and application in management,
- Work withMS-Office tools like MS-Word, Ms-Excel and MS-Powerpoint for personal use and office use,
- Understand the Management Information System concepts and SDLC process and DSS and GDSS concepts
- Familiarise with the Information Technology tools and trends in present day scenario.

UNIT - I

Introduction : Basics of Computers - Major components of a computer system –- Types of Computers – Organisation System of Computer - Operating Systems: Definition, Functions, Types and Classification – Introduction to MS-Office – Features and Applications of MS–Word - – Types of Menus – Home – Insert – Design – Layout – References – Mailing – Review and View menus. (Theory and Practicals)

UNIT - II

MS-PowerPoint : Introduction - Features – Slide Creation – Slide Layouts – Slide Preparation – Slide Sorting – Slide Formatting – Home – Insert – Design – Animation – Slide Show – Review – View menu Options – Slide Show - Applications of MS-PowerPoint - Writing programs using menus. Introduction to MS-Excel : Introduction – Features – Advantages – Limitations. Menus in MS-Excel : Home – Insert – Page Layout – Formulas – Data – Review – View Menu Options. (Theory and Practicals)

UNIT - III

Introduction: System : Definition - Types of System - Information System : Types – Management Information System (MIS) : Meaning – Importance – Need - Characteristics – Organizational Structure of MIS – Role of the Management Information System – Applications of MIS**.** Tools and Techniques for System Development **- System Development Life Cycle (SDLC) :**Stages in developing SDLC.**Concept ofDecision Support System (DSS) :** Meaning – Architecture – Characteristics – Components – Concept of Group Decision Support System (GDSS) – Components. (Theory only)

UNIT - IV

Functional Information Systems : The Major Business Systems – Basic Elements of a Business organization -Marketing Information System – Concept – Components – Architecture - Financial Information System – Concept – Components – Architecture - Human Resource Information System – Concept – Components – Architecture(Theory only)

UNIT - V

Information Technology Tools and Trends : Concepts of IT : Multimedia - Image processing systems and Document Management Systems – Tools of IT - Trends in IT – Techniques of IT –Applications of IT – e-Business and e-Commerce tools and techniques – ERP - Introduction – Advantages and Limitations – EDI Technology. (Theory only)

REFERENCE BOOKS

31. RohitKhurana, Introduction to Information Technology, Pearson Education.
32. ITL education: Introduction to Computer Sciences, Pearson Publishers
33. Hunt and Shelly: Computers and commonsense, PHI publishers.
34. Dhiraj Sharma, Information Technology for Business, Himalaya Publishing House.
35. Kenneth C. Laudon and Jane P. Laudon: Management Information System, Eighth edition Prentice Hall of India.
36. Jawadekar W.S., Management Information System, TaTa McGraw Hill Publishing Company Limited, New Delhi.
37. James A.O Brien: Management Information Systems, TaTa McGraw Hill Publishing Company Limited, New Delhi.
38. Effy OZ, Management Information System, Vikas Publishing House.
39. Gordon B. Davis and Margrethe H. Oison, Management Information System, TaTa McGraw Hill Publishing Company Limited, New Delhi.
40. C.S.V. Murthy: Management Information System, Himalaya publishing House.

MBA(HRM) 12008 – HUMAN VALUES AND PROFESSIONAL ETHICS

Course Objective : To create awareness, Conviction and commitment to Values and Ethics for improving the quality of life through education and for advancing social and human well being.

Learning Outcomes: After completion of the course the students learns about morals, Values, work ethics and learns to respective ethics and develop civic virtue.

UNIT – I

Definition and Nature of Ethics – Its relation to Business and Environment. Need and Importance of Professional Ethics – Goals – Ethical Values in various Professions – Ethical theories about right action.

UNIT –II

Nature of Values – Good and Bad, Ends and Means, Actual and potential Values, Objective and Subjective Values, Analysis of basic moral concepts – right, ought, duty, obligation, justice, responsibility and freedom, Good behavior and respect for elders – moral development theories.

UNIT – III

Value education – definition and its relevance to present days – Concept of human values – self introspection – self esteem – family values – components – structure – and responsibilities of family – neutralization of anger – adjustability – threats of family life-Time allotment for sharing ideas and concerns.

UNIT –IV

Business ethics –Ethical standards of business – Immoral and illegal practices and their solutions – characteristics of ethical problems in management – causes of unethical behavior – ethical abuses and work ethics.

UNIT – V

Environmental and social ethics: ethical theory, man and nature, ecological crisis issues related pollution, waste, climate change, energy and population, social issues – human rights violation and social disparities.

References:

5. R.S. Naagarazan –A TEXT BOOK ON PROFESSIONAL EHICS AND HUMAN VALUES – New age International (p) Ltd.
6. M.Govindarajan, S. Natarajan, V.S. Senthil Kumar – PROFESSIONAL ETHICS & HUMAN VALUES.
7. R.R.Gran, R.Sangal, G.P. Bagania – FOUNDATION COURSE IN HUMAN VALUES & PROFESSIONAL ETHICS.
8. Jayashree Suresh, B.S. Raghavan – HUMAN VALUES AND PROFESSIONAL EHTICS.

II SEMESTER

MBA(HRM)22001: MARKETING MANAGEMENT

Course Objective: The course is designed to obtain knowledge and understanding of the key concepts of marketing and enables to apply to the practical situations in the workplace.

Learning Outcomes: On successful completion of this course, the students would be familiarized with the fundamentals of marketing, nuances and complexities involved in product and pricing decisions, skills needed to take better distribution decisions and promotion-mix decisions and will be able to understand emerging trends in marketing to take proactive measures in the present cutthroat competition.

Unit-I

Introduction to Marketing: Definition, Nature, Scope and importance of Marketing – Marketing Concepts – Marketing Vs. Selling –Marketing Mix- Marketing Environment: Meaning, Significance of Scanning Marketing Environment, Components of Micro environment, Macro environment.

Unit-II

Analysing Marketing opportunities: Consumer behaviour-Meaning- factors influencing buying behaviour-consumer decision making process, Segmentation: Need- Benefits - Bases of segmentation, Target market, Product differentiation, Product Positioning, Marketing Research: Concept - Objectives - types - Process – Merits and Demerits.

Unit-III

Developing Marketing Strategies: Concept of Product- Product Classifications- Product Mix- New Product development - Product Life Cycle, Designing Marketing Strategies for: Market leaders – Challengers - Followers and Nichers – Ansoff matrix, Branding: Essentials of a good brand - types of brands, Packaging and labelling.

Unit-IV

Planning Marketing programs: Objectives - factors affecting pricing decisions- pricing methods- Pricing Strategies for existing products and new products.Channels of Distribution: Definition, Need and Types of Channels, Channel Management Decision – Retailing – Types of Retailers – Retailer Marketing Decisions – Trends in Retailing, Wholesaling.-The growth and types of wholesaling – Wholesaler Marketing Decisions – Trends in Wholesaling, Other forms of distribution.

Unit-V:

Marketing Communication: Concept – importance – Promotional Mix: Advertising - Sales promotion - Personal Selling - Public Relations – Recent trends in Marketing: Social Marketing – Ambush Marketing – Green Marketing – Emotional Marketing – `Digital Marketing.

Reference Books

1. Marketing Management, R.S.N Pillai, Bagavathi, S.Chand
2. Business Marketing Management: B2B, Hutt & Speh, Cengage Publisher
3. Marketing Management Text & Cases, Indian Context Tapan K Panda, Excel Publisher
4. Principles of Marketing Kotler Armstrong PHI Publisher
5. Marketing Management, Rajan Saxena .TMH Publisher

MBA(HRM)22002: PRINCIPLES OF HUMAN RESOURCE MANAGEMENT

Course Objective: To equip the students with basic concepts, methods, techniques and issues of Human Resource Management and the various functions of HRM including Quality of Work Life in the liberalized environment.

Learning Outcomes:

On completion of this course, the students will be able

1.To develop the understanding of the concept of human resource management and to Understand its relevance in organizations.

2. To develop necessary skill set for application of various HR issues.

3. To analyse the strategic issues and strategies required to select and develop manpower resources.

4. To integrate the knowledge of HR concepts to take correct business decisions.

UNIT - I: Human Resource Management Introduction: Concept and Functions of Human Resource Management; Approaches to Human Resource Management; Evolution of HRM in India; HRM and Environment; Organizing the HR Unit; Line and Staff Relationship; Policies and Procedures; Planning HR activities; Controlling HR Function.

UNIT – II: Procurement: Organizational Design and Job Design; Job Analysis; Job description; Job specification; Human Resource Planning ; Recruitment: Sources of Recruitment; Selection Procedure (including e-recruitment and selection procedure) and Induction.

UNIT – III: Training and Development: Workers training; training process; training methods; Management Development Programs; Performance appraisal Methods and Problems; Talent Management; Career Planning and Development.

Unit IV: Employee Compensation: Factors affecting compensation; Equity and Compensation; Job Evaluation; Variable Compensation; Fringe Benefits; Motivation of employees; Quality of work life; Trade Unions; Collective Bargaining; Conflict Management.

Unit V: Maintenance: Communication and Counseling; Employee Welfare; Employee Health and Safety; .Separation: Turnover, Retirement, Lay Off, Retrenchment; Discharge; Dismissal and V.R.S. ;Maintenance of HR Data Base; HR Research; HR Audit; HR Accounting.; Challenges and Opportunities in the Globalized Era; Outsourcing of HR functions.

Suggested Books

1.Personnel Management, Flippo, Edwin B, McGraw Hill Publishing Company..

2.Personnel Manaement Text and Cases C.B. Mamoria, Himalaya publications

3.Human Resource Management text and cases V.S.P. Rao, Excel Books.

4.Human Resource Management Text and cases K. Aswathappa, Tata McGraw-Hill

5.Human Resource Management Garry Dessler, Pearson Education.

6. Human Resource Management - Dr. C.B. Gupta - Sultan and Sons.

7. Personnel & Human Resource Management - P. Subba Rao - Himalaya Publishing House.
8. Personnel Management & Human Resources - C.S. Venkata Rathnam & B.K. Srivastava. Tata McGraw-Hil

MBA(HRM) 22003– FINANCIAL MANAGEMENT

Course Objective: The Course aims at familiarizing the participants with the skills related to basic principles, tools and techniques of Financial Management.
Course Outcomes: Upon Successful completion of the course, students will be able to

- Practically understand and follow day-to-day developments in financial management
- Develop an attitude of integrative thinking while analyzing and interpreting financial statement and accounting information
- Develop the skill of evaluating the projects using capital budgeting techniques
- Construct the optimum capital structure of the organization
- Critically evaluate the working capital requirement of the business firms
- Able to understand dividend theories and its valuation.

UNIT–I
Foundations of Finance: Introduction to Finance - Nature and scope of Financial Management - Functions – Goals - maximizing vs satisfying (School); Profit Vs Wealth Vs Welfare; Agency relationship and costs - Role of financial manager**. (Theory Only)**
UNIT-II
Financial Statement Analysis: Meaning – Classification – Tools - Trend analysis – Comparative statement analysis – Common-size statement analysis – Ratio analysis - Funds flow statement analysis – Cash flow statement analysis. **(Theory & Problems)**
UNIT-III
Financing Decisions: Sources of Finance – Short term sources – Long term sources. Leverage analysis – Operating leverage – Financial leverage – Combined leverage. Capital structure decisions – Factors determining Capital Structure -Tools for designing optimum capital structure – EBIT-EPS analysis – Financial BEP and Indifference Curve analysis – CAPM - Capital Structure theories – Net Income Approach – Net Operating Income Approach – M-M Hypothesis – Traditional Approach. Cost of Capital – Elements of Cost of Capital – Measurement of Cost of Capital – WACC. **(Theory & Problems)**

UNIT-IV
Investment Decisions: Nature and significance of Investment Decision – Estimation of Cash Flows – Steps in Capital Budgeting Process – Evaluation techniques – Traditional techniques – Payback period – ARR - Discounted Cash Flow techniques – NPV – Profitability Index – IRR – Discounted Payback Period - The NPV Vs IRR Debate. **(Theory & Problems)**
Liquidity Decisions: Concepts and characteristics of Working Capital –Approaches of working capital - Factors determining the working capital - Operating cycle –Methods of estimating working capital requirements. **(Theory & Problems)**

UNIT-V

Dividend Decisions: Meaning – Forms of dividends - Concept of relevance and irrelevance theories – Walter's Model – Gordon's Model – MM Hypothesis – Factors determining Dividend Policy. **(Theory Only)**

Reference Books

1. I.M. Pandey, "Financial Management", Vikas Publishing, 2007.
2. M.Y Khan & P.K. Jain, "Financial Managemengt, Text and Problems", TMH, New Delhi.
3. Prasanna Chandra, "Financial Management: Theory and Practice", TMH, New Delhi.
4. Bruner. R.F., "Case Studies in Finance", Tata McGraw Hill, New Delhi.
5. Managerial Finance, Gitman L.J.,11th Edition, Pearson Education 2006.
6. Principles of Corporate Finance, Richard A Brealey etal., Tata McGraw Hill 2007.
7. Corporate Finance: Theory and Practice, Vishwanath.S.R.2007, 2/e, Sage Publications.
8. Financial Management – Text and cases, Bringham & Ehrhardt, Cengage, 2005.
9. Case Studies in Finance, Bruner.R.F.2007, 5th Edition, Tata McGraw Hill, New Delhi.

MBA(HRM) 22004: PRODUCTION MANAGEMENT

Course Objective: The Objective of the course is to enable students to understand the production Planning and Controlling aspects of a typical production and operations organization.

Learning outcomes: Core features of Production Management function, gaining knowledge to run work systems effectively, analyzing various facility alternatives, Plan and implement suitable quality control measures in quality circles, better understanding of modern production tool

Course Layout:

Unit-I

Production System: Types of Production system: Flowshop, Job shop, Batch; Responsibilities of Production Manager; Differences and similarities between manufacturing and service operations; Product design: Characteristics of good product design; Approaches to product design: Quality function deployment, Concurrent engineering, Ergonomics, Value engineering/Value analysis, Productivity: Importance, Measuring productivity, ways of improving productivity; production planning: tactical, operational, strategic; Maintenance management (including problems):functions, types.

Unit-II

Design of Work System: Work study: benefits, work study procedure; Method study: objectives, method study procedure, process charts; Work Measurement (including problems): benefits, techniques of work measurement.

Unit-III

Flow shop scheduling: Shop floor planning (including problems): Johnson's rule, extension of Johnson's rule, CDS Heuristics; Inventory management: objectives, Inventory control techniques (including problems); Facility location: errors in selection, relative importance of location factors; facility layout: factors influencing facility layout, types of layout.

Unit-IV

Quality Management: relevance of quality control, impact of poor quality, statistical process control: acceptance sampling for variables and for attributes, control charts (including problems) for variables and for attributes; Six Sigma: types of six sigma belts, benefits; quality circles; vendor analysis.

Unit-V

Modern production management Tools: Just in time manufacturing: wastes in production process, benefits; push and pull production system, Kanban system; ISO 9000 series: -benefits, steps in ISO 9000 registration; Business process reengineering: characteristics, steps in implementing BPR, advantages; Lean manufacturing: steps, components,

Reference Books

1.Production Management, Martand T. Telsang S. Chand Publishers
2.Production and Operations Management K. Aswathappa, K.Shridhara Bhat Himalaya Publishing House
3.Production and Operations Management R. Pannerselvam PHI publishers
4.Production and Operations Management S.N Chary McGraw Hill
5.Production and Operations Management -Text and cases Upendra Kachru, Excel Books

MBA(HRM)22005: OPERATIONS RESEARCH

Course Objectives: This module aims to impart knowledge to students the concepts and tools of operations research, understand mathematical models used in operations research and apply these techniques constructively to make effective business decisions.

Learning outcomes: On completion of the course the student will be able to:

- Formulate real-world problems as a linear programming model and describe the theoretical working s of the graphical, simplex and Big-M methods, demonstrate the solution process by hand and solver.
- Formulate transportation and assignment problems and describe theoretical workings of the solution methods for transportation and assignment problems, demonstrate solution process by hand and solver.
- Design and solve PERT/CPM.
- Simulate different real life probabilistic situations using Monte Carlo simulation technique.
- Apply the knowledge of game theory concepts to articulate real-world decision situations for identifying, analyzing, and practicing strategic decisions to counter the consequences.

Unit-I

Definition, Importance of Operations Research for Management, Nature of Operations Research, Scientific method in operation research, Characteristics and phases of Operations Research, Classification of models, Principles of modeling, Problem models of Operations Research, scope and limitations. Linear programming: formulation, terminology, applications of LPP, advantages and limitations of LPP Graphical solutions, Simplex method, Big-M method and two phase method.

Unit-II

Transportation problem:- General TP, Transportation table and loops, formulation, optimal solutionof a TP, finding an IBFS, Degeneracy in TP, Transportation algorithm(Modi method),unbalanced transportation problem. Assignment problem:- Mathematical formulation of the assignment problem, Traveling salesman problem, solutions, differences of transportation and assignment problems , Hungarian method, unbalanced assignment problem .

Unit-III

Network Analysis:- Activity, merge event, burst event, looping, dangling, Redundancy, project Management by PERT/CPM, project crashing, PERT analysis and Computations, differences of PERT/CPM.

Unit-IV

Game theory:- concepts, Characteristics, pay off matrix, maximin-minimax principle, saddle point, Dominance, Zero-sum game, two, three and more persons games, analytical method of solving two person zero sum games, mixed strategies of S_A ,S_B and value of the game, graphical solutions for (m×2) and (2× n) games, linear programming method of simplex method in game theory, Iterative method

Unit – V

Simulation:- Meaning – Definition of Simulation – Types of Simulation – Advantages and Disadvantages of Simulation – Event Type of Simulation – Monte – Carlo Simulation – Generation of Random Numbers – Simulation of Queueing System – Simulation of an Inventory System – Simulation Languages.

Reference Books

1, Shenoy, G.V. Srivastava, V. K. and Sharma S.C., "Operations Research for Management".
2. Kantiswaroop, Man Mohan and Gupta, Operations Research.
3. Goel and Mittal, Operations Research.
4. Sharma S.K. k.,Operations Research.
5. Hamdy, A. Taha:Operations Research: An introduction, prentice Hall of India New Delhi, 2007.
6. R.Panneerselvnam PHI 2nd Ed. Operations Research

MBA(HRM) 22006 – BUSINESS ENVIRONMENT

Course Objective: The present course aims at familiarizing the students with various aspects of economic, social, political and cultural environment of India. This will help them in gaining a deeper understanding of the environmental factors influencing Indian business organizations and also the students understand the legal and regulatory framework for doing business in India.

Learning Outcomes: On completion of the course, the student would

- Be aware of dimensions of the Business Environment.
- Analyse the impact of culture and technology on business.
- Explain the economic trends and effect of Government policies as LPG.
- Be acquainting with the various legal frame works in India pertaining to Business.

UNIT – IBusiness Environment: Meaning – Importance – Nature – Environmental Factors – Changing the dimensions of Business environment – monitoring techniques of environmental scanning

UNIT – IISocio – Cultural and Technological Environment: Elements of Socio – Cultural Environment: Impact on Business – Culture and Sub culture pattern – Social responsibility of business – Technology upgradation – technology transfer – Technological Policy.

UNIT – IIIEconomic and Political Environment: Significance and elements of economic environment – economic system – economic planning in India – Industrial Policy – New foreign trade policy – liberalization – privatization and globalization – Demonetization – Monetary and Fiscal policy – EXIM policy – critical elements of political environment.

UNIT –IVLegal Environment of Business: Political Institutions – Legislature, Executive and Judiciary – Changes of Legal Environment in India – Intellectual Property Rights – Major regulations pertaining to business.

UNIT – VBusiness Legislations: Consumer Protection Act 1986 – SICA Act – 1985 – FEMA Act 1999 – IT Act 2000 – Competition Act 2002 – MSME Act 2006.

Suggested Books:

1. Francis Cherunilam, ***Business Environment***, Himalaya Publishing House, Mumbai.
2. Fernando, A.C., ***Business Environment***, Pearson.
3. Suresh Bedi, ***Business Environment,*** Excel Books, New Delhi,
4. Adhikary.M. ***Economic Environment of Business***, Sultan Chand & Sons, New Delhi.
5. Aswathappa.K., ***Essentials of Business Environment***, Himalaya Publishing House, Delhi.
6. Justin Paul, ***Business Environment***, Text and Cases, Tata McGraw Hill.
7. Krishna Rao,P, ***WTO-Text & Cases***, PSG Excel Series.
8. R.S.N. Pillai and Bagavathi, "***Legal Aspects of Business***", S.Chand, New Delhi.
9. H.L.Ahuja, "***Economic Environment of Business"*** S.Chand, New Delhi.
10. G.Prasad, ***Business and Corporate Laws***, Jai Bharathi Publishers.

MBA(HRM) 22007: Dynamics of Leadership

Objective: The course is aimed at equipping the students with necessary concepts and techniques to develop effective leadership skills to attain objectives of the enterprise in a conducive environment.

Outcomes: After completion of the course the student will be able to inspire, influence, guide and lead others to participate and attain the common goal.

Unit -I

Introduction: meaning, nature and importance, impact of leadership on organizational performance, leadership roles, types of leadership, framework for understanding leadership, traits, motives and characteristics of leaders.

Unit -II

Effective Leadership behavior and attitude: Task-related attitudes and behavior, Relationship oriented attitudes and behavior, 360-degree feedback for fine-tuning a leadership approach,

Unit-III

Leadership styles – classical leadership style, boss-centered Vs employee-centered leadership continuum, the autocratic, participative, free-rein continuum, the leadership grid style, the entrepreneurial leadership style, gender difference in leadership style, selecting the best leadership style, Leadership theories

Unit-IV

Developing team work: team leadership vs. solo leadership, advantages and disadvantages of group work and team work, the leader role in the team-based organization, leader actions that foster teamwork, outdoor training and team development, the leader- member exchange model and teamwork.

Unit-V

Leadership development: development through self-awareness and self-discipline, development through education, experience, and mentoring, leadership development programs, evaluation of leadership development efforts, leadership succession.

Text books

3. Andrew J. DuBrin, Leadership, Biztantra, New Delhi.
4. Gary Yukl, Leadership in organizations, Pearson Education, New Delhi.

OPEN ELECTIVE

MBA(HRM) 22008: TALENT AND KNOWLEDGE MANAGEMENT

Course Objective: The main objective of this paper is to enable the students understanding the significance of Talent and Knowledge Management in today's business scenario.

Learning Outcome:

Students will be able to understand

10. Talent Management Process
11. Knowledge management aspects
12. Knowledge management assessment and solutions

Unit – I: Introduction : Meaning and importance of talent management, Designing and building a talent reservoir, Segmenting the Talent Reservoir, Talent Management Grid, Creating a talent management system, Institutional strategies for dealing with talent management.

Unit – II : Competency Management : Meaning, characteristics, types–Steps in developing a valid competency model, Talent management information systems; Developing a talent management information strategy, Role of leaders in talent management.

UNIT-III: Introduction to KM & Role of IT: Meaning & Importance of Knowledge Management, Data–information - Knowledge - Wisdom interrelationship, Organizational knowledge: Characteristics and components of organizational knowledge, Building knowledge societies, Role of Information Technology in Knowledge Management System.

UNIT-IV: Future of Knowledge Management & Industry Perspective: knowledge management in manufacturing and service industries, Knowledge management in finance, Knowledge management in marketing, Business ethics and Knowledge Management, Challenges and future of knowledge management.

UNIT-V: Knowledge Management Process: Stages of Knowledge Management process, Knowledge Capital vs. Physical Capital, Knowledge Management Strategies, Factors influencing Knowledge Management, Web portals, Information architecture – Net banking in India.

Suggested Books

1. Sudhir Warier, "Knowledge Management", Vikas Publishing House Pvt. Ltd.
2. Thorne & Pellant, "The Essential Guide to Managing", Viva Books.
3. Stuart Barnes(Ed) "Knowledge Management Systems". Cengage Learning.\
4. Ed by Lance A. Berger and Dorothy R Berger. "The Talent Management Handbook", 2004, Tata McGraw Hill edition.
5. Ed by Larry Israelite, "Talent Management", ASTD Press.
6. Sajjad M Jasmuddin, "Knowledge Management", 1st ed, 2009, Cambridge.
7. Stuart Barnes, "Knowledge Management Systems", Ed, Cengage Learning
8. Donald Hislop, "Knowledge management in Organizations", 2009, Oxford University Press, Second edition.

MBA(HRM) 22009: FUNDAMENTALS OF BUSINESS MANAGEMENT

Course Objective: The course aims to acquaint with fundamentals of management and various functional areas of management.

Learning Outcome:

- To Apply elements of effective decision making to areas that are central to career development
- To have an understanding of the basic concepts, and processes of communication
- To obtain knowledge and understanding of the key concepts of marketing and enables to apply to the practical situations in workplace
- To strategically plan for the human resources needed to meet organizational goals and objectives
- To aim at familiarizing the participants with the skills related to basic principles, tools and techniques of Financial Management

Unit – I:

Fundamentals of Management: Concept – Significance – Functions – Principles - Role and Responsibilities of a Manager – Management is an Arts Or Science – Concept of MBO – Management vs Administration – Advantages - Limitations.

Unit-II

Introduction to Business: Concept - Nature – Features – Types of Business – Business Vs Trade – Business Communication and its importance – Goal setting – Types of Strategies.

UNIT – III:

Marketing Management: Concept of Marketing –Nature – Scope – Distinction between Marketing and selling – Marketing Mix – Steps in New Product Development – Product life Cycle – Process of Marketing Research – Marketing Strategies – e-Marketing – Social Marketing.

UNIT-IV:

HRM: Concept – Nature – Objectives – Significance - functions – Role of HR Manager – HR Planning – Recruitment Process – Sources of Recruitment – Methods of Recruitment – Job Induction – Job Description - Job Specification – Job Analysis – Job Evacuation Process – Training and Development – Career Planning and Development Methods – Leadership – Motivation – Stress Management.

UNIT- V:

Financial Management: Concept – definitions – Nature – Scope – Objectives – Significance – Financial Decisions – Sources of Finance – concept of Cost of Capital Importance – classifications of costs – Computation of Specific Source of fund cost – WACC Concept of working capital Management – Objectives – Sources of W.C – Kinds of W.C – Components of W.C – Importance – Operating cycle – Cash Conversion cycle – Estimation of working capital – Dividend Policy – Issue of Dividend and Bonus Shares.

Reference Books:

1.Philip Kotler, Marketing Management, Pearson Education.
2.Heinz Weirich and Harold Koontz, Management, TMH.
3.I.M.Pandey, Financial Management, Vikas Publishers.
4.Garry Dessler, Human Resource Management, Pearson Edition.

III SEMESTER

MBA(HRM) 32001: BUSINESS LAW

Course Objective: The course aims to acquaint students with various laws governing business operations in India.

Learning Outcomes: On completion of this course, the students would be able to learn thoroughly about the general contracts, understand the contracts relating to the sale of goods, use negotiable instruments in practical life and familiarize with the legal frame work regarding forms of business association and income taxation.

Unit – I

The Indian Contract Act – 1872: Nature of a Contract - Classification of Contracts - Essentials elements of valid Contract — Capacity of parties – Free Consent – Performance of Contract - Discharge of Contracts – Breach of Contract and its Remedies.

Unit – II

Sale of goods Act – 1930: Meaning of Contract of Sale of Goods- Essential Elements of Contract of Sale, Conditions and Warrantees; Performance of Contract of Sale, Unpaid Seller:Concept - Rights of Unpaid Seller. **Indian Partnership Act – 1932**: Elements of partnership - Constitution of Partnership - Forms of partnership - Types of partners– Rights, Duties and Liabilities of Partners. The LLP Act, 2008: Meaning, formation and LLP vs. partnership firm.

Unit- III

Negotiable Instruments Act – 1881: Meaning - Characteristics– Promissory Note – Definition- Characteristics, Bills of Exchange: Definition – Characteristics – difference between promissory note and Bill of exchange, Cheque: Definition – Characteristics – differences between Cheque and Bill of exchange – Crossing of Cheque - Types of Endorsements, Electronic funds transfer terminology– NEFT, MICR, RTGS, and CTS.

Unit-IV

The Companies Law: Meaning of a company - Characteristics - Types of Companies – Steps and Procedure for incorporation of the Company – Memorandum of Association - Articles of Association – Shares: Meaning- Types of Shares, Directors: appointment- removal -powers, duties and responsibilities- Company management: Meetings – types, kinds of meetings- Resolutions- types-minutes, Winding up of a company.

Unit –V

Income Tax Act – 1961(Theory only):Meaning – Characteristics - Purpose of Income Tax, Terminology of Income Tax: Income- person-Assesse- Assessment Year- Previous year , Gross Total Income , Advance Payment of Tax , Tax Deducted at Source.

Reference Books

1. Bansal, C.L., Business and Corporate laws, 1st Edition, Excel Books, 2006.
2. S.K Maheswari, S.N., Maheswari, A Manual of Business Law, Himalaya Publishing House, 2006.
3. Lal, B.B., & Vashisht, N., Direct Taxes, Latest Edition, Pearson Education, 2009.
4. Kapoor, N.D., Mercantile law, Sultan Chand & Sons, 2006

MBA(HRM) 32002: TOTAL QUALITY MANAGEMENT

Course Objectives: This course is designed to learn the fundamentals of Total Quality Management with emphasis on quality philosophies and tools in the managerial perspective.

Learning Outcomes:
1. Summarize the Total quality principles.
2. Demonstrate the tools utilization for quality improvement.
3. Analyze the various types of techniques are used to measure quality.
4. Describe the dimensional barrier regarding Quality.
5. Apply the various quality systems in implementation of Total quality management.

UNIT- I: Total Quality Management: Meaning & Definitions of quality, Need for quality, quality Evolution, Dimensions of quality, Basic concepts of total quality management, Principles of TQM, Service Quality , Customer Satisfaction , Gurus of TQM, TQM Framework.

UNIT- II: Management Tools: Forced Field Analysis – Affinity Diagram – Just in time –Quality Circles – Cost Benefit Analysis – Flow Charts – Run and Control Charts – Check Sheets – Histograms – Scatter Diagrams – Cause and Effect Analysis – Process Simulation.

UNIT- III: Tools for Quality: Benchmarking – Quality Function Deployment – Quality By Design – Failure Mode and Effect Analysis – Total Productive Maintenance – ISO 9000 – ISO 14000 and ISO 18000.

UNIT- IV: Six Sigma: Definition ---– Competitive Advantage -- Implementation of Six Sigma – Design for Six Sigma and Tools.

UNIT- V: Business Process Reengineering: Introduction, Meaning & Concerpt of Business Process Reengikneering — Principles and applications of Business Process Reengineering – The Reengineering Process –Benefits and Limitations of Business Process Reengineering..

Suggested Books:

1. Besterfiled, D.H. “Total Quality Management”, Pearson Education, Inc. 2003.
2. Zeiri., “Total Quality Management for Engineers”, Wood Head Publishers, 1991.
3. Evans, J. R., and Lidsay, W.M., “The Management and Control of Quality”, 5th Edition, South-Western (Thomson Learning), 2002.
4. Oakland.J.S. “Total Quality Management”, Butterworth – Hcinemann Ltd., Oxford, 1989.
5. Narayana V. and Sreenivasan, N.S., “Quality Management – Concepts and Tasks”, New Age International, 1996.
6. Kanishka Bedi., “Quality Management”, Oxford University Press, 2006.

INTERNAL ELECTIVES

MBA(HRM) 32331. MANAGEMENT OF INDUSTRIAL RELATIONS

Course Objective: To enlighten the students with the Concepts and Practical applications of Industrial Laws and Employee relations.

Learning Objectives: Upon completion of the course, the student would

- Be aware of the concepts of industrial relations.
- Be acquainted with the legal framework stipulated under the Industrial Dispute Act, 1947.
- Be imbibed with the concepts, principles and issues connected with trade unions, collective bargaining and workers participation.
- Understand trade unionism in India and legal frame work under the Trade Union Act, 1926.

Unit – I: Industrial Relations: Scope and Significance – Evolution of Industrial Relations in India and comparative analysis with USA and UK– Recent Trends in Industrial Relations – Approaches to Industrial Relations – Theories of Industrial Relations.

Unit – II: Promotion of Harmonious Relations – Machinery for Prevention and Settlement of Industrial Disputes – Conciliation – Arbitration and Adjudication – Code of Discipline and Code of Conduct; Industrial Disputes Act 1947.

Unit – III: Collective Bargaining (CB) – CB Practices in India – Participative Management Forms and Levels – Schemes of Workers' Participation in Management in India – ILO and its impact.

Unit - IV: Trade Unions: Concept, Growth, functions and Objectives of Trade Unions - Trade Union Movement in India, UK and USA - Changing Role in the Context of Liberalization - Trade Union Act 1926.

Unit-V: Trade Unionism in India: Problems of Trade Union; Recognition, Leadership, Political involvement, Union rivalry; National trade Union Federations; Emerging Trends in Trade Unions in India.

Suggested Books:

1. VenkatRatnam, C.S. – Industrial Relations, Oxford University Press.

2. SC Srivathava, Industrial Relations and Labour Laws, Vikas, New Delhi.

3. M.Arora: Industrial Relations, Excel Publications.

4. P.R.N.Sinha, InduBalaSinha and SeemaPriyadarshiniShekar, "Industrial Relations, Trade Unions and Labour Legislation", Pearson Education, New Delhi.

5. Ramaswamy E.A. – The Strategic Management of Industrial Relations, Oxford University Press.

6. Cowling and James, The Essence of Personnel Management and Industrial Relations, Prentice Hall of India.

7. RatnaSen, "Industrial Relations in India", Macmillan India Ltd. New Delhi.

8. Michael Armstrong, Employee Reward, Universities Press (India) Ltd.

MBA(HRM) 32332 - EMPLOYEE COMPENSATION AND ADMINISTRATION

Course Objective: Explain how perceptions of compensation differ among society, stockholders, managers and employees. Understand the concept of a compensation strategy, where it comes from, how it relates to the organization's situation**.**

Learning Outcomes:
On completion of this course the student will be able to recognize how pay decisions help the organisation and analyze, integrate and apply the knowledge in solving compensation related problem in the organisation.

UNIT I :

Employee compensation: Concept and Significance: Wage Concept: Wage , Salary , Minimum Wage, Living Wage, Need-Based Minimum Wage, Money Wage and Real wage; Wage policy in India ; Theories of wages.

UNIT II :

Wage Administration Principles: Factors influencing Wage Fixation and Methods wage Differentials: Occupational, skill, Sex, Inter-Industry, Regional and Sectional.

UNIT III:

Wage Fixation Mechanisms: Statutory Wage fixation, Wage Boards, Collective Bargaining, Adjudication, Pay Commission; Wage Fixation in Public Sector.

UNIT IV:

Incentives : Principles and procedures for installing incentive system; Types of wage Incentive System, Wage incentive Schemes in India, working of incentive schemes, Linking wage with productivity; Fringe Benefits: Concepts and Types.

UNIT V:

Wage and salary policies in Organization: Role of HR Department in wage and salary Administration, Managerial compensation, Perquisites and special Features; Recent trends in managerial compensation in Indian Organizations, International compensation: Components of International compensation, expatriate and repatriate compensation, approaches to international compensation.

Suggested Books:

7. Subramanian, K.N., Wages in India, Tata Mc Graw Hill Publishing Co. Ltd., New Delhi.
8. Sarma. A.M, Understanding Wages Systems, Himalaya Publishing House, Mumbai.
9. Varma, Promad, Wage Determination: concepts and cases, Oxford IBH publication. Ltd New Delhi.
10. Chatterjee, N.N., Management of Personnel of in Indian Enterprises. Allied Books agency, Culcutta.
11. Aswathappa. K., Human Resource and Personnel Management. Tata Mc Graw Hill Publishing Co.
12. Dipak Kumar Bhattacharyya, Compensation Management, Oxford University press, New Delhi.

MBA(HRM) 32333: EMPLOYEE WELFARE AND LABOUR ADMINISTRATION

Course Objective: To enlighten the students with the Concepts and Practical applications of employee welfare and labour administration.

Learning Outcomes:

- **Employees Welfare measures are in addition to their wages and services.**
- **ILO develop effective standards, fundamental principles, and fundamental rights at work**
- **Implementation of statutory and non-statutory welfare programmes**
- **Social security measures for employees**

Unit – I : LABOUR WELFARE

Labour Welfare : Concept, Definitions, Scope, Aims and Objectives and Philosophy of Lab our Welfare; principles of Lab our Welfare: Indian Constitution and Labour Welfare Historical Development of Lab our Welfare in India:

Unit – II: ILO

Impact of ILO; Structure, Function, Welfare work on labour welfare in India; Agencies of Lab our Welfare and Their roles: State, Management, Trade Unions and Voluntary Agencies.

Unit – III: WELFARE PROGRAMES

Labour Welfare Programmers ; Statutory and Non-Statutory, Extra Mural and Intra Mural: Canteen, Housing, Workers Education Scheme; Welfare Office: Role , Status and Functions.

Unit – IV: SOCIAL SECURITY

Social Security : Definition, Aims and Objectives; Social Assistance and Social Insurance, Financing of Social Security Schemes, Development of Social security in India; Social Security Measures for Industrial Employees.

Unit – V: LABOUR ADMINISTRATION

Labour Administration : Central Lab our Administrative Machinery in India; Chief Lab our Commissioner , Director general of Employment and Training, director general of factory Advice Service, Provident Fund Organization, ESI Scheme : Lab our Administration in AP

Reference Books

1. Moorthy, M.V., Principals of Lab our welfare in India, Sree Ram Centre
2. Sharma, A.M., Aspects of Lab our Welfare and Social Security, Himalaya Pub. House, Mumbai.
3. Ram Chandra P.Singh, Lab our Welfare Administration in Indian, Deep & deep Pub., New Delhi.

MBA(HRM) -32334- ORGNIZATIONAL CHANGE & DEVELOPMENT

Objectives:

• To understand the forces that stimulate change

• To understand the necessity for change

• To understand the resistance to change

• To manage the change process and

• To understand the concept and techniques of OD

• To enable the skills for the application of OD in organizations.

Outcome: After successful completion of the course the student will be able to understand the stimulating forces for change, why employees resist to change and how to manage the change process. Student will be able to know the techniques of OD and acquire the application skills of OD in organizations.

UNIT-I: Change – stimulating forces – planned change – change agents – unplanned change – Model of organizational change – Lewin's three Step Model.

UNIT-II: Resistance to change – individual factors – organizational factors – techniques to overcome change.

UNIT-III: Change programs – effectiveness of change programs – change process – job redesign – sociotechnical systems.

UNIT-IV: OD – basic values – phases of OD – entry – contracting – diagnosis – feedback – change plan – intervention – evaluation – termination.

UNIT-V: OD intervention – human process interventions, structure and technological interventions and strategy interventions – sensitivity training – survey feedback, process consultation – team building – inter-group development – innovations – learning organizations.

TEXT BOOKS:

1. French & Bell: ORGANISATIONAL DEVELOPMENT, McGraw-Hill.

2. Vinayshil Gautham & S.K.Batra: ORGANISATION DEVELOPMENT SYSTEM, Vikas Publishing House.

REFERENCES:

2. Rajiv Shaw: SURVIVING TOMORROW: TURNAROUND STRATEGIES IN ORGANISATIONAL DESIGN AND DEVELOPMENT, Vikas Publishing House.

MBA(HRM) 32335: HUMAN RESOURCE DEVELOPMENT

Course Objective: The course aims to equip students to develop themselves into a critically reflective and capable HRD practitioner, or a manager who can facilitate the learning of others. The major objective of the course tis to explain and demonstrate the contribution of HRD in an organization and enable student to develop an ability to decide learning and training needs and have competence in the design and delivery of learning programmes.

Course Outcomes: On successful completion of the course students will be able to:

- To build an understanding and perspective of HRD as discipline appreciating learning,
- To learn OD as an applied field of change.
- To assess the training needs and competencies in designing and delivery of training programmes,
- To understand the application of HRD practices in various sectors.

Unit – I

Human Resource Development: concept, Origin and Need for HRD; Objectives of HRD,Systems approach to HRD: Approach to Activity Areas of HRD; HRD Interventions ; Performance appraisal, Potential Appraisal, Feedback and Performance coaching, HRD Climate; Challenges and goals of HRD; HRD functions and Staffing; Roles and competencies of HR professionals; Role of Line and Staff Agencies of HRD.

Unit – II

HRD –Trends: Organization Development: OD Concept, Definitions, Characteristics ,Features of OD, OD Interventions, Approaches to OD Change Lewins Three- Steps Model, Experience in Indian Organizations, Future of HRD. Employee Welfare and Quality of Work Life, Career Management; Management of stress and conflict at work place;

Unit – III

Human Resource Training : Concept and Importance: Assessing Training Needs: Process of Training; Designing and Evaluating, Training and Development Programmers, Organizational Culture, Types, Developing Right Culture, Work Place Jealousies and Policies, Developing goals of Managers;

Unit – IV

Application of HRD, HRD for workers (Blue Collar Employees)Types and Methods of Training, Managing Diversity for HRD, Behavior Modeling, Brain Storming Case Study.

Unit – V

HRD in Practice: Quality Circles: HRD in Large, small, Manufacturing and Service Organizations, Global Developments and Implications for HRD in India, HRD outsourcing, BPO, ITES. HRD Audit. Industrial Distributes.

Reference Books

1. Rao, T.V., Human Resource Development, Sage publications, New Delhi.

2. T.V. and Pareek, Udai, designing and managing Human Resource Systems; Oxford and IBR Pub. Ltd., New Delhi.
3. Nadler, Leonard, Corporate Human Resource Development, Van Nostrand Reinhold/ASTD, New York.
4. ILo, Teaching and Training Methods for Management Development Hand Book McGraw Hill, New York.
5. Graig, Robert l. and bittel Lester R.(ed), Training and Development Development Hand Book McGraw Hill,New York.
6. Rao T.V.(et),HRD in the New Economic Environment, TMH ,New Delhi.
7. Dr. D.K.Bhattacharya, HRD, Himalaya Publishing New Delhi
8. T.D.Tiwari and Anjuthakker, Wisdom Publications,
9. A.M.Shakhi, HRD
10, Gupta & Gupta . HRD, Deep & Deep Publications

MBA(HRM)- 32336- STRESS MANAGEMENT

COURSE OBJECTIVE: To provide a broad physical, social and psychological understanding of human stress. The main focus is on presenting a broad background of stress.

OUTCOMES: Students will be able to understand the management of work-related stress at an individual and organizational level and will help them to develop and implement effective strategies to prevent and manage stress at work.

UNIT I UNDERSTANDING STRESS: Meaning – Symptoms – Works Related Stress – Individual Stress – Reducing Stress – Burnout.

UNIT II COMMON STRESS FACTORS TIME & CAREER PLATEAUING: Time Management – Techniques – Importance of planning the day – Time management schedule – Developing concentration – Organizing the Work Area – Prioritizing – Beginning at the start – Techniques for conquering procrastination – Sensible delegation – Taking the right breaks – Learning to say 'No'.

UNIT III CRISIS MANAGEMENT: Implications – People issues – Environmental issues –Psychological fall outs – Learning to keep calm – Preventing interruptions – Controlling crisis – Importance of good communication – Taking advantage of crisis – Pushing new ideas – Empowerment.

UNIT IV WORK PLACE HUMOUR: Developing a sense of Humour – Learning to laugh – Role of group cohesion and team spirit – Using humour at work – Reducing conflicts with humour.

UNIT V SELF DEVELOPMENT: Improving Personality – Leading with Integrity – Enhancing Creativity – Effective decision Making – Sensible Communication – The Listening Game – Managing Self – Meditation for peace – Yoga for Life.

REFERENCES

1. Cooper, Managing Stress, Sage, 2011

2. Waltschafer, Stress Management, Cengage Learning, 4th Edition 2009.

3. Jeff Davidson, Managing Stress, Prentice Hall of India, New Delhi, 2012.

4. Juan R. Alascal, Brucata, Laurel Brucata, Daisy Chauhan. Stress Mastery. Pearson

5. Argyle. The Psychology of Happiness. Tata McGraw Hill. 2012

6. Bartlet. Stress – Perspectives & Process. Tata McGraw Hill. 2014

MBA(HRM) – 32337 - LEADERSHIP

OBJECTIVE: To identify leadership qualities for an effective process of change. What kind of knowledge, skills, talent and competencies are required for a leader to bring a successful organizational change.

OUTCOMES: After successful completion of the course the student will be able to act as a bridge between organization and envisioned change and also be able to lead effectively during change

UNIT – I: INTRODUCTION: Leadership: Concept, Characteristics, roles, motives, skills and functions. Leadership Vs Management. Effective leadership behaviours and attitudes. Impact of Leadership on organizational performance.

UNIT – II: LEADERSHIP STYLES AND THEORIES: Popular Leadership Styles, Entrepreneurial and Super leadership. Transactional Vs Transformational leadership. Triat and Path – Goal theories of leadership.

UNIT – III: ORGANISATIONAL CHANGE: Types and forces of change, Framework for change management. Proactive change and reactive change. Elements of planned change. Action research model. Individual and organisational barriers to change management and overcoming the barriers to change management.

UNIT – IV: INFLUENCE OF CHANGE: Six belief changers that Influence change, organisational change through influencing individual change. Approaches: Kotter's eight step plan, Greiner's Change process model. Four key drivers of organisational change. Factors contributing to resistance to change. Best practices to overcome resistance to change.

UNIT – V: ORGANISATIONAL CULTURE AND CHANGE MANAGEMENT: Organisational Culture and Leadership, Types of Cultures, Primary and Secondary ways to influence culture, elements of organisational culture. Diagnosing, creating and managing organisation culture.

SUGGESTED BOOKS:

1. S. Chandan, "Organisational Behaviour", Vikas Publishing House Pvt. Ltd. 3rd Edition

2. Herbert G. Hicks and C.Ray Gullett, "Theory and Behavior", McGrew Hill.

3. Andrew 1 Dubrin, "Research Findings, Practice and Skills", Houghton Mifflin Company, 3rd Edition.

4. Kavitha Singh, "Organization Change & Development", 2005, Excel Books.

5. Adrainthornhill, Phil Lewis, Mike Millmore, Mark Saunders, "Managing Change – A Human Resource Strategy Approach", Pearson Education, 2006.

6. Nilakant V and Ramnarayan, "Managing Organizational Change", Response Books, 2006

OPEN ELECTIVE
MBA(HRM) 32003: ENTREPRENEURSHIP DEVELOPMENT

Course Objective: The objective of this course is to create conceptual understanding of the topic among the students and comprehend the environment of making of an Entrepreneur and to develop perspective understanding of startups and MSMEs in the Indian context.

Learning Outcomes:
On completion of the course, the student will be able to have conceptual understanding of the concept of entrepreneur and entrepreneurship; growth of women and rural entrepreneurship in Indian context. He would be able to generate ideas and opportunities for business ventures. Student will have through knowledge of MSMEs. He will be able to recognize various institutions like Commercial banks, SSIDC, CII, FICCI and ASSOCHAM.

Unit – I Entrepreneur and Entrepreneurship: Evolution of the Concept of Entrepreneur – Characteristics of an Entrepreneur – Distinction between an Entrepreneur and Intrapreneur and a Manager – Functions of an Entrepreneur – Types of entrepreneurs, Concept of Entrepreneurship – Functions, Problems, Entrepreneurial process – Growth of Entrepreneurship in India – Recent Trends of Women Entrepreneurship – Meaning of and Need for Rural Entrepreneurship – Problems and Development of Rural Entrepreneurship.

Unit II Startup Ideas and Opportunity Assessment: Importance of Ideas – Sources of startup Ideas – Techniques for generating ideas – Steps in potential ideas – Opportunity Recognition- sources and process – Development of Programmes E – Business Ventures – Importance of Financial Management – Project Feasibility Study.

Unit – III MSME Enterprises: Definitions, Characteristics – Relationships of MSME – Relationship with large units – Export Oriented Units - Rationale – Objectives – Scope of Small Enterprises – Opportunities for an Entrepreneurial career – Role of Small Enterprises in Economic Development – Causes and Symptoms of Sickness – Cure for Sickness.

Unit IV Project preparation and Financing Ventures: Meaning of and Preparation of Project – Importance of Report – Content; Guidelines for Report preparation – Network Analysis – PERT and CPM – Sources of Finance – Concept of working Capital and Estimation – Seed Capital – Venture Capital.

Unit V Institutional support to Entrepreneurs: Commercial Banks – Other major financial institutions – Central Level Institutions – KVIC; SIDO; NSIC : National Productivity Council (NPC); EDII – State Level Institutions – DIC – SFC-state Small Industries Development Corporation (SSIDC) – Industry Associations – Confederation of Indian Industry(CII) ; Federation of Indian Chamber of Commerce Industry (FICCI); Associated Chambers of Commerce and Industry of India (ASSOCHAM)

Suggested Books:

1. Vijay Sathe, “Corporate Entrepreneurship” 1st edition, 2009, Cambridge
2. S.S. Khanka, “Entrepreneurial Development”, 2007, S. Chand & Co. Ltd.
3. Vasanth Desai, “Dynamics of Entrepreneurial Development and Management”, 2007, HPH,Millenium Edition.

4. Dr. Vasant Desai, "Small Scale Industries and Entrepreneurship", 2006, HPH.
5. P. Narayana Reddy, "Entrepreneurship – Text and Cases", 2010, 1st Ed. Cengage Lerning.
6. David H. Hott, "Entrepreneurship New Venture Creation", 2004, PHI.
7. E – Book, MSME at a glance – English version, Ministry of MSME.
8. Jaynal Ud – Din Ahmed and Abdul Rashid, MSME in India, New Century Publications.

MBA(HRM) 32004: BUSINESS RESEARCH METHODS

Course Objective: The objectives of this course is to provide the students the knowledge of doing research and basicStatistical tools to apply for solving business related problems.

Learning outcomes: On successful completion of the course the student will be able to:

- Identify the overall process of designing a research study from its inception to its report.
- Apply appropriate analytical methods to find solutions to business problems that achieve stated objectives.
- Calculate and interpret the correlation between two variables.
- Calculate the linear regression equation for a set of data and know basic assumptions behind regression analysis.
- Explore small and large sample data to create testable hypothesis and identify appropriate statistical tools.

Unit-I

Introductionto Business Research Method:Concept of Business Research Method, Nature of Business Research Method, Scope of Business Research Method, Need and the role of Business Research, Characteristics of Research, Types of Research, The Research Process, Steps involved in preparing Business Research Planan Overview.

Unit- II

Research Design: Meaning of Research Design, Need for Research Design, Features of a good Design, Types of Research Design: Exploratory, Descriptive and Casual Research Exploratory Research, Experimental Designs, Types of Errors effecting Research Design, Research Design process.

Unit- III

Data Collection: Primary and Secondary Data-Sources-Advantages / Disadvantages, Data Collection Methods - Observations, Survey, Interview, Concept of Questionnaire and Schedule, Principles of Design Questionnaire and Schedule, Limitations of Questionnaire, Qualitative Techniques of Data Collection. Measurement and Scaling Techniques - Nominal Scale, Ordinal Scale, Interval Scale, Rating Scale.

Unit – IV

Sampling Theory: Meaning, Need and Importance of Sampling, Steps in Sampling Process, Types of Sampling Methods, Sampling and Non-Sampling Errors, Sample Design, Determinants of Sample Size,Steps in Designing the Sample.

Unit – V

DataAnalysis: Measures of Central Tendency and Dispersion, Correlation Analysis, Regression Analysis.
Hypothesis Testing:- Introduction, Types of hypothesis, procedure for testing of hypothesis, Types of Errors in testing of hypothesis-Tests of significance for small samples: - application, t-test, Z- Test, F-Test, Chi-square test and ANOVA- one way and two-way classifications.

Reference Books
1. N.D. Yohra,2001, Quantitative Techniques in management, Tata McGraw Hill, 2ndnedition.
2. Barry Render, Ralph M. Stair, Jr. and Michael E. Hanna, 2007, Quantitative analysisfor management, 9th Edition, Pearson publication
3. Gupta S.P. Statistical Methods. Sultan Chand and sons, New Delhi.2005
4. C.R. Kothari, Research Methodology: Methods and Techniques,2/e,VishwaPrakashan 2006
5. William G. Zikmund, Business Research Methods, Thomson, 2006.

IV SEMESTER

MBA(HRM) 42001-STRATEGIC MANAGEMENT

Course Objective: The objective of this course is to analyze the main structural features of an industry and develop strategies that position the firm most favorably in relation to competition and influence industry structure to enhance industry attractiveness, to recognize the different stages of industry evolution and recommend strategies appropriate to each stage and to appraise the resources and capabilities of the firm in terms of their ability to confer sustainable competitive advantage and formulate strategies that leverage a firm's core competencies.

Learning Outcomes: On completion of the course the student will be able to understand the importance of strategies in the organizations in the midst of the tough and turbulent competitive market environment. He will have deep knowledge on the processes of strategy formulation, strategic analysis, strategy implementation and strategic control.

Unit-I: **Introduction:** Concepts in Strategic Management, Strategic Management as a process –Developing a strategic vision, Mission, Objectives, Policies – Factors that shape a company's strategy – Crafting a strategy – Industry and Competitive Analysis, Porter's Five Forces Model.

Unit-II: **Environmental Scanning and leadership**: Methods. SWOT Analysis – Strategies and competitive advantages in diversified companies and its evaluation. Strategic Analysis and Choice: Tools and techniques- BCG Matrix, Space Matrix, GE Model, Grand Strategy Matrix -Strategic Leadership: Leadership and Style – Key Strategic Leadership Actions - Developing Human Capital and Social Capital – Balanced Scorecard.

Unit-III: **Strategy Formulation** : Strategy Framework For Analyzing Competition, Porter's Value Chain Analysis, Competitive Advantage of a Firm, Exit and Entry Barriers - Formulation of strategy at corporate, business and functional levels. Types of Strategies – Tailoring strategy to fit specific industry – restructuring and diversification strategies – different methods Turnaround strategy and diversification strategies.

Unit-IV: **Strategy Implementation** : Strategy and Structure, Leadership, culture connection - Strategies for competing in Globalizing markets and internet economy – Organizational Values and Their Impact on Strategy – Resource Allocation – Planning systems for implementation.

Unit-V: **Strategy Evaluation and control** – Establishing strategic controls - Measuring performance – appropriate measures- Role of the strategist – using qualitative and quantitative benchmarking to evaluate performance - strategic information systems – problems in measuring performance – Strategic surveillance - strategic audit.

REFERENCES:

1 .Vijaya Kumar P,.HittA : Strategic Management, Cengage learning, New Delhi,2010.
2. John A PearceII, AmitaMital: "Strategic Management", TMH, New Delhi, 2012.
3. Sanjay Mohapatra: "Cases Studies in Strategic Management", Pearson, New Delhi,2012.
4. Adrian Haberberg&Alison: Strategic Management, Oxford University Press, New Delhi, 2010.
5 .P.Subba Rao: "Business Policy and Strategic Management" Text and Cases, Himalaya Publishing House, New Delhi, 2011.
6. Appa Rao, Parvatheshwar Rao, Shiva Rama Krishna: "Strategic Management and Business Policy", Excel Books, New Delhi, 2012.

MBA(HRM) 42002: ENTREPRENEURSHIP DEVELOPMENT

Course Objective: The objective of this course is to create conceptual understanding of the topic among the students and comprehend the environment of making of an Entrepreneur and to develop perspective understanding of startups and MSMEs in the Indian context.

Learning Outcomes:
On completion of the course, the student will be able to have conceptual understanding of the concept of entrepreneur and entrepreneurship; growth of women and rural entrepreneurship in Indian context. He would be able to generate ideas and opportunities for business ventures. Student will have through knowledge of MSMEs. He will be able to recognize various institutions like Commercial banks, SSIDC, CII, FICCI and ASSOCHAM.

Unit – I Entrepreneur and Entrepreneurship: Evolution of the Concept of Entrepreneur – Characteristics of an Entrepreneur – Distinction between an Entrepreneur and Intrapreneur and a Manager – Functions of an Entrepreneur – Types of entrepreneurs, Concept of Entrepreneurship – Functions, Problems, Entrepreneurial process – Growth of Entrepreneurship in India – Recent Trends of Women Entrepreneurship – Meaning of and Need for Rural Entrepreneurship – Problems and Development of Rural Entrepreneurship.

Unit II Startup Ideas and Opportunity Assessment: Importance of Ideas – Sources of startup Ideas – Techniques for generating ideas – Steps in potential ideas – Opportunity Recognition- sources and process – Development of Programmes E – Business Ventures – Importance of Financial Management – Project Feasibility Study.

Unit – III MSME Enterprises: Definitions, Characteristics – Relationships of MSME – Relationship with large units – Export Oriented Units - Rationale – Objectives – Scope of Small Enterprises – Opportunities for an Entrepreneurial career – Role of Small Enterprises in Economic Development – Causes and Symptoms of Sickness – Cure for Sickness.

Unit IV Project preparation and Financing Ventures: Meaning of and Preparation of Project – Importance of Report – Content; Guidelines for Report preparation – Network Analysis – PERT and CPM – Sources of Finance – Concept of working Capital and Estimation – Seed Capital – Venture Capital.

Unit V Institutional support to Entrepreneurs: Commercial Banks – Other major financial institutions – Central Level Institutions – KVIC; SIDO; NSIC : National Productivity Council (NPC); EDII – State Level Institutions – DIC – SFC-state Small Industries Development Corporation (SSIDC) – Industry Associations – Confederation of Indian Industry(CII) ; Federation of Indian Chamber of Commerce Industry (FICCI); Associated Chambers of Commerce and Industry of India (ASSOCHAM)

Suggested Books:

1. Vijay Sathe, “Corporate Entrepreneurship” 1st edition, 2009, Cambridge
2. S.S. Khanka, “Entrepreneurial Development”, 2007, S. Chand & Co. Ltd.

3. Vasanth Desai, "Dynamics of Entrepreneurial Development and Management", 2007, HPH,Millenium Edition.
4. Dr. Vasant Desai, "Small Scale Industries and Entrepreneurship", 2006, HPH.
5. P. Narayana Reddy, "Entrepreneurship – Text and Cases", 2010, 1st Ed. Cengage Lerning.
6. David H. Hott, "Entrepreneurship New Venture Creation", 2004, PHI.
7. E – Book, MSME at a glance – English version, Ministry of MSME.
8. Jaynal Ud – Din Ahmed and Abdul Rashid, MSME in India, New Century Publications.

INTERNAL ELECTIVES

MBA(HRM) 42431: INTERNATIONAL HUMAN RESOURCE MANAGEMENT

Course Objective: The course is designed to enhance the potentials of the student to manage Human Resource in Multi National Organizations to achieve Business Standards.

Learning Outcomes: On successful completion of the course, the students would be able to demonstrate the issues related to host, home and third country nationals, assess the international culture and diversities, understand the Human Resource Management activities with respect to Multinational corporations and capture the issues in international industrial relations.

Unit - I

Introduction to International Human Resource Management: Concept, Scope and Significance - Expatriate- Approaches to International Human Resource Management, Differences between Domestic and International HR Activities; Role of International HR Department - Issues and Challenges of IHRM, Organizational structure of multinational corporations,

Unit- II

Socio – Culture Contexts: Cultural Factors - Cultural Sensitivity - Culture affects Management approaches - Cross-cultural Communication - Cross Culture Differences in the Work Place – Hofstede Cross-Culture theory.

Unit – III

Recruitment and Selection: Concept – sources of Human Resources: Micro level, Macro level, Modern Sources, Techniques of Recruitment – Centralized Vs Decentralized recruitment – Selection: The Expatriate System, Reasons for Expatriate failure in foreign assignment - Selection Techniques for International Assignment: Adaptability to cultural change, Motivation for a foreign assignment and Leadership ability.

Unit – IV

Training and Development: Need for Global training - Areas of Global Training & Development, Compensation : Objectives of International Compensation Management - Complexities in International Compensation Management- - Factors Affecting International Compensation Management - Approaches to International Compensation Management, Performance Management: System of performance appraisal – Problems of Performance Appraisal – Measures for effective Performance Appraisal.

Unit -V

Introduction to International Industrial Relations: Key Issues in International Industrial Relations - Trade Unions and International Industrial Relations - Conflict Resolution in Multinational Corporations; Forms of Industrial Democracy to Multinational Corporations – Regional Integration – NAFTA, EU.

Reference Books

1. Dowling Welch, Schuler, International Human Resource Management Thomson, New Delhi.
2. Anne WilHarzing et al., International Human Resource Management., sage, New Delhi
3. P.SubbaRao, International Human Resource Management, HPH, New Delhi
4. Briscoe, Dennis R., International HRM , Prentice Hall NJ.
5. Torrington, D., International HRM : Think Globally and Act Locally, Hemal Hempstead, Prentice Hall.

MBA(HRM) 42432: STRATEGIC HUMAN RESOURCE MANAGEMENT

Course Objective: The Objective of this course is to appreciate how human resource is emerging as a key resource for competitive advantage and understanding the role of HRM in organizational performance.

Course Outcome:

On completion of this course the students will be able to develop the understand of the concept of Strategic Human Resource Management and to understand it's relevance in organisation and to analyse the strategic issues and strategies required to select and to develop manpower resources.

UNIT I : Strategic Human Resource Management: Strategy meaning**,** Types of strategies, Human Resource Strategy, Human resource as assets, Evolution of SHRM, Distinctive Human Resource Practices, SHRM approaches, alternative HR strategies..

UNIT II : Human Resource Environment: Technology and Organization Structure; Worker Values and Attitudinal Trends; Management Trends, Demographic Trends: Trend's in the utilization of human resources and international developments.

UNIT III : Strategic International Human Resource contributions: Strategic Human Resource Activity Typology; Classifying Human Resource Types : Integration of strategy and human resource planning: The Human Resource manager and Strategic Planning. Strategic, Human Resource Planning**.**

UNIT IV: Strategic Human Resource Processes: Workforce Utilization and Employment Practices; Efficient Utilization of Human Resources; Dealing with employee shortages: Selection of employees; Dealing with employee surpluses and special implementation challenges. Reward and development systems: Strategically Oriented Performance Management Systems: Strategically oriented compensation systems and employee development.

UNIT V: Impact of Human Resource Practices: Individual high performance practices; Systems of high – performance human resource practices: individual Best practices vs. Systems of Practices and Universal Practices vs. Contingency Perspectives. Human Resource Evaluation: Over view of the Evaluation: Approaches to Evaluation: Evaluation Strategic Contributions of Traditional Areas: and Evaluation Strategic Contributions in Emerging Areas.

Suggested Books :

1. Greer, Charles R. (2003) Strategic Human Resource Management – A General Managerial Approach New Delhi: Pearson Education (Singapore) Ple. Ltd.
2. Mabey, Chrisopher and Salaman, Graeme, Strategic Human Resource management, Beacon, New Delhi.
3. Salaman, Graeme, Human Resource Strategies, Sage Publications, New Delhi.
4. Porter, Michael S., Competitive Advantage: Creating and Sustainig Superior Performance, Free Press, New York.
5. TanujaAgarwala, Strategic Human Resource Management, Oxford Univesrsity Press, New Delhi.

MBA(HRM) 42433 : LABOUR LEGISLATIONS

Course Objective: To have a broad understanding of the legal principles governing the employment relationship at individual and collective level. To familiarize the students to the practical problems inherent in the implementation of labour statutes.

Learning outcomes:
After going through various labour laws, students will be conversant regarding conflict management in legal perspective and judicial system pertaining to labour management relations.

Unit – I: Industrial Jurisprudence: Meaning and Definitions, Sources of Industrial Jurisprudence, Industrial Jurisprudence Principles Social Justice, Natural Justice, Equity, National Economy, Dynamism, Constitutional Norms, Welfare, Res Judicata, Laches, Vicarious Liability.

Unit – II: Labour Legislations:Growth, Specific Objectives of labour legislations in India and Classification of labour legislations, International Labour Organisation (ILO) Writs and appeals under the Indian Constitution.

Unit – III: The Factories Act, 1948. The Contract Labour (Regulation and Abolition) Act 1970. The mines Act 1952

Unit – IV: The Plantations Labour Act, 1951, The Dock Workers (Regulation of Employment) Act 1948, The A.P Shops and Establishments Act 1988.

Unit – V: The Child Labour (Prohibition and Regulation) Act 1986. The Apprentices Act 1961.

Suggested Books

8. Malik, P.L Industrial Law, Eastern Book Company, Lucknow
9. Sharma A.M. Industrial Jurisprudence, Himalaya Publishing House, New Delhi
10. Mishra P.N., Labour and Industrial Laws, Central Law Publishing, Allahabad
11. Vaidyanathan, N, IOL Conventions and India, Minverva Associates, Calcutta
12. Goswami, V.G. Labour and Industrial Relations Law, Central Law Agency, Allahabad
13. Agarwal, S.L, Labour Relations Law in India, Mc Milan Company of India Ltd., New Delhi
14. Sinha, P.R.N, Industrial Relations and Labour Legislations, Oxford and I.B.H Publishing Co., New Delhi

MBA(HRM) 42434: PERFORMANCE MANAGEMENT AND EMPLOYEE COUNSELLING

Course Objective: This course is designed to assist Human Resources professionals and operational managers in giving effective performance appraisals that help motivate employees to achieve higher productivity.

Learning Outcomes:

1.To identification of the Potentials of the Employees skills and abilities.
2.Provides an opportunities the supervisor to give feedback on the performance and its related behavior.
3. To build/booster morale among the employees And to identified the training needs.
4.To help, define career paths and increase Job satisfaction.
5. To increase Employee retention and accountability

Unit – I

Formats for Scaling and Measurement, Designing Appraisal Form; Potential Assessment, Performance Planning. Performance Management: Concept and Objectives; Goal setting and Expectancy Theory; Performance Management Models; Designing Performance Management System; Designing of PMS in MNC – Aims and Role of PMS, Characteristics of an Ideal PMS, Linking of Performance Management.

Unit – II

Designing Training Needs Assessment(TNA), Tools, Effective Delivery of Training. Developing Training Modules including Training Objectives, Lesson plan, and Training Climate, Effective Delivery of Training; Monitoring Performance; Performance Feedback Performance Review; Coaching; Mentoring: Performance Management Reward Systems in MNC.

Unit – III

Quality Performance Management- Concept, Definitions and Mechanics; Elements of Team Building, Team Characteristics and Behaviors , Team Concepts and Norms, Cross Functional Teams, Coaching.

Unit – IV

Organizational Structure and Employee Motivation and Morale; Learning organizations; Counseling: Meaning, Need for counseling; Functions of Counseling; Forms of Counseling; Counseling Process; Counseling Variables; Pre-requisites for Effective Counseling; Skills of an Effective Counseling.

Unit – V

Quality Circles- Feature Process, Pre-requisites for their Efficiency. Quality Performance Management in Indian and Western Thought in a Market Era. Performance Management and Motivation from Global Scenario – Application of Expectancy Model, Reward and Recognition from Global Perspective.

Reference Books

1.Prem Chand, Performance Management, Macmillin, New Delhi
2.T.V.Rao, Performance Management and Appraisal System Response
3.Dave, Indu, The Basic Essentials of Counseling, Sterling Pub. Pvt., Ltd., New Delhi
4.Carroll, Michal and Watso, Michael, Hand Book of Counseling in Organizations, Sage Pub., New Delhi
5.Mabey, Chirstopher and Salamanm Graeme, Stgrategic HRM, Beacon Books, New Delhi
6.Rao T.V., and PAreek, Udai(ed)., Redesigning Performance Appraisal System, Tata McGrew Hill Pub., New Delhi
7.Neale, Frances, Handbook of Performance Management, Jaico Pub., House, New Delhi
8.Benson, Gray, Stepping Up Performance, Jaico Pu., House, New Delhi
9.Walters, Mike, The Performance Management Handbook, Jaico Pub., House, New Delhi
10.Murphy, Kerin R., and Cleveland, Jeanette N., Understanding Performance Appraisal, Sage, London
11.David Wade and Ronald Recardo, Corporate Performance Management, Butterworth Heinemann, New Delhi
12.Kur Verweire etal, Integrated Performance Management, Sage, New Delhi.
Text Book : Perforamance Management Herm……..nnis Pearson Education ,2007
13. Performance Management Systems , UK Sahu,Excel Books

14.The Tale …..Management Hand Book A Berger & Dorothy R.Berger, Tata Mc-Graw Hill

MBA(HRM) 42435- HUMAN RESOURCE MANAGEMENT IN SERVICE SECTOR

Course Objective: The objective is to understand the maintaining and improving the service quality and performance in service sectors.

Course Outcome:

On completion of this course the students will be able to understand the concept of Service and application of Human Resource Management in different service sectors.

UNIT I :

Concept of Service: Types of Service, Service Management, Evolving Environment of Services, Myths about Service, Service as a System, Attitudes towards Service Sector, Reasons for growth of the Service sector.

UNIT II :

Nature of Service sector: Characteristics of Services, Elements of Customer Service, Components of Service, Identifying customer Groups, Service Process, Classification of Servicing operating systems, Balancing Supply and Demand, Challenges for service managers, People and service, Maintaining and Improving Service Quality and performance.

UNIT III :

Human Resource Management in Service Organizations: Concept, Functions, Utilization, Development, Environment, Organising HRM Functions in Service Sector, Competencies and service organizations, Performance Measurement, Empowerment in service organizations, Managing services across Boundries.

UNIT IV :

Application in HRM in service sector: HRM in Hospitals, Hotels, Insurance and Banking, other Financial Institutions, Ports and Docks, Managing Salary Levels, Working Conditions, Legal provisions, Unionism, Problems and Challenges.

UNIT V :

HRM in IT Sector: Software Industry and BPO Sector, Wage Salary Levels, Working Conditions, Legal Provisions, Unionization, Distribution of Male and Female Workers, Gender Bias, Problems and Challenges.

Suggested Books

5. Balaji. B., Services Marketing and Management, S. Chand & Co. Ltd., New Delhi.

6. Haksever, Cengiz, Barry Pender, Roberta S.Russel and Robert G.Murdik, Service Management and Operations, Pearson Education (pte)ltd., New York.

7. Van Dierdonck van woy, Service Management An Integrated Approach, Financial Times/ Prentice hall of India, New Delhi.

8. Goyal.R.C., Human Resource Management in Hospitals. Prentice hall of India, New Delhi.

MBA(HRM) – 42436 – Management of Unorganized Labour

Objective: The course is designed to enable the students to understand the size and role of unorganized workers in Indian economy, to know various types of unorganized workers, to understand the problems of unorganized labor and to know the role played by the different actors for the welfare of the unorganized workers.

Outcome: After successful completion of the course the student will be able to organize the unorganized workers and create awareness among them for their wellbeing.

UNIT I: Unorganized Labour: Concept; Nature Size and Structure; its Role in the National Economy; Size, causes and Problems.

UNIT II: Unorganized Labour : in Different Sectors; Nature; Employment Status, Wage Levels and Problems of Home Based Workers – Domestic Workers-Sex Workers- Plantation Workers- Scavengers- Casual Labour, Agriculture Labour, Forest Labour; Bonded Labour, Contract Workers. Relevant Acts and Legal Provisions for all sectors.

UNIT III: Construction Workers, Mines and Quay Workers; Fisheries, Beedi Workers; Inter-State Migrant Workers; Workers in Shops and Commercial Establishments, Employees in Small and Medium Enterprises. Relevant acts and Legal Provisions. Accident Risk at Work – Social security and welfare measures – Unorganized workers depending on common prosperity resources.

UNIT IV:Human Rights and Unorganized Labour; Employment of Women and Children; Patten of Women Employment Wages; Legal Provisions; Social Status; Problems; Women and Trade Unions; Employment of Children; nature and Extent; Legal Provisions; Problems of Girl Child; ILO Conventions.

UNITV: HRD Interventions for Unorganized Labour; Skill and Knowledge Up gradation; Leadership Development; Creating Awareness for Cooperative Organization; Involvement of Community Leaders; Non Governmental Organizations; Government Schemes; Organizing the Unorganized Labour; Role of Trade Union; Role of ILO., CBWE and Jana Sikshan Samsthan

Suggested Readings:

Government of India, Report of the First National Commission on Labour, New Delhi.
Government of India, Report of the Second National Commission on Labour, New Delhi.
Government of India, Report of the Royal Commission on Labour , New Delhi.
Dutt, Rudra. Organizing the Unorganised Workers, Vikas Pub. House Pvt. Ltd., New Delhi.
Singh, I.S.(ED)., Women as a Workforce in the Organized Sector Empirical Perspectives, Oxford and IBH Pub. Co., Ltd., New Delhi.
Jhabrala, Renana and RKA Subrahmanya, The Unorganised Sector Work Security and Social Protection, Sage Publications, New Delhi,
Holmstrom, M ark, Industry and Inequality, Orient Longman, Hyderabad
Gangrade, K.D., Gathia, J.A., Women & Child Workers in Unorganised Sector; Non –Government Organisation, Perspective, Concept Pub. Co., New Delhi.
Siva Ramakrishna, K., Ramesh, K.,and Gangadhara Rao, M., HRM in Agriculture, Discovery Pub. House, New Delhi.

Neera, Burra; Burra to Work; Child Labour in India, Oxford University Press, New Delhi.
Government of India Agricultural Labour Enquiry Reports, Labour Bureau, Simla.
Radhakrishna, R., and Sharma, Alak N.(ed), Empowering Rural Labour in India- Market State and Mobilisation, Institute for Human Development, New Delhi.

MBA(HRM) – 42437 -TRAINING AND DEVELOPMENT

Objectives:

• To appreciate the significances of training and development

• To introduce the basic concepts in training and development

• To understand the methods of training and development and

• To expose to the HRD practices in organizations.

Outcomes: After completion of the course the student will be able to learn the basic concepts of training and development, methods of training and development and gain the knowledge of HRD practices followed in India.

UNIT-I: Job analysis – manpower planning – at the start of the business and as ongoing process – performance appraisal – standards, methods, errors.

UNIT-II: Learning Objectives – domains of learning – methods of learning – importance of teaching techniques – instruction technology – instructor behavior – attention versus involvement.

UNIT-III: Need for Training and Development – Role of Development officers – administrators, consultants, designers and instructors – determining training needs – potential macro needs – usefulness of training – development of competency-based training programs – Evaluation of training programs.

UNIT-IV: Methods of training – on the job training – off the job training – choosing optimum method – the lecture – field trips – panel discussion – behavior modeling – interactive demonstrations – brain storming – case studies – action mazes, incident process, in-baskets, team tasks, buzz-groups and syndicates, agenda setting, role-plays – reverse role plays, rotational role plays, finding metaphors, simulations, business games, clinics, critical incidents, fish bowls, T groups, data gathering, grouping methods, transactional analysis, exception analysis.

UNIT-V: Need for development – differences between training and development – management development program – career development program – counseling – evaluation of programs – job evaluation – methods and techniques.

REFERENCES:

1. B. Taylor & G.Lippitt: MANAGEMENT DEVELOPMENT AND TRAINING HANDBOOK.

2. William E.Blank, HANDBOOK FOR DEVELOPING COMPETENCY BASED TRAINING PROGRAMMES, Prentice-Hall, New Jersey, 1982.

M. Sc. Organic Chemistry Syllabus

2021-22 onwards

Program Code: CHEYVU

YOGI VEMANA UNIVERSITY

Vemanapuram, Kadapa-516 005, A.P., INDIA

(A State University, Accredited with "B" Grade by NAAC)

Program Educational Objectives (PEOs)

1. Students will learn fundamentals and advanced topics in the major fields of organic, inorganic, physical and analytical chemistry to improve their confidence levels to excel in teaching and research fields.
2. Students will be encouraged to improve their skills to design research project based on their firm theoretical understanding of the chemical sciences.
3. Students are motivated to pursue higher studies in the chosen field.
4. To impart sufficient knowledge to students in wide range of chemistry techniques and their applications in scientific domains.

Program Specific Outcomes (PSOs)

After the successful completion of M.Sc. organic chemistry program, the students will be able to

1. Apply advanced concepts of organic, inorganic, physical and analytical chemistry to solve the complex problems to improve the quality of human life.
2. Get sufficient expertise in the operational knowledge and laboratory skills in all major fields of chemistry.
3. Emphasize on integrating various disciplines of science and encourage for interdisciplinary/multidisciplinary approach.
4. Acquire the knowledge on the role of chemistry in industries and get trained for industrial entrepreneurship.

Program Outcomes (POs)

After successful completion of the M.Sc. organic chemistry program, the students will:

1. Gain sufficient training to meet current industrial needs.
2. Acquire the knowledge on the role of chemistry in industries and to become entrepreneur.
3. Understand the importance of chemistry in day to day life.
4. Gain advanced knowledge and insights in general and green chemistry.

YOGI VEMANA UNIVERSITY

Vemanapuram, Kadapa-516 005, Andhra Pradesh, INDIA

(A State University, Accredited with "B" Grade by NAAC)

M.Sc. Organic Chemistry

(For the students admitted during the academic year 2021–2022 onwards)

Course Code	Title of the Course	No. of Credits	Credit Hours/Week		Maximum Marks		
			Theory	Practical/ Project	IA[1] Marks	SEE[2] Marks	Total
FIRST SEMESTER							
CHE15031	Inorganic Chemistry – I	**04**	**04**	–	**25**	**75**	**100**
CHE15032	Organic Chemistry – I	**04**	**04**	–	**25**	**75**	**100**
CHE15033	Physical Chemistry – I	**04**	**04**	–	**25**	**75**	**100**
Internal Elective							
CHE15034A[3]	General Topics inChemistry	**04**	**04**	–	**25**	**75**	**100**
CHE15034B[3]	Materials Chemistry	**04**	**04**	–	**25**	**75**	**100**
CHE15034C[3]	Pharmaceutical Quality Control and Quality Assurance	**04**	**04**	–	**25**	**75**	**100**
CHE15035	Inorganic ChemistryPracticals	**04**	–	**24 (8 x 3 = 24)**	–	**100**	**100**
CHE15036	Organic Chemistry Practicals	**04**	–	**24 (8 x 3 = 24)**	–	**100**	**100**
	Tutorials and Seminars	–	**04**	–	–	–	–
	Total	**24**	**28**	**48**	**100**	**500**	**600**
SECOND SEMESTER							
CHE25031	Inorganic Chemistry – II	**04**	**04**	–	**25**	**75**	**100**
CHE25032	Organic Chemistry – II	**04**	**04**	–	**25**	**75**	**100**
CHE25033	Physical Chemistry – II	**04**	**04**	–	**25**	**75**	**100**
Open Elective							
CHE25034A[4]	Basics of Chemistry	**04**	**04**	–	**25**	**75**	**100**
CHE25034B[4]	Chemistry in day-to-day life	**04**	**04**	–	**25**	**75**	**100**
CHE25034C[4]	SWAYAM /MOOCs/ NPTEL[5]	**04**	–	–	**25**	**75**	**100**
CHE25035	Organic Chemistry Practicals	**04**	–	**24 (8 x 3 = 24)**	–	**100**	**100**

CHE25036	Physical Chemistry Practicals	**04**	–	**24 (8 x 3 = 24)**	–	**100**	**100**
	Tutorials and Seminars	–	**04**	–	–	–	–
	Total	**24**	**24**	**48**	**100**	**500**	**600**

THIRD SEMESTER							
CHE35031	Inorganic Chemistry – III	**04**	**04**	–	**25**	**75**	**100**
CHE35032	Organic Chemistry – III	**04**	**04**	–	**25**	**75**	**100**
CHE35033	Physical Chemistry – III	**04**	**04**	–	**25**	**75**	**100**
Open Elective							
CHE35034A[4]	Drug Discovery, Designand Development	**04**	**04**	–	**25**	**75**	**100**
CHE35034B[4]	Bio-analytical and ForensicChemistry	**04**	**04**	–	**25**	**75**	**100**
CHE35034C[4]	Environmental and Industrial Analytical Chemistry	**04**	**04**	–	**25**	**75**	**100**
CHE35035	Multistep Synthesis of Organic Compounds	**04**	–	**24 (8 x 3 = 24)**	–	**100**	**100**
CHE35036	Skill Oriented Course	**04**	**04**		**10**	**40**	**50**
				12 (4 x 3 = 12)		**50**	**50**
	Tutorials and Seminars	–	**04**	–	–	–	–
	Total	**24**	**32**	**36**	**110**	**490**	**600**
FOURTH SEMESTER							
CHE45031	Organic Chemistry – IV	**04**	**04**	–	**25**	**75**	**100**
CHE45032	Organic Chemistry – V	**04**	**04**	–	**25**	**75**	**100**
CHE45033	Organic Spectroscopy	**04**	**04**	–	**25**	**75**	**100**
Internal Elective							
CHE45034A[3]	Medicinal Chemistry and Natural Products	**04**	**04**	–	**25**	**75**	**100**
CHE45034B[3]	Industrial Organic Chemistry	**04**	**04**	–	**25**	**75**	**100**
CHE45034C[3]	Bio-organic Chemistry	**04**	**04**	–	**25**	**75**	**100**
CHE45035	Spectral Identification of Organic Compounds (UV, IR, ^{1}H & ^{13}C NMR and Mass)	**04**	–	**24 (8 x 3 = 24)**	–	**100**	**100**
Internal Elective							
CHE45036A[6]	Project Work	**04**	–	–			**100**
CHE45036B[6]	Multidisciplinary Course	**04**	–	**24 (8 x 3 = 24)**	–	–	**100**
	Tutorials and Seminars	–	**04**	–	–	–	–
	Total	**24**	**28**	**48**	**100**	**500**	**600**
	Grand Total	**96**			**400**	**2000**	**2400**

[1] IA: Internal Assessment; [2] SEE: Semester End Examination; [3] Internal Elective (IE) – Choose one paper; [4] Open Elective (OE) – Choose one paper; [5] Online Courses from MOOCs/SWAYAM/ NPTEL; [6] Project Work/Multidisciplinary Course - Choose one.

FIRST SEMESTER

CHE15031: INORGANIC CHEMISTRY – I

UNIT – I: Metal-ligand Bonding Theories

UNIT – II: Metal-ligand Equilibria in Solution and Theory of HSAB
UNIT – III: Reaction Mechanisms of Complexes

UNIT – IV: Carbonyl and Nitrosyl Complexes, and Metal Atom Clusters

---

Course Objectives:
The main objectives of this course are:

1. To gain knowledge about the metal-ligand bonding theories of complexes.
2. Understand the concepts of metal-ligand equilibria, theory of HSAB and its applications.
3. Learn the concepts of reaction mechanism, substitution reactions, acid hydrolysis, base hydrolysis and electron transfer reactions.
4. Understand the preparation, structure, and bonding carbonyl & nitrosyl complexes, and metal atom clusters.

Expected Course Outcomes:
After completion of this course students should be able to:

1. Understand the nature of metal – ligand bonding in coordination complexes throughcrystal field theory, molecular orbital theory and ligand field theory.
2. Further, students will familiarize the nature of reaction mechanism of transition metal complexes.
3. Students will also understand the concepts of bonding and structure of metal carbonyls and nitrosyls.

UNIT – I: Metal-ligand Bonding Theories 15 Hrs

Crystal field theory (CFT) for bonding in transition metal complexes; crystal field splitting of *d*-orbitals in octahedral, tetrahedral, tetragonal and square planar fields; crystal field stabilization energy (CFSE) and its calculation in six and four coordinated complexes; spectrochemical series with reference to ligands and metal ions; factors affecting the magnitude of Δ_O in octahedral complexes; Jahn–Teller effect and its consequences; shortcomings of CFT; covalency: evidence for covalency, Nephelauxetic effect; applications of crystal field theory – structure of spinels (normal and inverse); octahedral site specific energy (OSSE); molecular orbital theory: concept of ligand groups orbitals (LGOs), MO diagrams for octahedral, tetrahedral and square planar complexes, and MO treatment of π-bonds.

UNIT – II: Metal-ligand Equilibria in Solution and Theory of HSAB 15 Hrs

Metal-ligand Equilibria in Solution. Stepwise and overall formation constants and their interrelationship; trends in stepwise formation constants; factors affecting the stability of metal complexes; chelate effect; determination of binary formation constants by p^H-metry and spectrophotometric methods.

Theory of HSAB. Hard and soft acids and bases; classification; acid-base strength and hardness; symbiosis; electronegativity and hardness; application of HSAB: biological functions and toxicology of metals, and medicinal applications.

UNIT – III: Reaction Mechanisms of Complexes 15 Hrs

Reactivity of metal complexes; inert and labile complexes; kinetics and mechanisms of substitution reactions; kinetics of substitution reactions in octahedral complexes; acid hydrolysis and factors affecting acid hydrolysis; base hydrolysis; conjugate base mechanism; anation reactions; substitution reactions in square planar complexes; trans effect and mechanism of trans effect; electron transfer reactions, inner sphere and outer sphere mechanisms and Marcus theory.

UNIT – IV: Carbonyl and Nitrosyl Complexes, and Metal Atom Clusters 15 Hrs

Metal Carbonyl and Nitrosyl Complexes. Metal carbonyls: preparation of metal carbonyls of Mn, Fe, Co and Ni, bonding in carbonlys, EAN and 18-electron rule in carbonyls, π-bonding in carbonyls, terminal and bridging carbonyls, measurement of π-bond strength in carbonyls, structures of mononuclear, binuclear, trinuclear and tetranuclear carbonyls; metal nitrosyls: chemistry of linear and bent nitrosyls, nitrosyls as NO^+ and NO^- donors, analytical uses of nitrosyl complexes.

Metal Atom Clusters. Cage structures, higher boranes, carboranes, metal-metal bonds in carbonyl cluster, LNCCs and HNCCs, isoelectronic and isolobal relationships, hetero atom in metal atom clusters, electron counting schemes for HNCCs, HNCCs of Fe, Co, Ni, Ru, Rh, Pd, Os, Ir and Pt, lower halide and chalcogenide clusters, triangular clusters, solid state extended arrays.

Books suggested

[1] Advanced Inorganic Chemistry, F. A. Cotton, G. Wilkinson , M. Bochmann and R. N. Grimes, 5th Ed.(John Wiley& Sons Inc.).
[2] Inorganic Chemistry: Principles of Structure and Reactivity, J. E. Huheey, E. A. Keiter and R. L.Keiter, 4th Ed. (Prentice Hall).
[3] Inorganic Chemistry: G. Wulfsberg (University Science Books).
[4] Introduction to Ligand Fields, B. N. Figgis (Krieger Pub Co.).
[5] Concise Inorganic Chemistry, J. D. Lee, 5th Ed. (Wiley-Blackwell).
[6] Modern Inorganic Chemistry, W. L. Jolly, 2nd Ed. (McGraw-Hill).
[7] Coordination Compounds, S. F. Kettle (Springer).

CHE15032: **ORGANIC CHEMISTRY – I**

UNIT – I: Aromaticity

UNIT – II: Reaction Mechanism and Reactive Intermediates
UNIT – III: Substitution Reactions

UNIT – IV: Stereochemistry and Conformational Analysis

Course Objectives:
The main objectives of this course are:

1. To know about the basic concept of aromaticity of the organic molecules.
2. To understand the reaction mechanism, preparation, geometry and stability of reaction intermediates.

3. To understand the reaction mechanism of the aliphatic & aromatic nucleophilic and aromatic electrophilic substitution reactions.

4. To acquire basic knowledge about the concept of chiraity in stereoisomers, and conformational analysis.

Expected Course Outcomes:

On the successful completion of the course, student will be able:

1. To learn the structural and electronic criteria of aromaticity and its applications in benzenoid & non-benzenoid, charged ring, fused-ring and heteroaromatic systems.
2. To understand the physical parameters of organic reactions, basic principles of reaction mechanisms.
3. To gain detailed knowledge on reaction intermediates.
4. To understand the basics of reaction mechanism of the S_N1, S_N2, SET, S_Ni and S_NAr reactions andtheir applications through the name reactions.
5. To learn the physical parameters and reaction mechanism of aromatic electrophilic substitution reactions and their applications via the name reactions.
6. To understand the concept of chiraity, geometrical isomerism, axial chirality, planar chirality, atropisomerism and their applications.
7. To acquire thoroughness in conformational analysis of acylic and alicylic systems.

Unit I: Aromaticity 15 Hrs

Localization, delocalization, conjugation, resonance, the energy, structural and electronic criteria for aromaticity; relationship among energetic, structural and electronic criteria; Huckle's rule and molecular orbitaltheory, aromaticity in benzenoid and non-benzenoid compounds; aromaticity in charged ring fused-ring systems; heteroaromatic systems; annulenes: cyclobutadiene, benzene,1,3,5,7- cyclooctatetraene, [10] annulenes-1,3,5,7,9-cyclodecapentaene isomers, and [12]-, [14]-, [16]- and [18]- annulenes; azulenes; fulvenes; fullerenes; ferrocene; anti-aromaticity; homo-aromaticity.

UNIT – II: Reaction Mechanism and Reactive Intermediates 15 Hrs

Reaction Mechanism. Types of bond cleavage; general classification of organic reactions; potential energy diagrams; thermodynamic requirements; kinetic requirements; kinetic and thermodynamic control; general methods of determination of reaction mechanism.

Reactive Intermediates. General methods of generation, geometry, stability and reactivity of carbocations, carbanions, free radicals, carbenes, nitrenes and arynes.

UNIT – III: Substitution Reactions 15 Hrs

General introduction, classification of substitution reactions.

Nucleophillic Substitutions. i. Aliphatic nucleophillic substitutions. S_N1 and S_N2 reactions: mechanism, energy profile diagram and stereochemistry; SET and S_Ni mechanisms; neighbouring group participation: criteria for determining the participation of neighbouring group, neighbouring group participation involving halogens, oxygen, sulphur, nitrogen, aryl, σ and π- bonds. **ii. Aromatic nucleophilic substitution.** Introduction; S_NAr and benzyne mechanisms; von Richter, Sommelet-Hauser and Smiles rearrangements.

Aromatic Electrophilic Substitutions. Introduction; arenium ion mechanism-S_E2 reaction; orientation and reactivity; energy profile diagram; diazonium coupling; Vilsmeier reaction; Gattermann-Koch reaction; Pechman

reaction; Reimer-Tiemann reaction.

UNIT – IV: Stereochemistry and Conformational Analysis
15 Hrs

Concept of Chirality. Definitions: enantiomer, diastereomer, invertomer, homomer, epimer, anomer; *R*, *S* nomenclature; molecules with single chiral center: tricoordinate and tetracoordinate; molecules with two and more chiral centers: constitutionally unsymmetrical and symmetrical, erythro - threo nomenclature; chiral manifestations.

Aspects of Geometrical Isomerism (π-Diastereoisomerism). *Cis-trans*, and *E-*, *Z-* nomenclature; methods of determining configuration of geometrical isomers using physical, spectral and chemical methods; stability; *cis-trans* interconversion.

Stereoisomerism in Molecules without Chiral Center. Axial chirality: Allenes, alkylidenecycloalkanes, spiranes, nomenclature. **Atropisomerism:** Biphenyl derivatives, nomenclature. **Planar Chirality:** Ansa compounds, paracyclophanes, *trans*-cyclooctene, helicity.

Conformational Analysis. 2,3-dimethylbutane; conformation and intramolecular hydrogen bonding: ethylene glycol, 2-chloroethanol; 2,3-dibromobutane; butane-2,3-diol; disubstituted cyclohaxanes; cyclohexene; cyclohexanone; decalin; 9-methyldecalin.

Books Suggested

[1] Advanced Organic Chemistry-Reactions, Michael B. Smith and Jerry March, Reactions, Mechanismand structure, 6th Ed. (John Wiley & Sons).
[2] Organic Chemistry, Francis A. Carey, 4th Edition, (McGraw-Hill Higher Education).
[3] Organic Chemistry, Paula Yurkanis Bruice, 4th Ed. (Printice Hall).
[4] Organic chemistry-Clayden, Greeves, Warren and Wothers, (Oxford University Press, 2001).
[5] Organic Chemistry, Leroy G. Wade. JR, Jan William Simek, M. S. Singh, 9th Ed. (Pearson, 2017)
[6] Advanced Organic Chemistry, Part A, Structure and Mechanism, Francis A. Carey, Richard J Sundberg (Springer 2007)
[7] Advanced Organic Chemistry: Reactions and mechanisms, Miller Bernard, 2nd Ed. (Pearson, 1997).
[8] Organic Chemistry Structure and Reactivity, Ege Seyhan,3rd Ed.(Prentice Hall and Macmillan,1994).
[9] Stereochemistry to Organic Compounds, Ernest L. Eliel, (John Wiley, 2008).
[10] Introduction to stereochemistry and conformational analysis, Eusebio Juaristi, 1st Ed (Wiley, 1991)
[11] Stereochemistry to Organic Compounds, Principles and Applications D. Nasipuri, 4th Ed. (New AgeInternational, 2020).
[12] Stereochemistry, Conformation and Mechanism, P.S. Kalsi, 8th Ed. (New Age International, 2015).

CHE15033: PHYSICAL CHEMISTRY – I

UNIT – I : Quantum Chemistry – I

UNIT – II: Chemical Dynamics – I

UNIT – III: Thermodynamics – I

UNIT – IV: Electrochemistry – I

Course Objectives:

The main objectives of this course are:

1. To give a thorough introduction to the study of quantum chemistry, chemical dynamics, thermodynamics and electrochemistry.

2. Understanding of physical and mathematical aspects of quantum mechanics, theories and basics of chemical dynamics thermodynamics and electrochemistry and various applications of electrochemical and dynamics of chemical approaches
3. Expose students to quantum mechanical operators, dynamics of chemical reactions, electrochemical reactions and related mathematical topics.

Expected Course Outcomes:

On the successful completion of the course, student will be able to

1. Acquire in depth knowledge in quantum mechanics, quantum chemistry, chemical dynamics thermodynamics and electrochemistry.
2. Understand the principles and applications of Schrodinger wave equation, slow and fast reaction, entropy, electrochemical cell models, batteries.
3. Apply theory to support experimental results.

UNIT – I : Quantum Chemistry – I 15 Hrs

Introduction to Exact Quantum Mechanical Results. Operator algebra; Eigen values and Eigen functions; operators for momentum and energy; linear combination of Eigen functions of an operator; the Schrodinger wave equation and the postulates of quantum mechanics; discussion of solutions of the Schrodinger equation to some model systems, viz., particle in a box, harmonic oscillator, rigid rotor, hydrogen atom.

Approximate Methods. The variation theorem; perturbation theory (first order and non-degenerate); application of variation method perturbation theory and perturbation theory to the helium atom.

UNIT – II: Chemical Dynamics – I 15Hrs

Theories of Reaction Rates. Collision theory; steric factor; theory of absolute reaction rates-reaction coordinate, activated complex and the transition state; thermodynamic formulation of reaction rates; Arrhenius equation.

Unimolecular Reactions. Lindemann, Lindemann-Hinshelwood, and RRKM theories; termolecular reactions; complex reactions-rate expressions for opposing, parallel and consecutive reaction (all first order type).

Chain Reactions. Dynamic chain; hydrogen-bromine reaction; pyrolysis of acetaldehyde; decomposition of ethane; photochemical reactions-H_2-Br_2, H_2-Cl_2 reactions; autocatalysis; H_2-O_2 reaction; explosion limits; rate expressions for chain reaction.

UNIT – III: Thermodynamics – I 15 Hrs

Brief Review of Thermodynamic Concepts. Enthalpy; entropy; free energy; concept of entropy; entropy as a state function; entropy change in reversible process and irreversible process; temperature-entropy diagrams; entropy change and phase change; entropy of mixing; entropy and disorder-residual entropy; Maxwell relations.

Classical and Statistical Thermodynamics. Partial molar properties: their significance and determination of partial molar volume, fugacity and its determination; concept of distribution; thermodynamic probability and most probable distribution; ensemble averaging; postulates of ensemble averaging; canonical; grand canonical and micro-canonical ensembles; partition functions; translational, rotational, vibrational and electronic partition functions; Gibbs-Duhem equation; calculation of thermodynamic

properties in terms of partition functions; heat capacity; chemical equilibria and equilibrium constant in terms of partition functions; entropy of monatomic gases (Sackur-Tetrade equation).

UNIT – IV: Electrochemistry – I 15 Hrs

Strong Electrolytes. Effect of dilution on equivalent conductance-Inter ionic attraction; Debye-Huckel- Onsager treatment; derivation of Debye-Huckel-Onsager equation; verification and limitation of Onsager equation; Bjerrum treatment of electrolytes; Debye-Falkenhagen and Wien effects.

Activity and Activity Coefficients. Relation between different types of activity coefficients; determination of mean ionic activity coefficients by solubility and EMF methods; Debye-Huckel limiting law and its verification (qualitative).

Reversible Electrochemical Cells. Chemical cells and concentration cells; types of reversible electrodes; electrode potentials; reactions in reversible cells; Nernst equation; thermodynamic and kinetic derivation; concentration cells with and without transference; liquid junction potential and its determination; determination of standard potentials; significance of standard half-cell potentials; applications of electrochemical cells; commercial cells; conductometric and potentiometric titrations.

Books suggested

[1] Physical Chemistry, P. W. Atkins (ELBS).
[2] Introduction to quantum Chemistry, A. K. Chandra (Tata McGraw Hill).
[3] Quantum Chemistry, Ira N. Levine (Prentice Hall).
[4] Atomic Structure and chemical bond, Manas Chandra.
[5] Chemical Kinetics, K.J.Laidler (McGraw Hill).
[6] Kinetics and Mechanism of chemical Transformations, J. Rajaraman and J. Kuriacose (Mcmilan) .
[7] Thermodynamics for Chemists, S. Glasstone.
[8] Chemical Thermodynamics, I. M. Klotz.
[9] Statistical Thermodynamics, M. Dole.
[10] Modern Electrochemistry, vol. I & II, J. O. M. Bockris and A. K. N. Reddy (Plenum).
[11] An Introduction to Electrochemistry (3rd ed.), S. Glasstone (A fffilated East-West).

INTERNAL ELECTIVES

CHE15034A: GENERAL TOPICS IN CHEMISTRY

UNIT – I: Symmetry and Group Theory

UNIT – II: Errors and Statistical Treatment

UNIT – III:

Chromatographic Techniques
UNIT – IV: Molecular Spectroscopy

Course Objectives:

The main objectives of this course are:

1. To understand the fundamentals of various point groups, symmetry, and group theory aspects.
2. To acquire sufficient knowledge on understanding the errors and statistical treatment of analytical data.
3. To provide opportunities to students to understand various types of chromatographic techniques and their applications.

4. Expose students to understand the fundamental principles of molecular spectroscopy including microwave, IR, and Raman spectroscopies and various rules involved.

Expected Course Outcomes:

By learning this course, students are able to:

1. Derive the symmetry of chemical substances that is needed in designing the chemical substances and estimating the physical properties of matter including spectroscopic characteristics.
2. Students are also estimates the errors in chemical analysis, understand the limits of errors, perform the corrections and realizes the significance of chemical analysis.
3. Further students gain knowledge in choosing proper spectroscopic and chromatographic techniques based on the nature of interactions, physical and chemical properties of the chemical substances while their analysis.

UNIT – I: Symmetry and Group Theory 15 Hrs

Symmetry elements and symmetry operation; definitions of a group, sub-group; relation between orders of a finite group and its sub-group; conjugacy relation and classes-point symmetry group; Schonflies symbols; representation of groups by matrices (representation for C_{n9} C_{nv9} D_{nh9} etc. groups to be worked out explicitly); character of a representation; the great orthogonality theorem (without proof); character tables and their use in spectroscopy.

UNIT – II: Errors and Statistical Treatment 15 Hrs

Introduction; Sources of errors; accuracy; precision; minimization of errors; average; median values; absolute error; relative error; mean deviation; relative mean deviation; standard deviation; relative standard deviation; variance; range; confidence interval; comparison of results: F-test and student's t- test (i. comparison of mean and true value, ii. comparison of two means and iii. comparison of more than two means - ANOVA); Dixon's Q-test; Gaussian distribution of random errors; correlation and regression; significant figures and rules for computations

UNIT – III: Chromatographic Techniques 15Hr

Definition and classification; principle, materials, methods and applications of paper chromatography, thin layer chromatography, column chromatography, size exclusion chromatography, ion exchange chromatography; high performance liquid chromatography (HPLC): principle, instrumentation and applications; gas chromatography (GC): principle, instrumentation, GC columns, detectors and applications.

UNIT – IV: Molecular Spectroscopy 15Hrs

Microwave Spectroscopy. Classification of molecules; rigid rotor model; non-rigid rotor; stark effect.

Infrared Spectroscopy. Review of linear harmonic oscillator; vibrational energies of diatomic molecules; zero-point energy; force constant; bond strengths; anharmonicity; Morse potential energy diagram; vibration-rotation spectroscopy; PQR branches; vibrations of simple polyatomic molecules (CO_2, H_2O etc.); selection rules; exclusion principle.

Raman Spectroscopy. Classical and quantum theories of Raman effect; pure rotational, vibrational and vibrational-rotational spectra; rotational Raman spectra; selection rules.

Books Suggested

[1] Symmetry and Spectroscopy molecules –K. Veera Reddy, New Age Publications, New Delhi.
[2] Chemical Applications of Group Theory by Bhattacharya.
[3] Vogel's Text Book of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D. Barnes and M.J.Thomas, 4th& 6th Ed.(Pearson Education Asia).
[4] Instrumental Methods of Analysis, H. W. Willard, L. L. Merritt and J. A. Dean (Affiliated East-West).
[5] Principles of Instrumental Analysis, D. A. Skoog and D. M. West (Holt, Rinehart and Wilson).
[6] Separation Process Principles, J. D. Seader and E. J. Henley (John Weily& Sons Inc).
[7] Physical and Chemical Methods of Separation, E. W. Berg (McGraw Hill).
[8] Physical Methods in Chemistry, R. S. Drago (Saunders).
[9] Introduction to molecular Spectroscopy, G. M. Barrow (McGraw Hill).

CHE15034B: MATERIALS CHEMISTRY

UNIT – I: Preparation Methods

UNIT – II: Characterization of Materials

UNIT – III: Magnetic and

Optical Properties of Materials UNIT – IV: Materials for Fuel Cells and Batteries

Course Objectives:

The main objectives of this course are:

1. To understanding the various types of methods for nanomaterials preparation.
2. To gain knowledge on characterization of nanostructured materials.
3. To understand the properties of nanomaterials.
4. To gain knowledge on the application of nanomaterials especially for fuel cells and batteries.

Expected Course Outcomes:

By learning this course, students will

1. Develop fundamental knowledge regarding the synthesis and characterization of nanomaterials.
2. This course also allows students to understand the detailed magnetic and optical properties of materials in nanoscale regime.
3. Students will expose to the application of nanomaterials particularly in the field of energy conversion (through fuel cells) and energy storage (through batteries).

UNIT – I: Preparation Methods 15 Hrs

Chemical precipitation and co-precipitation; metal nanocrystals by reduction; sol-gel synthesis; microemulsions or reverse micelles; solvothermal synthesis; microwave heating synthesis; sonochemicalsynthesis.

UNIT – II: Characterization of Materials 15 Hrs

X-Ray diffraction (XRD); scanning electron microscopy (SEM); transmission electron microscopy (TEM); atomic force microscopy (AFM).

UNIT – III: Magnetic and Optical Properties of Materials 15 Hrs

Magnetic properties - dia, para, ferro, anti-ferro and ferri magnetism; measurements - magnetic moment and magnetic susceptibility; optical properties - optical absorption and band gaps; luminescence: principle, characteristics and materials.

UNIT – IV: Materials for Fuel Cells and Batteries 15 Hrs

Proton exchange membrane fuel cells; material aspects; lithium battery materials; electrode and electrolyte materials.

Books Suggested

[1] Nanochemistry: A Chemical Approach to Nanomaterials; G.A. Ozin, A.C. Arsenault and L. Cademartiri (RSC, London).

[2] Nanocomposite Science and Technology; P.M. Ajayan, L.Z. Schadler and P.V. Brown (Wiley).

[3] Characterization of Nanophase Materials; Z.L. Wang (ed.) (Wiley-VCH).

CHE15034C: PHARMACEUTICAL QUALITY CONTROL AND QUALITY ASSURANCE

UNIT – I: Quality Audit Documentation and Handling UNIT – II:

Organization and Personnel Responsibilities UNIT – III: Regulatory Aspects and Quality Control UNIT – IV: Basic concepts of Quality Assurance

Course Objectives:

The main objectives of this course are:

1. To know about the basics of quality audit like SOP, ICH, ISO etc.
2. To understand the various documentation processes and handling of materials.
3. To understand the organizational responsibilities and personal responsibilities in the pharma sector.
4. To acquire basic knowledge about the regulatory aspects and quality control.
5. To know about the Basic concepts of Quality Assurance

Expected Course Outcomes:

On the successful completion of the course, student will be able:

1. To learn the preliminary issues of standard operating procedure, international conference harmonization, ISO-9000, ISO-14000 etc.
2. To get awareness about the methods of documentation and handling of materials.

3. To gain detailed knowledge on organizational responsibilities and personal responsibilities in the maintenance of pharma industry.
4. To develop knowledge validation procedures and regulatory aspects of and quality control aspects
5. To understand the basics of Quality Assurance.

UNIT – I: Quality Audit, Documentation and Handling 15 Hrs

Quality audit. Standard operating procedure (SOP); international conference harmonization (ICH); ISO-9000; ISO-14000, WHO specifications, USFDA guidelines and ICMR.

Documentation and Handling : Manufacturing documents, Master Formula, batch formula, Record,Distribution of records, Handling of returned goods, Recovered materials and Reprocessing.

UNIT – II: Organization and Personnel Responsibilities 15 Hrs

Training, Hygiene, Premises: Location, Design, Plant layout, Construction, Maintenance and Sanitations. Environmental control, Sterile areas, control of contamination.

UNIT – III: Regulatory Aspects and Quality Control 15 Hrs

Regulatory aspects. Validation of Personnel, Equipment and cleaning methods, regulatory aspects ofpharmaceutics.

Quality Control. In-process quality Control on various dosage forms, Sterile and non- sterile operations.

UNIT – IV: Basic concepts of Quality Assurance 15Hrs

Basic concepts, principles or prescription, Needs, requirements and expectations, characteristics ofquality, Achieving, sustaining and improving quality, Quality dimensions and costs of quality.
Elements of quality Assurance, Quality Management System, Quality management concepts andprinciples: ISO 9001:2000, QMS Case studies on ISO 9001: 2000 in chemical industries.

Books Suggested

[1] R. Pannerselvam, Production and Operations Management, Prentice Hall India Learning Pvt. Ltd 3rd Ed., 2012.
[2] M. Savsar, Quality Assurance and Management, InTech-Croatia, 2012, ISBN 978-953-51-0378-3.
[3] D.C. Montgomery, Statistical Quality Control, John Wiley & Sons, 5th Ed., 2005.
[4] M. K. Starr, Production and Operations Management, Biztantra, Delhi, 2004.
[5] D.H. Shah, QA Manual, Business Horizons, 2000 .
[6] D.H. Besterfield, C. Besterfield-Michna, G.H. Besterfield, M. Besterfield-Sacre, Total Quality Management, Pearson Education, Inc., 3rd Ed., 2003.
[7] P. Konieczka, J. Namiesnik, Quality Assurance and Quality Control in the Analytical Chemical Laboratory: A Practical Approach, 1st Ed., CRC press 2009.
[8] D. Hoyle, ISO 9000 Quality Systems Handbook, 5th Ed., Butterworth Heinemann-Elsevier, New York,2006.
[9] E. Prichard, V. Barwick, Quality Assurance in Analytical Chemistry, John Wiley & Sons, 2007.

CHE15035: INORGANIC CHEMISTRY PRACTICALS

Course Objectives:
The main objectives of this course are:

1. To train students to improve skills in preparation and processing of inorganic complexes.
2. To gain knowledge in the quantitative analysis of inorganic complexes.

Expected Course Outcomes:
On the successful completion of the course, student will be able:

1. Gain knowledge on preparation and estimation of inorganic complexes.

---

1. Preparation and Purification of Inorganic Complexes

a) Chloropentamminecobalt(III)chloride
b) *Bis*(oxalate)cuprate(II)dehydrate
c) *Tris*(oxalato)ferrate(III)

d) Hexaamminenickel(II)chloride
e) Tetra (ammine) copper(II) sulphate.
f) Tris(acetylacetonato) Manganese(III) chloride
g) Tris(ethylenediammine) nickel(II) thio sulphate

2. Complex Analysis

a) Estimation of cobalt present in chloropentamminecobalt(III)chloride
b) Estimation of copper present in *bis*(oxalate)cuprate(II)dehydrate
c) Estimation of iron present in *tris*(oxalato)ferrate(III)
d) Estimation of nickel present in hexaamminenickel(II)chloride.
e) Estimation ofcopper in Tetra (ammine) copper(II) sulphate by titrating with sodium thiosulphate.
f) Estimation of Manganese inTris(acetylacetonato) Manganese(III) chloride by Volhard's method.
g) Estimation of nickelin Tris(ethylenediammine) nickel(II) thio sulphate by EDTA (Back titration).

Book Suggested

Vogel's Text Book of Quantitative Chemical Analysis, J. Mendham, R. C. Denney, J. D. Barnes and M. J.Thomas, 4th& 6th Ed. (Pearson Education Asia).

CHE15036: ORGANIC CHEMISTRY PRACTICALS

Course Objectives:
The main objectives of this course are:

1. To understand the basic principles of method of separation of binary mixture of organic compounds.
2. To understand the preparation, purification and identification of organic compounds through single step synthesis.

Expected Course Outcomes:
On the successful completion of the course, student will be able:

1. To get skill in the separation of binary mixture of organic compounds.
2. To attain hands on experience in the simple organic synthetic methods like methylation, nitration, oxidation, reduction, condensation, addition etc.
3. To attain hands on experience in the purification methods like recrystallisation.

Separation of a binary mixture and single step preparation of organic compounds

i) Identification of method of separation of binary mixture or organic compounds.

ii) Single step preparations

Preparation, recrystallization, and determination of melting point & yield of **i.** nerolin, **ii.** *p*-nitro acetanilide, **iii.** *m*-dinitrobenzene, **iv.** phthalimide, **v.** hippuric acid, **vi.** 2,3-diphenylquinoxaline, **vii.** Diels- Alder adduct, **viii.** benzotriazole, **ix.** 7-hydroxy-4-methylcoumarin, and **x.** phenothiazine.

Book Suggested

Vogel's Text Book of Practical Organic Chemistry, B.S. Furniss, A.J. Hannaford, P.W.G. Smith, A.R. Tatchell, 5Ed. (Longman Scientific & Technical).

SECOND SEMESTER

CHE25031: INORGANIC CHEMISTRY – II

UNIT – I: Organometallic Chemistry

UNIT – II: Transition Metal π-Complexes

UNIT – III: Electronic Spectra of transition metal complexes and inner transition metals

UNIT – IV: Magnetic Properties of Transition Metal Complexes and inner transition metals

Course Objectives:

The main objectives of this course are:

1. To give the principles of organometallic chemistry.
2. To gain knowledge on synthesis, properties, structure and bonding of transition metal π-Complexes
3. Expose students to analyze electronic spectra of transition metal complexes and inner transition metals.
4. Develop knowledge on magnetic properties of transition metal complexes and inner transition metals.

Expected Course Outcomes:

On the successful completion of the course, student will be able:

1. Understand the role of organometallic reagents in various important reactions like hydroformylation, oxopalladation, Ziegler – Natta polymerization.
2. Understand the preparation and properties, nature of bonding and structure of transition metal pi-complexes.
3. Understand the electronic spectra of complexes, calculation of microstates, findout ground state terms with their energies, spin and orbital selection rules, energy correlation diagrams (Orgel and Tanabe-Sugano diagrams), charge transfer spectra.
4. Gain knowledge on the magnetic properties of complexes and understand spin-only and effective magnetic moments, determination of magnetic susceptibility.

UNIT – I: Organometallic Chemistry 15 Hrs

Stoichiometric reactions in catalysis; homogeneous catalytic hydrogenation; hydroformylation (oxoreaction); isomerization; Zeigler-Natta polymerization of olefins; oxopalladation reactions; activation of small molecules by coordination; fluxionality and dynamic equilibria in compounds such as η^2-olefin, η^3-allyl and dienyl complexes.

UNIT – II: Transition Metal π-Complexes 15 Hrs

Transition metal π-complexes with unsaturated organic molecules such as alkenes, alkynes, allyl, diene, dienyl, arene and trienyl complexes, general methods of preparation, properties, nature of bonding and structural features, important reactions relating to nucleophilic and electrophilic attack on ligands.

UNIT – III: Electronic Spectra of transition and inner transition metal Complexes 15 Hrs

Free Ion terms and energy levels: configurations, terms, states and microstates; calculation of microstates for p^2 and d^2 configuration; L-S (Russell-Saunders) coupling schemes; J-J coupling scheme;

derivation of terms for p^2 and d^2 configuration; hole formulation; energy ordering of terms (Hund's Rules); Selection rules: Laporte orbital selection rule, spin selection rules; splitting of energy levels and spectroscopic states, Orgel diagrams of d^1 to d^9 metal complexes; interpretation of electronic spectra of aquo complexes of Ti(III), V(III), Cr(III), Mn(II), Fe(II), Fe(III), Co(II), Ni(II) and Cu(II); calculation of interelectronic and spectra parameters for d^8 metal complexes; Tanabe-Sugano diagrams for d^2 and d^6 octahedral complexes; charge transfer (L → M and M → L) spectra of metal complexes. Spectral properties of inner transition metal complexes (lanthanides and actinides).

UNIT – IV: Magnetic Properties of Transition and inner transition Metal Complexes 15 Hrs

Diamagnetism; paramagnetism; orbital and spin contributions; spin-orbit coupling; Hund's third rule and energies of J levels; Curie law and Curie-Weiss law; ferromagnetism and antiferromagnetism; temperature independent magnetism; magnetic susceptibility and determination of magnetic susceptibility by Gouy method; paramagnetism and crystalline fields – Ti^{3+}, V^{3+}, VO^{2+}, Cr^{3+}, Mn^{2+}, Fe^{3+}, Co^{2+}, Ni^{2+} and Cu^{2+}; magnetic exchange in copper acetate and other dimers. Magnetic properties of innertransition metal complexes (lanthanides and actinides).

Books Suggested

[1] Advanced Inorganic Chemistry, F. A. Cotton, G. Wilkinson , M. Bochmann and R. N. Grimes, 5th Ed.(John Wiley& Sons Inc.).
[2] Inorganic Chemistry: Principles of Structure and Reactivity, J. E. Huheey, E. A. Keiter and R. L.Keiter, 4th Ed. (Prentice Hall).
[3] Inorganic Chemistry: G. Wulfsberg (University Science Books).
[4] Introduction to Ligand Fields, B. N. Figgis (Krieger Pub Co.).
[5] Concise Inorganic Chemistry, J. D. Lee, 5th Ed. (Wiley-Blackwell).
[6] Modern Inorganic Chemistry, W. L. Jolly, 2nd Ed. (McGraw-Hill).
[7] Coordination Compounds, S. F. Kettle (Springer).
[8] Magnetochemistry, R. L. Carlin (Springer-Verlag New York).
[9] Elements of Magnetochemistry R. L. Dutta, A. Syamal, 2nd Ed. (Affiliated East-West Press Pvt. Ltd).
[10] The Organometallic Chemistry of the Transition Metals, R. H. Crabtree, 3rd and 4th Ed. (Wiley Interscience).
[11] Organometallic Chemistry: A Unified Approach, R. C. Mehrotra, A. Singh, 2nd Ed. (New Age International).
[12] Principles of Organometallic Chemistry, P. Powell, 2nd Ed. (ELBS).

CHE25032: ORGANIC CHEMISTRY – II

UNIT – I: Addition Reactions

UNIT – II: Elimination, Esterification and Hydrolysis Reactions

UNIT – III: Molecular Rearrangements

UNIT – IV: Nomenclature and Aromaticity of Heterocycles

Course Objectives:

The main objectives of this course are:

1. To understand the mechanism of electrophilic, nucleophilic and free radical addition reactions.

2. To understand the reaction mechanism of condensation reactions via the name reactions.
3. To understand the mechanism of elimination, esterification and hydrolysis reactions.
4. To understand the mechanism and applications of various classes of molecular rearrangement reactions.
5. To acquire basic knowledge on systematic nomenclature and aromatic behavior of heterocyclic compounds.

Expected Course Outcomes:

On the successful completion of the course, student will be able:

1. To learn the mechanism and stereochemical aspects of addition reactions involving electrophiles, nucleophiles and free radicals.
2. To understand the reaction mechanism of condensation reactions and their applications through named reactions.
3. To learn the mechanism and stereochemical aspects of variety of elimination reactions like E1, E2 and E1cB etc.
4. To gain detailed knowledge about various esterification reactions.
5. To understand the mechanism and applications of hydrolysis of ester, acid halide and amide.

UNIT – I: Addition Reactions 15 Hrs

Introduction; addition reactions involving electrophiles (Br_2, HBr, HOBr, and H_2O/H_2SO_4); nucleophilic additions (Aldol, Cannizaro, Michael, Robinson anulation, Baylis-Hilman Reaction, Darzens condensation, Mannich, Claisen, Dieckmann, Perkin, Knoevenagel, Claisen-Schmidt, Benzoin and Stobbe condensation reactions, Grignard and Wittig reactions); free radical additions -Kharash peroxide effect;

Stereospecificity in addition reactions: bromination, dihydroxylation, hydroboration, hydrogenation and epoxidation reactions.

UNIT – II: Elimination, Esterification and Hydrolysis Reactions 15 Hrs

Elimination Reactions. Introduction; type of eliminations: α-, β- and γ-eliminations; Zaitsev (Saytzeff) and Hofmann rules; mechanism: E1, E2 and E1cB; competition between elimination and substitution; stereochemistry and orientation in E2 eliminations; pyrolytic syn elimination; dehydration of alcohols; dihydro-eliminations of C-C, C-O and C-N; dihalo-elimination; decarboxylative eliminations; molecular rearrangement during elimination; fragmentation reactions.

Esterification Reactions. Reaction between carboxylic acid and alcohol: Fischer,MitsunobuandSteglichesterifications; reaction between acid halide and alcohols; reaction between carboxylic acid and alkyl halides; trans esterification.

Hydrolysis Reactions. General mechanism and applications of ester hydrolysis in acidic and basic conditions; hydrolysis of acid halides; hydrolysis of amides.

UNIT – III: Molecular Rearrangements 15 Hrs

Introduction; types of molecular rearrangements; migratory aptitude; rearrangements to electron deficient carbon: pinacol-pinacolone, Wagner-Meerwein, Wolff, dienone-phenol, benzil-benzilic acid, Demjanov and Tiffeneau–Demjanov rearrangements; rearrangements to electron deficient nitrogen: Beckmann, Hofmann, Curtius, Schmidt

and Lossen rearrangements; rearrangements to electron deficient oxygen: Baeyer-Villiger and Dakin rearrangements; rearrangements to electron rich carbon:

Favorskii, Neber and Witting rearrangements; rearrangements to aromatic ring: Claisen, thermal Fries, benzidine and Hofmann-Martius rearrangements.

UNIT – IV: Nomenclature and Aromaticity of Heterocycles 15 Hrs

Nomenclature of Heterocycles. Systematic nomenclature (Hantzsch-Widman system); trivial system; fusion nomenclature system; replacement nomenclature system; monocyclic heterocycles, fused heterocycles, spiroheterocycles; bridged heterocycles; bicyclic systems; polycyclic systems; heterocyclic ring assemblies.

Aromaticity of Heterocycles. Chemical behavior of aromatic heterocycles; five and six-membered aromatic heterocycles and mixed aromatic heterocycles; relationship with carbocyclic aromatic compounds; criteria of aromaticity in heterocycles; structural and electronic criteria.

Books Suggested

[1] Advanced Organic Chemistry-Reactions, Michael B. Smith and Jerry March, Reactions, Mechanism and structure, 6th Ed. (John Wiley & Sons, 2006).
[2] Organic Chemistry, Francis A. Carey, 4th Edition, (McGraw-Hill Higher Education).
[3] Organic Chemistry, Paula Yurkanis Bruice, 4th Ed. (Printice Hall).
[4] Organic chemistry-Clayden, Greeves, Warren and Wothers, (Oxford University Press, 2001).
[5] Organic Chemistry, Leroy G. Wade. JR, Jan William Simek, M. S. Singh, 9th Ed. (Pearson, 2017)
[6] Advanced Organic Chemistry, Part A, Structure and Mechanism, Francis A. Carey, Richard J Sundberg, 5th Ed (Springer 2007)
[7] Advanced Organic Chemistry, Part B, Reactions and Synthesis, Francis A. Carey, Richard J Sundberg, 5th Ed (Springer 2008)
[8] Strategic Applications of Named Reactions in Organic Synthesis, Laszlo Kurti, Barbara Czako(Elsevier, 2005)
[9] A Guide Book to Mechanism in Organic Chemistry, Peter Sykes, 6th Ed., (Longman and Wiley)[10]Heterocyclic Chemistry Vol. 1-3, R. R. Gupta, M. Kumar, V. Gupta, Springer Verlag
[11] Heterocyclic Chemistry, J.A.Joule, Keith Mills, 5th Edition ((Wiley 2010)
[12] Fundamentals of Heterocyclic Chemistry, Louis D. Quin, John A Tyrell (Wiley 2010)

CHE25033: PHYSICAL CHEMISTRY – II

UNIT – I: Quantum Chemistry – II

UNIT – II: Chem

ical Dynamics – II

UNIT – III: Thermodynamics – II

UNIT – IV: Electrochemistry – II

Course Objectives:

The main objectives of this course are:

1. To present the applicative aspects of quantum chemistry, quantum chemistry, chemical dynamics thermodynamics and electrochemistry.
2. To learn the theories and applications of quantum mechanical treatment of angular momentum, conjugated systems, homogenous and heterogeneous catalysis, laws of classical and statistical thermodynamics, electrochemistry.

3. To develop a vast knowledge in the interpretation of various physical quantities involved in Thermodynamics, Debye -Hückel Limiting Law, apply theories in electrochemistry to analyzeelectrode kinetics.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1. Understand the concepts and applications of quantum chemistry, kinetics of catalytic reactions, classical and statistical thermodynamics, partition function. toanalyze the variation of fugacity, heat capacities.
2. Apply theory to support experimental results

UNIT – I: Quantum Chemistry – II 15 Hrs

Angular momentum. Angular momentum; rotations and angular momentum; Eigen functions and Eigen values of angular momentum; ladder operator; addition of angular momenta; spin angular momenta; anti-symmetry and Pauli Exclusion Principle; Slater determinant.

Molecular Orbital Theory. Hückel theory of conjugated systems; π-bond order and charge density calculations; application to ethylene, butadiene and benzene; molecular term symbols; Russell– Saunders coupling.

UNIT – II: Chemical Dynamics – II 15 Hrs

Acid Base Catalysis. Specific acid catalysis and general acid catalysis (hydrolysis of ester and vinyl ether); specific base catalysis and general base catalysis (the alcohol reaction anD hydrolysis of acetic anhydride); protolytic and prototropic mechanism.

Homogeneous and Heterogeneous Catalysis. Homogeneous catalysis; catalysis by transition metal ions and their complexes; industrially important processes; supported transition metal complexes as catalysts; bimolecular reactions; electronic theories of chemisorption and heterogeneous catalysis.

Introduction to Enzyme Catalysis. Michaeles - Menton Kinetics - Effect of pH and effect of temperature on the rates of enzyme reactions.

UNIT – III: Thermodynamics – II 15 Hrs

Phase Equilibria. Equilibrium between two phases of one component; the Clapeyron equation; the Clausius Clapeyron equation, applications; integrated form of Clapeyron equation.

Phase rule. Thermodynamic derivation of phase rule; solid-liquid equilibria; thermal analysis; simple eutectic, congruent fusion, incongruent, fusion and systems consisting of both; application of phase rule to three component system; Stokes and Roozeboom plots; three component liquid systems; formation of one pair, two pairs and three pairs of partially miscible liquids; two salts and water; no chemical combination; double salt formation; one salt forms hydrate and two salts form hydrates; solid solutions.

UNIT – IV: Electrochemistry – II 15 Hrs

Irreversible Electrode Phenomenon. Reversibility and irreversibility; dissolution and deposition potentials decomposition voltage; overvoltage and diffusion overvoltage.

Batteries. Primary and secondary batteries; fuel cells - proton exchange membrane fuel cells; advantage and limitations of fuel cells; working principles of UPS and its applications.

Electrochemical Study. General consideration, costing on electrolytic process, electrolysis parameters, principles of cell design and the addition technology of electrolysis process and typical cell design. Cyclic voltammetry and its applications.

Books Suggested

[1] Physical Chemistry, P. W. Atkins, (ELBS).
[2] Introduction to quantum Chemistry, A. K. Chandra (Tata McGraw Hill).
[3] Quantum Chemistry, Ira N. Levine, (prenticxe Hall).
[4] Coulson's Valence, R. Mcweeny, (ELBS).
[5] Modern Electrochemistry, vol.I& II, J. O. M. Bockris and A. K. N. Reddy (Plenum).
[6] An Introduction to Electrochemistry (3rd ed.), S. Glasstone (Affiliated East-West).
[7] Micelles, theoretical and applied aspects, V. Moroi (Plenum).
[8] A text Book of Physical Chemistry (2nd Ed.), S. Glasstone (Macmilan).
[9] Principles of Physical Chemistry, Maron and Prutton.
[10] Theoretical Electrochemistry, L. I. Antropov.

OPEN ELECTIVE

CHE25034A: BASICS OF CHEMISTRY

UNIT – I: Organic Chemistry

UNIT – II: Parameters in Sample Preparation
UNIT – III: Bioinorganic Chemistry

UNIT – IV: Polymer Chemistry

Course Objectives:
The overall objective of this course is:

To understand fundamentals of organic chemistry, basic parameters of sample preparation for analysis, polymer chemistry, bioinorganic chemistry.

Expected Course Outcomes:
By learning this course, students will
Know the fundamentals of organic chemistry, basic parameters of sample preparation for analysis,polymer chemistry, bioinorganic chemistry.

UNIT – I: Organic Chemistry 15 Hrs

Hybridization in organic compounds; inductive effect; conjugation and resonance; homolysis; heterolysis; types of organic reactions; introduction to reactive intermediates; classification of isomerism; stereochemistry of organic compounds – *R* & *S* and *E* & *Z* nomenclature.

UNIT – II: Parameters in Sample Preparation 15 Hrs

Definition and calculation of substance in moles and milli moles; solutions and their concentrations: definition of

solution, solute and suspension, weight percentage, volume to volume percentage, mole fraction, mole percentage, molarity, molality, normality; density and specific gravity; conversion of weight/moles to volume using density; compound empirical and molecular formulae.

UNIT – III: Bioinorganic Chemistry 15 Hrs

Essential and trace elements – role of metal ion in biological process; Na^+/K^+ pump; photosynthesis – structure of chlorophyll, photosynthetic mechanism in bacteria and in green plants (Z-scheme, PS-I & PS- II); respiration (transport and storage of dioxygen) – structure and function of myoglobin, hemoglobin, hemerythrin and model systems.

UNIT – IV: Polymer Chemistry 15 Hrs

Terminology. Monomers; repeat units; degree of polymerization; linear; branched and network polymers; classification of polymers.

Synthetic methods. Condensation, addition, radical chain, ionic and coordination, copolymerization.

Applications. Biomedical and industrial applications.

Books Suggested

[1] Organic Chemistry, Paula YurkanisBruice, 4th Ed. (Printice Hall).
[2] 2. Mechanism and Theory in Organic Chemistry, Thomas H. Lowry, Kathleen S. Richardson, Harper& Row, (Publishers, Inc.).
[3] Analytical Chemistry, G. D. Christian, 5th Edition, John Wiley & Sons.
[4] Bioinorganic Chemistry, R. W. Hey, Ellis Horwood Ltd.,Chichester, New York
[5] Bioinorganic Chemistry, K. Hussain Reddy, New Age International Publisher, New Delhi.
[6] Text Book of Polymer Science, F. W. Billmeyer, Jr. (Wiley Inter Science).
[7] Polymer Chemistry, Gowarikar.

CHE25034B: CHEMISTRY IN DAY-TO-DAY LIFE

UNIT – I: Essential Micronutrients

UNIT – II: Soil Nutrients and Food Additives
UNIT – III: Dyes, Paints and Pigments

UNIT – IV: Soaps, Detergents and Disinfectants

Course Objectives:
The overall objective of this course is:

1. To impart knowledge to students on fundamental aspects of chemistry related to day-to-day life.
2. Students will gain knowledge on constituents of soil nutrients, food additives.
3. Gain knowledge on chemical constituents of soaps, detergents, and disinfectants.

Expected Course Outcomes:
This course is designed to give students:

1. Fundamental understanding of nature chemicals used in daily life
2. Gain knowledge in micronutrients essential in daily life.
3. Understand the composition of soil nutrients and food additives, abuse of additives in foods and beverages.

4. To aware of classification and uses of dyes, paints and pigments.To gain fundamental knowledge about the chemical constituents present in soaps, detergents and disinfectants.

UNIT – I: Essential Micronutrients 15 Hrs

Carbohydrates, proteins, lipids, nucleic acids and vitamins: definition, sources, classification, applications and diseases due to deficiency.

UNIT – II: Soil Nutrients and Food Additives 15 Hrs

Fertilizers, pesticides and insecticides: definition, classification, characteristics and uses; additives: definition, characteristics, uses and abuse of additives in foods and beverages.

UNIT – III: Dyes, Paints and Pigments 15 Hrs

Dyes: definition, classification based on mode of application and structure, applications; paints: definition, i ngredients, characteristics, uses and drying process; p igments and varnishes: definition, characteristics, types and uses.

UNIT – IV: Soaps, Detergents and Disinfectants 15 Hrs

Soaps and detergents: definition, ingredients, classification, characteristics and uses; disinfectants: definition, characteristics and uses; perfumes: definition, characteristics, raw materials and perfumes used in soaps; cosmetics.

Books Suggested

[1] Industrial Chemistry by B.K. Sharma, Goel publishing House, Meerut.
[2] K. Bagavathi Sundari (2006), Applied Chemistry, M.J.P. Publishers.
[3] Des W. Connell (2016). Basic Concepts of Environmental Chemistry, Second edition, Taylor & Francis Group.
[4] Ley E.Manahan (2009), Fundamentals of Environmental Chemistry, Third Edition, CRC Press, Taylor& Francis Group.

CHE25034C: SWAYAM/MOOCs/NPTEL

This course is intended to provide opportunity to students to acquire knowledge on important topics of chemistry designed and lectured by eminent faculty of famous institutions through SWAYAM/MOOCs/NPTEL platforms.

SWAYAM /MOOCs/ NPTEL programme based on student choice related to ChemistryExamples

1. https://nptel.ac.in/courses/104/106/104106122/

   Fundamentals of Spectroscopy, NCL Pune, IISER Pune by Prof. Anirban Hazra, Prof. Sayan Bagchi

2. https://nptel.ac.in/courses/103/108/103108124/

   Atomic and Molecular Absorption Spectrometry for Pollution Monitoring, IISc Bangalore by Dr. J.R.Mudakavi.

3. https://nptel.ac.in/courses/104106106

CHE25035: ORGANIC CHEMISTRY PRACTICALS

Course Objectives:

The main objectives of this course are:

1. To understand the methods involving in the isolation of natural products.
2. To understand the methods of identification of natural products.
3. To understand the principles involved in the estimation of organic compounds.

Expected Course Outcomes:

On the successful completion of the course, student will be able:

1. To gain hands on experience in the various isolation methods of natural products.
2. To gain detailed knowledge about various spectral methods for identification of isolated natural products.
3. To gain hands on experience in the various methods of estimation of functional groups in organic compounds.

1. Isolation and identification of Natural Products

a) Isolation of caffeine from tea leaves

b) Isolation of eugenol from cloves

c) Isolation of casein and lactose from milk powder

d) Isolation of piperine from black pepper

2. Estimations of organic compounds

a) Estimation of glucose

b) Estimation of aspirin

c) Estimation of paracetamol

d) Estimation of ibubrofen

Books Suggested

[1] Text book of practical organic chemistry including qualitative organic analysis by A.I. Vogel (Longman).
[2] Ikan, R. Natural Products, A Laboratory Guide, 2nd Ed.; Academic Press: New York, 1991.
[3] Quantitative analysis of drugs in pharmaceutical formulations by P D Sethi.
[4] Practical organic chemistry by Mann & Saunders.
[5] Text book of practical organic chemistry including qualitative organic analysis by A.I. Vogel (Longman).

CHE25036: PHYSICAL CHEMISTRY PRACTICALS

Course Objectives:

The main objective of this course is:

1. Impart training in operating different instruments used in the analysis of various chemical constituents.

Expected Course Outcomes:

On the successful completion of the course, student will be able:

1. To conduct the experiments of critical solution temperature of phenol-water system
2. To develop knowledge in the determination of rate constant of acid hydrolysis of an ester and investigate the effect of catalyst concentration, reactant concentration and temperature.
3. To interpret the experimental results obtained by conductometry and potentiometry.
4. Apply concepts of Physical Chemistry and Analytical Chemistry through experimentation.

---

1. Determination of critical solution temperature of phenol-water system and study the effect ofelectrolyte on CST.
2. Determination of eutectic composition and temperature of simple eutectic system (Urea-benzoic acid).
3. Determination of congruent composition and temperature of binary system (diphenylamine – benzophenone system)
4. Determination of rate constant of acid hydrolysis of an ester and investigate the effect of catalyst concentration, reactant concentration and temperature.
5. Conductometry.
   - **a)** Determination of cell constant.
   - **b)** Verification of Onsager equation.
   - **c)** Determination of dissociation constant of a weak acid.
   - **d)** Titration of a strong acid with a strong base.
   - **e)** Titration of a weak acid with a strong base.
6. Potentiometry
   - **a)** Titration of a strong acid with a strong base
   - **b)** Titration of a weak acid with a strong base
   - **c)** Titration of ferrous ammonium sulphate with potassium dichromate.

Book Suggested

Findlay's Practical Physical Chemistry by J.A. Kitchener, 8th Ed. (Longmans).

THIRD SEMESTER

CHE35031: INORGANIC CHEMISTRY – III

UNIT – I: Electron Spin Resonance and Mössbauer

Spectroscopy UNIT – II: Bioinorganic Chemistry

UNIT – III: Photoelectron Spectroscopy

UNIT – IV: Introduction to Nanomaterials

Course Objectives:

The main objectives of this course are:

1. To train students on fundamental principles of electron spin resonance and Mössbauer Spectroscopy.
2. To introduce students to key concepts of bioinorganic chemistry especially transport & storage of dioxygen, and electron transfer process.
3. To train students on principles, instrumentation and analysis of photoelectron spectroscopy.
4. To impart knowledge to students on preparation and characterization of nanomaterials.

Expected Course Outcomes:

By learning this course, students will

1. Describe the fundamental principles and applications of Electron spin resonance and Mossbauer spectroscopy.
2. Understand the key aspects of Photoelectron spectroscopy and its instrumentation, application to chemical analysis.
3. Understand the basic concepts of bioinorganic chemistry like storage and transport of oxygen, electron transfer in biology.
4. Describe the key concepts of nanomaterials synthesis, characterization.

UNIT – I: Electron Spin Resonance and Mössbauer Spectroscopy 15 Hrs

Electron Spin Resonance Spectroscopy. Introduction; principle; instrumentation; selection rules; g- factor and its significance; hyperfine and super hyperfine coupling; zero-field splitting including Kramer's degeneracy; application of ESR to free radicals and transition metal complexes; evidence for covalence in complexes ex. Cu(II)bissalicylaldimine, bis-acetylacetanatovanadyl and hexachloroiridium(IV) complexes.

Mössbauer Spectroscopy. Basic principles; isomer shift; quadrupole shift and spectrum display; applications: bonding and structures of Fe^{2+} and Fe^{3+} compounds including those of intermediate spin and Sn^{2+} and Sn^{4+} compounds, nature of metal-ligand bond, coordination number, unequivalent mössbauer atoms.

UNIT – II: Bioinorganic Chemistry 15 Hrs

Transport and Storage of Dioxygen. Metal complexes as oxygen carriers; heme proteins – structure and functions of hemoglobin and myoglobin; non-heme proteins – hemoerythrin and hemocyanin; model synthetic complexes of iron; cobalt and copper.

Electron Transfer in Biology. Structure and functions of metalloproteins in electron transfer process; catalase; peroxidase; cytochromes and iron-sulfur proteins; synthetic models.

UNIT – III: Photoelectron Spectroscopy 15 Hrs

Photoelectric effect; Koopmans theorem ionization energy; block diagram of photoelectron spectrometer: sources of radiation, monochromator, detectors, shake-up and shake-off features; Ultravoilet photoelectron spectroscopy; application of UPS to O_2 and N_2 molecules; electron spectroscopy of chemical analysis; applications of XPES to qualitative analysis; chemical shift; applicationto surface studies and structural analysis.

UNIT – IV: Introduction to Nanomaterials 15 Hrs

Basic chemistry for nanoscience, chemical routes for synthesis of nanomaterials: chemical precipitation and co-precipitation, metal nanocrystals by reduction, sol-gel synthesis, microemulsions or reverse micelles, solvothermal synthesis, microwave heating synthesis, sonochemical synthesis, characterization of nanomaterials: X-ray diffraction (XRD), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Atomic Force Microscopy (AFM).

Books Suggested

[1] Instrumental methods of analysis, H. W. Willard, L. L. Merritt and J. A. Dean.

[2] Advanced Inorganic Chemistry, F. A. Cotton, G. Wilkinson , M. Bochmann and R. N. Grimes, 5th Ed.(John Wiley& Sons Inc.).

[3] Inorganic Chemistry: Principles of Structure and Reactivity, J. E. Huheey, E. A. Keiter and R. L.Keiter, 4th Ed (Prentice Hall).

[4] Inorganic Chemistry, G. Wulfsberg (University Science Books).

[5] Concise Inorganic Chemistry, J. D. Lee, 5th Ed. (Wiley-Blackwell).

[6] Modern Inorganic Chemistry, W. L. Jolly, 2nd Ed. (McGraw-Hill).

[7] Introduction to Photoelectron Spectroscopy, P. K. Ghosh

[8] Nanochemistry: A Chemical Approach to Nanomaterials; G.A. Ozin, A.C. Arsenault and L. Cademartiri (RSC, London).

[9] Nanocomposite Science and Technology; P.M. Ajayan, L.Z. Schadler and P.V. Brown (Wiley).

[10] Characterization of Nanophase Materials; Z.L. Wang (ed.) (Wiley-VCH).

CHE35032: ORGANIC CHEMISTRY – III

UNIT – I: Pericyclic Reactions

UNIT – II: Photoch

em istr y UN IT – III: Gr ee n Ch em istr y

UNIT – IV: Nitrogen, Oxygen and Sulphur Based Heterocycles

Course Objectives:

The main objectives of this course are:

1. To understand the molecular orbital symmetry and various methods to explain the pericyclic reactions.
2. To understand the principles of photochemistry and reaction mechanism of various photochemical reactions.
3. To understand the concept and principles of green chemistry followed by variety of green synthetic methods.
4. To understand the synthesis, chemical reactivity and medicinal importance of nitrogen, oxygen and sulphur based heterocycles.

Expected Course Outcomes:

On the successful completion of the course, student will be able:

1. To learn the frontier molecular orbital symmetry of different systems.
2. To understand the pericylic reactions like electrocyclic, cycloaddition, and sigmatropic rearrangement reactions.

3. To learn the principles of photochemistry and mechanistic aspects of photochemical reactions through named reactions.
4. To gain detailed knowledge about concept and principles of green chemistry and advantages and applications of green synthetic methods..
5. To understand the synthesis, chemical reactivity and medicinal importance of five and six membered nitrogen, oxygen and sulphur based heterocyclic compounds.

UNIT – I: Pericyclic Reactions 15 Hrs

Molecular orbital symmetry; frontier orbitals of ethylene, 1,3-butadiene, 1,3,5-hexatriene, allyl system and 2,4-pentadienyl systems; classification of pericyclic reactions; electrocyclic reactions: conrotatory and disrotatory motions in 4n, 4n+2 systems; cycloadditions: antarafacial and suprafacial additions in 4n (2+2 cyclo addition) and 4n+2 (4+2 cyclo addition) systems, 1,3-dipolar cycloadditions and cheleotropicreactions; sigmatropic rearrangements: 1,3 and 1,5 suprafacial and antarafacial shifts of H and C, Claisen, Cope and oxy-Cope rearrangements; Ene reaction; FMO and PMO approach; Woodward- Hoffmann correlation diagrams and Woodward-Hoffmann selection rules of electrocyclic reactions, cyclo addition reactions and sigmatropic rearrangements.

UNIT – II: Photochemistry 15Hrs

Photochemical energy; Jablonski diagram; singlet and triplet states; photosensitization; quantum yield; photochemistry of carbonyl compounds: Norrish type-I and Norrish type-II cleavages; Paternò-Büchi reactions; photoreduction; Rearrangement of cyclohexenones, cyclohexadienones; photochemistry of 1,3-butadienes, di-π-methane rearrangement, oxa-di-π-methane rearrangement; photoisomerization of benzene, photo-Fries rearrangement of phenyl esters and anilides; Barton reaction. Metal free- photoredox catalysis: introduction, C-C couplings, carbonylation, $C(sp^2)$–H acylation of enamides, Hydrodefluorination of Fluoroarenes.

UNIT – III: Green Chemistry 15 Hrs

Concept of green chemistry, constituent principles of green chemistry, green synthetic methods – organic reactions in aqueous media: advantages and applications in pinacol coupling, Mukaiyama-aldol reaction, and Trost-Tsuji reaction; ionic liquids in organic synthesis: introduction, composition, and application in stereoselective halogenation, Friedel-Craft reaction and hydroformylation; microwave assisted reactions: principle, conditions, advantages over conventional heating, and application in Fischer-indole synthesis, Paal-Knorr pyrrole synthesis, Baylis-Hillman and benzil-benzilicacid rearrangement; phase transfer catalysis: introduction, types of phase transfer catalysts, mechanism of catalytic action, and application in benzoin condensation, Wittig, Wittig-Horner and Michael addition reactions; ultrasound assisted synthesis: introduction, advantages, applications in the synthesis of Diels- Alder, hydroboration and Reformatsky reactions.

UNIT – IV: Nitrogen, Oxygen and Sulphur Based Heterocycles 15 Hrs

Synthesis, chemical reactivity and medicinal importance of pyrazoles, imidazoles, oxazoles, isoxazoles, thiazoles, isothiazoles. benzopyrroles, benzofurans, benzothiophenes, quinolines and isoquinolines.

Books Suggested

[1] Advanced Organic Chemistry: Part A & B, F. A Carey and R. J. Sundberg, 5th Ed., Springer, 2007.
[2] Advanced Organic Chemistry: Part B: Reaction and Synthesis, F. A Carey and R. J. Sundberg, 5th Ed.

, Springer, 2008
[3] Advanced Organic Chemistry-Reactions, Mechanism and structure, Jerry March, 6th Ed. (John Wiley& Sons, 2006).
[4] Fundamentals of Photochemistry, K. K. Raotagi-Mukhergi, (Wiley Eastern,1978).
[5] Essential of Molecular Photochemistry, A. Gilbert and J. Baggott (Blackwell scientific Publications,Oxford 1991)).
[6] Introduction to Organic Photochemistry, Coyle J D, (Wiley, 1986).
[7] Synthetic Organic Photochemistry edited by Axel G. Griesbeck and JochenMattay (Marcel Dekker, New York, 2005).
[8] Green Chemistry: an introductory text; M. Lancaster; 2nd Ed. (RSC, 2010).
[9] Organic Synthesis: Special Techniques; V.K. Ahluwalia and R. Aggarwal; 2nd Ed. (Narosa, 2001).
[10] Organic Reactions in Aqueous Media with a Focus on Carbon-Carbon Bond Formation: A DecadeUpdate; Chemistry reviews (2005); Volume. 105; Pages. 3095 – 3165.
[11] Heterocyclic Chemistry, T.L.Gilchrist,2nd Ed (Longman Scientific & Technical ; New York : Wiley,1992).
[12] Heterocyclic Chemistry, Raj.K. Bansal, 4th Ed (New age Publishers, 2010)
[13] An Introduction to the Heterocyclic Compounds, R. M. Acheson, 3rd Ed, (John Wiley, 2008)
[14] Comprehensive Heterocyclic Chemistry III, A. R. Katrizky Christopher Ramsden, Eric Scriven, RichardTaylor, 1st Ed (Elsveir, 2008)

CHE35033: PHYSICAL CHEMISTRY-III

UNIT – I: Surface Chemistry

UNIT – II: Polymers –Basics and Characterization
UNIT – III: X-Ray Techniques

UNIT – IV: Nuclear Techniques

Course Objectives:

The main objectives of this course are to:

1. Understanding the basics, significance and applications of adsorption isotherms.
2. Enriching and appreciating the basic concepts and polymers and understand the significance of co-polymerization, coordination and conducting polymers and molecular weight concept of polymers and its determination.
3. To understand the structural aspects of materials in solid sate by XRD and XRF.
4. To study the basic principles of nuclear chemistry and basic knowledge about various
5. nuclear techniques.

Expected Course Outcomes:
On the successful completion of the course, student will be able to:

1. Recall the concepts on adsorption isotherms, kinetics of surface reactions and thermodynamics of surfaces.
2. Analyze the molecular weight of polymers and types of polymerization reactions.

3. Understand the principle of powder X-ray diffraction technique.
4. To acquire intense knowledge about the basic principles, instrumentation of nuclear counters and application in industry and pharmaceutics.

UNIT – I: Surface Chemistry 15 Hrs

Structural and theoretical treatment of liquid interfaces; thermodynamics of binary system; Gibbs equation and verification of Gibbs equation by microtome method and tracer method; spreading of one liquid on anther; states of monomolecular films; the surface area of solids; mixed films; Gibbs adsorption isotherm; the Longmuir adsorption isotherm; BET adsorption isotherm; estimation of surface area (BET equation, theoretical concept); adsorption time; Non equilibrium thermodynamics (entropy production in irreversible process); membrane transport in biochemical reactions.

UNIT – II: Polymers-Basics and Characterization 15 Hrs

Basic Concepts. Monomers; repeat units; degree of polymerization; linear, branched and network polymers; classification of polymers.

Polymerization Methods. Condensation, addition, radical chain, ionic and coordination, copolymerization, controlled free radical polymerization, viz. ATRP.

Average Molecular Weight Concepts. Number; weight and viscosity average molecular weights; polydispersity and molecular weight distribution; measurement of molecular weight: end group, viscosity, light scattering, osmotic and ultracentrifugation methods.

UNIT – III: X-Ray Techniques 15 Hrs

X-ray Diffraction. Bragg conditions; Miller Indices; Laue method; Bragg method; description of procedure for Debye Scherrer method of X-ray structural analysis of crystals; index reflections; identification of unit cells from systematic absences in diffraction pattern-structure of simple lattices and X-ray intensities-structure factor and its relation to intensity and electron density.

X-Ray Fluorescence Spectroscopy. Principle, energy dispersive X-ray fluorescence (EDXRF); wavelength dispersive X-ray fluorescence (WDXRF); applications.

UNIT – IV: Nuclear Techniques 15 Hrs

Basic concepts of nuclear chemistry; radioactive decay and equilibrium; nuclear reactions; Q value; cross sections; types of nuclear reactions; radioactive techniques: counting techniques such as G. M. ionization and proportional counter, isotopic dilution, neutron activation analysis, radiometric titration; radiopharmaceuticals: radioimmunoassay, immunoradiometric assay, classification of radiopharmaceuticals, labeled compounds preparation, PET studies.

Books Suggested

[1] Physical methods in Chemistry, R. S. Drago (Saunders College).
[2] Advanced Physical Chemistry by GurudeepRaj, Goel Publishers House, Meerut.
[3] An introduction to Electrochemistry-4th edn: By Samuel Glasstone Affiliated East West Press Pvt.Ltd., New Delhi.
[4] Electrochemistry by M. S. Yadav Anmol Publications, New Delhi.
[5] Essentials of Nuclear Chemistry, 4th Ed., 1995, H. J. Harnikar (Weily Eastern)
[6] Electrochemistry by S. Glasstone.
[7] Text Book of Polymer Science, F. W. Billmeyer, Jr. (Wiley Inter Science)
[8] Polymer Chemistry, Gowarikar.

OPEN ELECTIVE

CHE35034A: DRUG DISCOVERY, DESIGN AND DEVELOPMENT

UNIT – I: Basic Principles of Pharmacology and Concepts of Drug Delivery **UNIT – II: Lead Discovery and Optimization**

UNIT – III: SAR and QSAR Studies

UNIT – IV: Common Drugs

Course Objectives:

The main objectives of this course are:

1. To understand the basic principles of pharmacokinetics and pharmacodynamics and drug delivery systems.
2. To understand the basic principles of lead discovery and lead optimization methods.
3. To understand the concept and principles of SAR and QSAR.
4. To learn the structure, uses, mechanism of action of various classes of drugs.

Expected Course Outcomes:

On the successful completion of the course, student will be able:

1. To learn the basic principles of pharmacokinetics like ADME and pharmacodynamic aspects.
2. To understand about conventional and modern drug delivery systems.
3. To learn the principles of design of various classes of drugs and variety of lead optimization methods.
5. To gain detailed knowledge about SAR of different drugs and principles of QSAR in drug discovery and development.
6. To gain awareness on uses, mechanism of action of various classes of drugs.

UNIT – I: Basic Principles of Pharmacology and Concepts of Drug Delivery 15 Hrs

Definitions. Disease, drug, bioassay, pharmacokinetics and pharmacodynamics; stages involved in drug discovery; formulation; drug dosing forms: solid dosage forms, semi-solid dosage forms and liquid dosage forms; routes of drug administration.

Pharmacokinetics and Pharmacodynamics. Absorption, distribution, metabolism and excretion of drugs (ADME); nature of drug - receptor interactions; theories of drug action: occupancy theory, rate theory, Induced-fit theory, drug synergism and antagonism.

Concepts of Drug Delivery. Drug delivery definition; conventional drug delivery; polymer-drug conjugates; PEGylation; diffusion controlled systems; Ficks laws; reservoir systems; non-erodible matrix systems; bio-erodible systems; types of drug delivery systems; clinical trials of drug delivery systems.

UNIT – II: Lead Discovery and Optimization 15 Hrs

Lead discovery. Existing drugs as leads (me too drugs); pharmacophore; principles of design of agonists e.g. salbutamol, antagonists e.g. cimetidine and enzyme inhibitors e.g. captopril; drug discovery without lead – serendipity-penicillin and librium as examples.

Lead optimization. Bioisosterism; variation of alkyl substituents; chain homologation and branching; variation of aromatic substituents; extension of structure; ring expansion and ring contraction; ring variation; variation and position of hetero atoms; ring fusion; simplification of the lead; rigidification of lead; conformational blockers; discovery of oxamnquine.

UNIT – III: SAR and QSAR Studies 15 Hrs

Structure Activity Relationship (SAR). SAR in sulfa drugs, benzodiazepines, and taxol analogs; principles of prodrug design

Quantitative Structure Activity Relationship (QSAR). Introduction to QSAR; physicochemical properties – lipophilicity: partition coefficient (P) and the lipophilicity substituent constant (π); electronic effects: Hammett constant (σ), steric effects: Traft's constant (E_s), Hanscth analysis, Craig's plot, Topliss scheme, free Wilson approach, Lipenski rule of five.

UNIT – IV: Common Drugs 15 Hrs

Structure, uses, mechanism of action of antibacterial agents: sulfamethoxazole, penicillin G, antiviral agents: acyclovir, indinavir; anticancer agents: mechlorethamine, methotrexate; antifungal agents: fluconazole, griseofulvin; gastrointestrinal agents: ranitidine, omeprazole, metoclopramide, cardiovascular agents: amrinone, procainamide, captopril, propranolol, mehyldopa; anticoagulants: warfarin; central nervous system agents: paracetamol, betamethasone, chlorpromazine, levodopa, diazepam, phenytion, procaine.

Books Suggested

[1] Medicinal Chemistry and Pharmaceutical Chemistry, H. Singh and V. K. Kapoor (Vallab Prakashan,2017)
[2] An Introduction to Medicinal Chemistry, G. L. Patrik, 4th Ed (Oxford, 2013),
[3] Fundamentals of Medicinal Chemistry, Gareth Thomas (Wiley, 2003)
[4] Biochemical Approach to Medicinal Chemistry, Thomas Nogrady (Oxford University Press, 1988)
[5] Principles of Medicinal Chemistry, William Foye, 7th Ed (Lippincot 2012)
[6] Medicinal Chemistry, AshutoshKar (New age, 2005)
[7] Principles of Medicinal Chemistry, R. R. Nadendla(New age, 2005)
[8] Burger's Medicinal Chemistry and Drug discovery, Manfred E. Wolf, 5th Ed (Wiley, 1995)

CHE35034B: Bio-analytical and Forensic Analysis

UNIT – I: Basics of Forensic Chemistry

UNIT – II: Analytical Chemistry in Forensic Science – Biochemical Analysis
UNIT – III: Physical and Chemical Methods in Forensic Analysis

UNIT – IV: Immuno Analytical Techniques

Course Objectives:
The main objectives of this course are:

1. To understand the forensic chemistry and relevant regulations.
2. To understand the basic principles of analytical methods involved in forensic and biomedical analysis.
3. To understand the principles of physical and chemical methods of forensic analysis.
4. To understand the principles and applications of Immuno analytical techniques.

Expected Course Outcomes:

On the successful completion of the course, student will be able:

1. To learn the basic principles of forensic chemistry and relevant regulations.

2. To understand analytical protocols involved in the analysis of forensic and biomedical samples.
3. To learn the protocols of radio analytical, spectral, chromatographic methods involved in forensic analysis.
4. To gain detailed knowledge about of Immuno analytical techniques and their applications in the analysis of forensic materials.

UNIT – I: Basics of Forensic Chemistry 15 Hrs

Introduction and significance; bribe trapping by phenolphthalein; chemistry of fire – Fire triangle; definition of Arson and incendiary fire; motive of arson – indicators of arsons in SoC; collection for evidence; chemical analysis of arson residues and charred debris; relevant IPC sections – 285,435, 436 & IEA 113B.

UNIT – II: Analytical Chemistry in Forensic Science – Biochemical Analysis 15 Hrs

Analysis of biological stains and materials including blood; semen and saliva (qualitative and quantitative); isolation, sample preparation, identification and determination of 1. narcotics: heroin, morphine and cocaine; 2. stimulants: amphetamines, cocaine and caffeine; 5 metabolites of drugs in blood and urine of addicts; 3. depressants: benzodiazepines, barbiturates and mandrax; 4. hallucinogens:LSD and cannabis; 5. alcohol.

UNIT – III: Physical and Chemical Methods in Forensic Analysis 15 Hrs

Basic principles of non-destructive testing probes including radiography; Xera – radiography surface penetrations methods (SEM and laser probes); lie detection – introduction, process, meritsand demerits; application of spectroscopic, chromatographic techniques such as GC-MS, FT-IR, UV-visible spectroscopy, atomic absorption spectroscopy for chemical analysis of forensic samples.

UNIT-IV: Immuno Analytical Techniques 15 Hrs

Immunodiffusion: principle of single and double immunodiffusion; electrophoresis: gel, SDS- PAGE, immuno and capillary; isotope dilution techniques: principles and applications; radio isotope dilution techniques: use of radioisotope tracer techniques in biochemical experiments and their detection.

Books Suggested

[1] Forensic Chemistry by A Lucas, Publisher: Forgotten Books (5 May 2017), ISBN-13: 978-1330672037.

[2] Forensic Chemistry (Advanced Forensic Science Series) by Max M. Houck, Publisher:Academic Press(12 January 2015), ISBN-13: 978-0128006061.

[3] Kuby Immunology by Judith A. Owen, Jenni Punt , Sharon A. Stranford , Patricia P. Jones, Publisher:W H Freeman & Co (Sd); 7 edition (25 January 2013), ISBN-13: 978-1429219198.

[4] Roitt′s Essential Immunology (Essentials) by by Peter J. Delves and Seamus J. Martin, Publisher: Wiley-Blackwell; 13 Pap/Psc edition (13 January 2017), ISBN-13: 978-118415771.

[5] Textbook of forensic Chemistry Hardcover by Udai Arvind, Publisher: Centrum Press. (2014), ISBN-13: 978-9350843031.

[6] Basic Principles of Forensic Chemistry, Thomas J. Kennedy Donnell R. Christian Jr., Publisher:

Humana Press; 2012 edition (28 January 2014), ISBN-13: 978-1627038928.

CHE35034C: Environmental and Industrial Analytical Chemistry

UNIT – I: Water Quality Assessment

UNIT – II: Water Pollutants

UNIT – III: Chemical Analysis of Soil

UNIT – IV: Industrial Pollutants and Prevention

Course Objectives:

The main objectives of this course are:

1. To understand the methods of Water Quality assessment.
2. To understand the basic resources of water pollutants.
3. To understand the standard specifications of soil and soil analysis.
4. To understand the industrial pollutants and their prevention.

Expected Course Outcomes:

On the successful completion of the course, student will be able:

1. To learn the basics of water quality and methods of determining various parameters to verify it.
2. To understand various sources of water pollutants and their impact and assessment.
3. To learn the chemistry of soil, standard specifications of soil and trace element analysis in the soil.
4. To gain detailed knowledge about various pollutants from wide types of industries and their prevention strategies in industrial processes.

UNIT – I: Water Quality Assessment 15 Hrs

Determination of pH, EC, TDS, DO, colour, turbidity, total solids, conductivity, acidity, alkalinity hardness, chloride, fluoride, sulphate, nitrite, nitrate, phosphorous (total inorganic and organic),BOD, COD, TOC, pesticides.

UNIT – II: Water Pollutants 15 Hrs

Sources of water pollution: domestic, industrial, agricultural, soil and radioactive wastes as sources of pollution; c ontamination by inorganic and organic materials: parameters for analysis; impact of heavy metal pollution: assessment of toxic metal ions in water; impact of organic pollutants: assessment of dyes and other organic pollutants in water.

UNIT – III: Chemical Analysis of Soil 15 Hrs

Soil/sediment analysis: a brief idea of chemistry of soil; trace element analysis in soil-B, Cd, Cu, Fe, Mn, Mo, Zn and Pb; standard specifications for soil.

UNIT – IV: Industrial Pollutants and Prevention 15 Hrs

Pollutants from pigment and paint, textile industries, tannery, cosmetics, ceramics and glass, chemical and pharmaceutical, explosives, electroplating industries, food processing industries; pollution prevention strategies in industrial processes.

Books Suggested

[1] P. Patnaik, Handbook of Environmental Analysis: Chemical Pollutants in Air, Water, Soil and Solid Wastes, 3rd Edition, CRC Press, Taylor & Francis Group, Boca Raton, FL, 2018.

[2] Timothy J. Sullivan, Alan T. Herlihy and James R. Webb, Air Pollution and Freshwater Ecosystems: Sampling, Analysis, and Quality Assurance, CRC Press, Boca Raton, FL, Taylor & Francis Group, LLC, 2015.

[3] Leo M.L. Nollet and Fidel Toldra, Handbook of Analysis of Active Compounds in Functional Foods, CRC Press, Boca Raton, FL, Taylor & Francis Group, 2012.

CHE35035: MULTISTEP SYNTHESIS OF ORGANIC COMPOUNDS

Course Objectives:

The main objectives of this course are:

1. To understand the basic principles of organic synthesis.
2. To understand the multi step synthesis, purification and identification of organic compounds.

Expected Course Outcomes:

On the successful completion of the course, student will be able:

1. To get skill in the planning, set up, execution, and monitoring of organic synthesis.
2. To attain hands on experience in the work up protocols useful in organic synthesis.
3. To attain hands on experience in the purification methods and identification techniques of products.

---

1. Synthesis of Benzanilide from Benzophenone

Benzophenone → Benzophenone oxime → Benzanilide

2. Synthesis of Benzilic acid from

benzoinBenzoin → Benzil → Benzilic

acid

3. Synthesis of *p*-Bromoaniline from acetanilide

Acetanilide → *p*-bromoacetanilide → *p*-bromoaniline

4. Synthesis of Flavone from *o*-hydroxyacetophenone

o-Hydroxyacetophenone →*o*-benzoyl acetophenone → *o*-hydroxydibenzoylmethane → flavone

5. Synthesis of Methyl orange from 4-Aminosulphonic acid

4-Aminosulphonic acid→4-(chlorodiazenyl)benzenesulfonic acid →Methyl orange

6. Synthesis of 2-phenylindole from acetophenone.

acetophenone → acetophenone phenylhydrazone→ 2-phenylindole

7. Synthesis of symmetrical tribromobenzene from aniline.

aniline → 2,4,6-tribromoaniline → Symmetrical tribromobenzene

8. Synthesis of anthranilic acid from phthalic anhydride.

phthalic anhydride → phthalimide→ anthranilic

acid

9. Synthesis of 2-aminothiazoles from Methyl ketones

Methyl ketones →α-bromoketones → 2-aminothiazoles

Books Suggested

[1] Modern Organic Synthesis in the Laboratory A Collection of Standard Experimental Procedures, JieJack Li, Chris Limberakis, Derek A. Pflum.
[2] Practical Organic Chemistry by Mann and Saunders.
[3] Vogel's Text book of Practical Organic Chemistry.
[4] Spectrometric Identification of organic compounds, R.M. Silverstein, F.X. Webster and D.J. Kiemle, 7th Ed.,(Wiley).

CHE35036: Molecular Modeling and Pharmaceuticals

10 M (internal exam) +40 M (theory semester end exam) +50 M (practical exam)

Course Objectives:

The main objectives of this course are:

1. To understand the theory underlying with molecular drawing and molecular modeling.
2. To understand the synthesis and applications of various classes of drugs.
3. To learn the basics of drawing 2D structures of organic molecules and their docking with selected targets.
4. To learn the synthesis, purification and identification of small molecule drugs.

Expected Course Outcomes:

On the successful completion of the course, student will be able:

1. To learn the basics in molecular drawing using Chem Draw and molecular modeling usingSchrödinger.
2. To learn the synthesis various classes of drugs.
3. To get skill in the spectral analysis of synthesized small molecule drugs.

THEORY

UNIT – I: Molecular Drawing and Molecular Modeling for Drug Discovery
UNIT – II: Drugs & Pharmaceuticals

UNIT – I: Molecular Drawing and Molecular Modeling for Drug Discovery 15 Hrs

Molecular Drawing. Drawing the chemical structures; ChemDraw: basics of drawing the 2D structures of organic compounds and their 3D visualization.

Molecular Modeling. Informatics and methods in drug design: Introduction to bioinformatics, chemoinformatics, ADME databases, chemical, biochemical and pharmaceutical databases; virtual screening techniques: drug likeness screening, concept of pharmacophore mapping, pharmacophore based screening; molecular docking: rigid docking, flexible docking, manual docking, docking based screening, denovo drug design.

UNIT – II: Drugs & Pharmaceuticals 15 Hrs

Drugs & Pharmaceuticals Drug discovery, design and development; Basic Retrosynthetic approach. Synthesis of the representative drugs of the following classes: analgesics agents, antipyretic agents, antiinflammatory agents (Aspirin, paracetamol, lbuprofen); antibiotics (Chloramphenicol); antibacterial and antifungal agents (Sulphonamides; Sulphanethoxazol, Sulphacetamide, Trimethoprim); antiviral agents (Acyclovir), Central Nervous System agents (Phenobarbital, Diazepam), Cardiovascular (Glyceryl trinitrate), antilaprosy (Dapsone), HIV-AIDS related drugs (AZT- Zidovudine).

PRACTICALS

1. Basics of drawing the 2D structures of organic molecules using ChemDraw and their 3D conversions; molecular docking studies using Schrödinger.
2. Synthesis, monitoring, purification and spectral (FT-IR and UV-visible) analysis of analgesics agents.
3. Synthesis, monitoring, purification and spectral (FT-IR and UV-visible) analysis of antipyreticagents.
4. Preparation and spectral (FT-IR and UV-visible) analysis of magnesium bisilicate (Antacid).

Books Suggested

[1] Introduction to ChemDraw Ultra 12: https://staff.emu.edu.tr/sensevpayanilkan/Documents/courses/ITEC107/LECTURE7.pdf
[2] G.C.K. Robert, Drug Action at the Molecular Level, University Prak Press Baltimore.
[3] Y.C. Martin, Quantitative Drug Design, Dekker, New York.
[4] J.N. Delgado,W.A. Remers, Wilson & Gisvolds's Text Book of Organic Medicinal & PharmaceuticalChemistry" Lippincott, New York.
[5] H.J. Smith,H. Williams, Introduction to the Principles of Drug Design, Wright Boston.
[6] R.B. Silverman,The Organic Chemistry of Drug Design and Drug Action, Academic Press New York.
[7] N.S. Pagadala, K. Syed, J. Tuszynski, Software for Molecular Docking: AReview. Biophysical Reviews,2017, 9, pp.91–102.
[8] G.L. Patrick: Introduction to Medicinal Chemistry, Oxford University Press, UK.
[9] Hakishan, V.K. Kapoor: Medicinal and Pharmaceutical Chemistry, Vallabh Prakashan, Pitampura,New Delhi.
[10] William O. Foye, Thomas L., Lemke, David A. William: Principles of Medicinal Chemistry, B.I. Waverly Pvt. Ltd. New Delhi.

Industrial Visit:

Industrial visits will allow students to visualize the scenario of research in industry, industrial setup, advanced technologies and relevant instruments. It also motivates the students to choose their career in industry.

FOURTH SEMESTER

CHE45031: ORGANIC CHEMISTRY-IV

UNIT – I: Oxidations

UNIT – II: Red

u
c
t
i
o
n
s

UNIT – III: Non-Metallic Reagents in Organic Synthesis
UNIT – IV: Asymmetric Synthesis

Course Objectives:
The main objectives of this course are:

1. To understand the mechanism and applications of oxidation using wide range of oxidants.
2. To understand the mechanism and applications of different reduction reactions.
3. To understand the reactivity and applications of non metallic reagents in organic synthesis.
4. To understand the basics followed by strategies in asymmetric synthesis.

Expected Course Outcomes:
On the successful completion of the course, student will be able:

1. To learn the applications of variety of oxidants with mechanism.
2. To understand the applications of different reducing agents in organic synthesis withmechanism.
3. To learn the structural and bonding aspects of boron, silicon, phosphorus and sulphur reagents.
4. To gain detailed knowledge about applications of boron, silicon, phosphorus and sulphur reagents in organic synthesis.
5. To understand the basic principles as well as modern strategies of asymmetric synthesis and its applications through named reactions.

UNIT–I: Oxidations 15 Hrs

Alcohols to carbonyls. Chromium(VI) oxidants; dimethyl sulfoxide oxidation; periodate oxidation;Oppenauer oxidation; oxidation with manganese dioxide; DDQ; oxidation with silver carbonate.

Alkenes to Epoxides. Peroxide induced epoxidations.

Alkenes to diols. Oxidation with potassium permanganate; osmium tetraoxide; Prévost oxidation andWoodward modification.

Oxidation of alkyl or alkenyl fragments. Selenium dioxide.

UNIT – II: Reductions 15 Hrs

Nucleophilic Metal Hydrides. $LiAlH_4$; $NaBH_4$; Red-Al; alkoxy aluminates.

Electrophilic Metal Hydrides. BH_3; AlH_3; DIBAL.

Non-metallic Reductions. Diimide reduction; Wolf-Kishner reduction.

Dissolving Metal Reductions. Birch reduction; Clemmensen reduction.

Heterogeneous Catalytic Hydrogenations.

UNIT– III: Non-Metallic Reagents in Organic Synthesis

15 Hrs

Electronic structure and bonding in boron, phosphorus and sulphur compounds: reactivity andapplications in organic synthesis.

Boron Reagents. Organoboranes in the formation of C–C bonds, alcohols, amines, halogen and carbonylcompounds, free radical reactions of organoboranes: simple boranes and hindered boranes.

Phosphorus Reagents. Formation of C–C double bonds (Wittig and Horner-Wordsworth-Emmonsreactions); functional group transformations; eactivity as electrophiles and nucleophiles.

Sulphur Reagents. Sulphurylides: stabilized and non-stabilized, preparation and reactivity, sulphonylcarbanions.

Silicon reagents. Reactions involving β-carbocations and α-carbanions; utility of trimethylsilyl halides;silyl cyanides and triflates.

UNIT – IV: Asymmetric Synthesis 15 Hrs

Introduction and Terminology. Topicity in molecules: homotopic, heterotopic (enantiotopic and diastereotopic), prochirality nomenclature; Substitution and addition criteria; Pro-*R*, Pro-*S*, *Re*- and *Si*- faces; stereoselective reactions: enantioselectivity and diastereoselectivity; optical purity: enantiomeric excess and diastereomeric excess.

Strategies in Asymmetric Synthesis.

i. Chiral Substrate Controlled Asymmetric Synthesis. Nucleophilic additions to chiral carbonyl compounds; 1,2-asymmetric induction; Cram's rule; Felkin-Anh model.

ii. Chiral Auxiliary Controlled Asymmetric Synthesis. α-Alkylation of chiral enolates; azaenolates; imines; use of chiral auxiliaries in Diels-Alder reaction and aldol reactions.

iii. Chiral Reagent Controlled Asymmetric Synthesis. Asymmetric reductions using BINAL−H; asymmetrichydroboration using $(IPC)_2BH$ and $IPCBH_2$.

iv. Chiral Catalyst Controlled Asymmetric Synthesis. Sharpless and Jacobsen asymmetric epoxidations; asymmetric hydrogenations using chiral Wilkinson bisphosphine and Noyori catalyst; enzyme mediated enantioselective synthesis.

Books Suggested

[1] Modern Synthetic Reactions, H. O. House, 2nd Ed., (W.A. Benjamin).
[2] Modern Methods of Organic Synthesis, W. Carruthers, 4th Ed., (Cambridge University Press, 2004).
[3] Principles of Organic Synthesis, R. O. C. Norman and J. M. Coxon, 3rd Ed(Blakie Academic andProfessional, 1993).
[4] Organic Chemistry, Francis A. Carey, 4th Edition, (McGraw-Hill Higher Education).
[5] Organic Chemistry, Paula Yurkanis Bruice, 4th Ed. (Printice Hall).
[6] Organic chemistry-Clayden, Greeves, Warren and Wothers, (Oxford University Press, 2001).
[7] Organic Chemistry, Leroy G. Wade. JR, Jan William Simek, M. S. Singh, 9th Ed. (Pearson, 2017)
[8] Advanced Organic Chemistry, Part A, Structure and Mechanism, Francis A. Carey, Richard J Sundberg, 5th Ed (Springer 2007)
[9] Advanced Organic Chemistry, Part B, Reactions and Synthesis, Francis A. Carey, Richard J Sundberg,5th Ed (Springer 2008)
[10] Principles of organometallic chemistry, P.Powell 2nd Ed (Springer, 1988)

[11] Organo transition metal chemistry-Applications to organic synthesis, S.G.Davis, Pergmon.
[12] Strategies for organic drug synthesis and design By Daniel Ledneicer.

CHE45032: ORGANIC CHEMISTRY – V

UNIT – I: Basics of Organic Synthesis and Disconnection Approach – I UNIT – II: Disconnection Approach – II

UNIT – III: Metallic Reagents in Organic Synthesis
UNIT – IV: Methods in Organic Synthesis

Course Objectives:
The main objectives of this course are:

1. To understand the basics of organic synthesis and disconnection approach.
2. To understand the variety of disconnection approaches followed in the design of organic synthesis.
3. To understand the applications of metallic reagents in organic synthesis.
4. To understand the modern methods in organic synthesis.

Expected Course Outcomes:
On the successful completion of the course, student will be able:

1. To learn the various synthetic strategies and basics of retro-synthetic analysis.
2. To understand the applications of protecting groups in organic synthesis.
3. To learn the applications of variety of disconnection approaches like one group C-X disconnections, one group C-C disconnections, two group C–C disconnections etc.
5. To gain detailed knowledge about applications of metallic reagents in organic synthesis.
6. To understand the mechanism and applications of Pd mediated cross coupling reactions through named reactions.
7. To get knowledge on modern methods in organic synthesis and their applications.

UNIT–I: Basics of Organic Synthesis and Disconnection Approach - I 15 Hrs

Basics of Organic Synthesis. Classification of organic reactions; carbon-carbon single bond formation reactions; carbon-carbon double bond formation reactions; functionalization; functional group interconversion; organic synthesis: reason for organic synthesis and total (complete), partial (semi), formal, linear and convergent synthesis; introduction to synthetic strategies.

Disconnection Approach – I.

i. Introduction. Terminology: retrosynthetic analysis (disconnection approach), target, synthon, synthetic equivalent (reagent), functional group interconversion (FGI), functional group addition (FGA), functional group elimination (removal); synthesis of aromatic compounds: benzocaine, *p*-methoxytoluene, BHT, isobutylbenzene, trifluralin B, phenols, saccharine and *o*-cyanotoluene.

ii. Protecting groups. Introduction and protective groups for phenols and alcohols, amines, ketones and

aldehydes, and carboxylic acids.

UNIT–II: Disconnection Approach – II 15 Hrs

i. Importance of order of events;one group C-X disconnections; chemoselectivity; two group C-X disconnections; reversal of polarity (umpolung); cyclization reactions.

ii. One group C-C disconnections –synthesisof alcohols and carbonyl compounds; regioselectivity; olefin synthesis; use of alkynes in synthesis.

iii. Two group C–C disconnections: Diels-Alder reaction; 1,3-difunctionalized compounds – 1,3-dicarbonyl, β-hydroxy carbonyl and α,β-unsaturated compounds, 1,5-dicarbonyl compounds – Michael addition and Robinson annulation, synthesis of 1,2- and 1,4-dicarbonyl compounds – reconnection.

iv. General strategy.

UNIT– III: Metallic Reagents in Organic Synthesis 15Hrs

Organometallic Reagents. Grignard reagents, organolithium, organozinc, organocopper and organonickel reagents in Organic synthesis.

Palladium Mediated Cross-Coupling Reactions. Suzuki, Heck, Stille, Sonogishira, Buchwald-Hartwig and Negishi-Kumada cross-coupling reactions.

UNIT – IV: Methods in Organic Synthesis 15 Hrs

Enamines: introduction, generation, Stork enamine reaction, applications of enamines in organic synthesis; multi component reactions (MCR): introduction, Strecker synthesis, Ugi reaction, Mannich reaction, Biginelli reaction, and Hantzsch synthesis; tandem synthesis: definition, advantages, polyene cationic cyclizations, conjugate addition-aldol reaction, Mannich-cation olefin cyclization, Knoevenagal- hetero-Diels-Alder reaction. Electro-organic synthesis: introduction, anodic oxidation, cathodic reduction and cross coupling reactions.

Books/ Reviews Suggested

[1] Designing Organic Syntheses: A Programmed Introduction to the Synthon Approach, S. Warren, John Wiley &Sons.

[2] Organic Synthesis: Strategy and Control, P. Wyatt and S. Warren, John Wiley &Sons.

[3] Organic Synthesis: The Disconnection Approach, 1st& 2ndEd.s, S. Warren and P. Wyatt, John Wiley &Sons.

[4] Organic Synthesis: Concept, Methods and Starting Materials, J. Fuhrhop and G. Perzillin, (VerlageVCH) 2nd Ed., 1994.

[5] Organic Synthesis, M. B. Smith, 4th Ed., Elsevier, 2017.

[6] Advanced Organic Chemistry: Part A & B, F. A Carey and R. J. Sundberg, 5th Ed., Springer, 2007.

[7] Some Modern Methods of Organic Synthesis, W. Carruthers, 3rd Ed., (Cambridge Univ. Press).

[8] Introduction to Strategies for Organic Synthesis, L. S. Starkey, John Wiley & Sons, 2012.

[9] Modern Synthetic Reactions, H. O. House, 2nd Ed., (W.A. Benjamin).

[10] Multi-component Reactions: J. Zhu and H. Bienaymé (Wiley-VCH).

[11] Synthetic Organic Electrochemistry: An Enabling and Innately Sustainable Method: J.H. Evan, R. R. Brandon and S. B. Phil , ACS Cent. Sci. 2016, 2, 302 − 308. DOI: 10.1021/acscentsci.6b00091

[12] Electro-organic synthesis – a 21st century technique: D. Pollok and S. R. Waldvogel, Chem. Sci.,2020, 11, 12386. DOI: 10.1039/d0sc01848a

CHE45033: ORGANIC SPECTROSCOPY

UNIT – I: UV-Visible and IR Spectroscopy

UNIT – II: Nuclear Magnetic Resonance Spectroscopy (^{1}H NMR)
UNIT – III: ^{13}C NMR Spectroscopy and 2D NMR Techniques
UNIT – IV: Mass Spectrometry

Course Objectives:

The main objectives of this course are:

1. To understand the basics and applications of Ultraviolet and Visible Spectroscopy.
2. To understand the principle, instrumentation, applications of Infrared Spectroscopy.
3. To understand the principle, various aspects and applications of ^{1}H NMR Spectroscopy.
4. To understand the principle, various aspects and applications of ^{13}C NMR Spectroscopy.
5. To understand the principle and applications of 2D NMR Techniques.
6. To understand the principle; instrumentation, methods and applications of Mass Spectrometry.

Expected Course Outcomes:

On the successful completion of the course, student will be able:

1. To learn the various aspects involved in the Ultraviolet and Visible Spectroscopy and its applications.
2. To gain knowledge on the principle, instrumentation, aspects of Infrared Spectroscopy and its applications to identify functional groups in organic compounds.
3. To learn the principle, various aspects and applications of ^{1}H & ^{13}C NMR Spectroscopy in structural elucidation of organic compounds.
4. To attain basic knowledge on 2D NMR techniques and their applications in structural elucidation of organic compounds
5. To gain detailed knowledge about principle; instrumentation, and methods of mass spectrometry and its applications with respect to structure determination of organic compounds.

UNIT – I: UV-Visible and IR Spectroscopy 15 Hrs

Ultraviolet and Visible Spectroscopy. Various electronic transitions (185-800 nm); effect of solvent on electronic transitions; ultraviolet bands for carbonyl compounds, unsaturated carbonyl compounds, dienes and conjugated polyenes; Fieser–Woodward rules for conjugated dienes and carbonyl compounds; ultraviolet spectra of aromatic and heterocyclic compounds; steric effect in biphenyls; polycyclic aromatic compounds.

Infrared Spectroscopy. Instrumentation and sample handling; FT-IR. overtones, combination bands and Fermi resonance; factors influencing vibrational frequencies; characteristic vibrational frequencies of alkanes, alkenes, alkynes, aromatic compounds, alcohols, ethers, phenols and amines; detailed study of vibrational frequencies of carbonyl compounds (ketones, aldehydes, esters, amides, acids, anhydrides, lactones, lactams and conjugated carbonyl compounds).

UNIT–II: ^{1}H NMR Spectroscopy 15 Hrs

Nuclear spin; nuclear resonance; saturation; shielding of magnetic nuclei; deshielding; chemical shifts and its measurements; factors influencing chemical shift; chemical shift values and correlation for protons bonded to carbon (aliphatic, olefinic, aldehydic and aromatic) and other nuclei (alcohols, phenols, enols, carboxylic acids, amines and amides); spin-spin interactions; coupling constant (J): types and classification (ABX, AMX, ABC etc.) of coupling constants; Karplus curve variation of coupling constant with dihedral angle; virtual coupling; chemical exchange; effect of deuteration; hindered rotation; simplification of complex spectra: nuclear magnetic double resonance (spin decoupling); contact shift reagents; nuclear Overhauser effect (NOE).

UNIT–III: ^{13}C NMR Spectroscopy and 2D NMR Techniques 15 Hrs

^{13}C NMR Spectroscopy. CW and FT techniques; types of ^{13}C NMR spectra: undecoupled, proton- decoupled and off-resonance decoupled (ORD) spectra; ^{13}C chemical shifts; factors affecting the chemical shifts; chemical shifts of organic compounds; calculation of chemical shifts of alkanes, alkenes and alkynes; homonuclear (^{13}C-^{13}C J) and heteronuclear (^{13}C-,^{1}H J) coupling; ^{13}C NMR spectral editing techniques: principle and applications of DEPT.

2D NMR Techniques. Principles of 2D NMR; classification of 2D-experiments; correlation spectroscopy (COSY), HOMO COSY (^{1}H-^{1}H COSY), COSY of *m*-dinitrobenzene, isopentylacetate, hetero COSY (^{1}H,^{13}C COSY); hetero COSY of isopentyl acetate and 4-methyl-2-pentanol; HMQC; HMQC of codeine; long range ^{1}H,^{13}C COSY (HMBC); HMBC of codeine; NOESY; NOESY of 9-benzylanthracene.

UNIT–IV: Mass Spectrometry 15 Hrs

Introduction; principle; instrumentation; single and double focusing mass spectrometers; ionization methods: EI, CI, FDI, PDI, LDI, FAB, TSI and ESI; mass analyzers: MSA, ESA, QMA, ITA, TOF, FT and tandem; molecular-ion peak; nitrogen rule; base peak; metastable ion; isotopic abundance; high resolution mass spectrometry (HRMS); index of hydrogen deficiency (IHD); general methods of mass spectral fragmentation; Mc Lafferty rearrangement; ortho effect; factors affecting fragmentation; mass spectral fragmentation patterns of various classes of organic compounds: alkanes, alkenes, alkynes, aromatics, alcohols, alkyl halides, ethers, aldehydes, ketones, carboxylic acids, esters, amines, amides, nitriles, nitro compounds; mass spectral problems with respect to structure determination.

Books suggested

[1] Organic Spectroscopy, W. Kemp, 5th Ed. (ELBS.2).
[2] Spectroscopy of Organic Compounds, R.M. Silverstein and others, 5th Ed. (John Wiley).
[3] Spectrometric Identification of Organic Compounds, R.M. Silverstein, F.X. Webster and D.J. Kiemle,7th Ed. (Wiley).
[4] Introduction to Spectroscopy, A guide for students of organic chemistry, Donald L. Pavia, Gary M.Lamp man and George S. Kriz, 3rd Ed. (Thomson).
[5] Spectroscopic methods in Organic Chemistry, D.H. Williams & I. Flemming (TMH).
[6] Spectroscopy of Organic Compounds, P. S. Kalsi (Wiley).
[7] Nuclear Magnetic Resonance Spectroscopy: An introduction to Principles, Applications and experimental methods, Joseph B. Lambert, Eugene P. Mazzola, (Pearson Education Inc.).
[8] A Complete Introduction to Modern NMR Spectroscopy, Roger S. Macomber (John Wiley & Sons).

INTERNAL ELECTIVE

CHE45034A: MEDICINAL CHEMISTRYAND NATURAL PRODUCTS

UNIT – I: Basic Principles of Pharmacology and Concepts of Drug DeliveryUNIT – II: Drug Design, Lead Modification and SAR

UNIT – III: Terpenoids and Steroids

UNIT – IV: Alkaloids, Flavonoids and Isoflavonoids

Course Objectives:
The main objectives of this course are:

1. To understand the basic principles of pharmacokinetics and pharmacodynamics and concepts of drug delivery systems.

2. To understand the concept of drug design, lead modification strategies and SAR of drugs.
3. To understand occurrence, structure determination, stereochemistry, biosynthesis and synthesisof terpenoids and steroids.
4. To learn the structural elucidation, physiological action, biosynthesis and synthesis of alkaloids, flavonoids and isoflavonoids.

Expected Course Outcomes:

On the successful completion of the course, student will be able:

1. To learn the basic principles of pharmacokinetics like ADME, aspects pharmacodynamics and wide range of drug delivery systems.
2. To learn the principles of design of various classes of drugs and variety of lead modification strategies.
3. To gain detailed knowledge about SAR of different drugs, structure pruning techniques and principles of pro-drug design.
4. To gain understanding on structure determination, biosynthesis and synthesis of various terpenoids and steroids.
5. To gain familiarity on structural elucidation, physiological action and synthesis of various alkaloids, flavonoids and isoflavonoids.

UNIT – I: Basic Principles of Pharmacology and Concepts of Drug Delivery 15 Hrs

Definitions. Disease, drug, bioassay, pharmacokinetics and pharmacodynamics; stages involved in drug discovery; formulation; drug dosage: solid dosage forms, semi-solid dosage forms and liquid dosage forms; routes of drug administration.

Pharmacokinetics and Pharmacodynamics. Absorption; distribution; metabolism and excretion of drugs (ADME); nature of drug – receptor interactions; theories of drug action: occupancy theory, rate theory, induced-fit theory, drug synergism and antagonism.

Concepts of Drug Delivery. Drug delivery definition; conventional drug delivery; route specific drug delivery; polymer-drug conjugates; PEGylation; diffusion controlled systems; Ficks laws; reservoir systems; non-erodible matrix systems; bio-erodible systems; types of drug delivery systems; clinical trials of drug delivery systems.

UNIT – II: Drug Design, Lead Modification and SAR 15 Hrs

Drug Design. Lead discovery; existing drugs as leads (me too drugs); pharmacophore; principles of design of agonists; antagonists and enzyme inhibitors; design of salbutamol, cimetidine and captopril; drug discovery without lead – serendipity-Penicillin and Librium as examples.

Lead Modification Strategies. Bioisosterism; variation of alkyl substituents; chain homologation and branching; variation of aromatic substituents; extension of structure; ring expansion and ring contraction; ring variation; variation and position of hetero atoms; ring fusion; simplification of the lead; rigidification of lead.

Structure-activity Relationship (SAR) Studies. SAR in sulfa drugs, benzodiazepines and taxol analogs; Structure pruning techniques with morphine as example; principles of prodrug design.

UNIT – III: Terpenoids and Steroids 15 Hrs

Terpenoids. General methods of isolation; classification; isoprene rule; structure determination, stereochemistry, biosynthesis and synthesis of camphor, farnesol and zingiberene.

Steroids. Biological importance of steroids; Diel's hydrocarbon and stereochemistry of steroids; structure determination of cholesterol; structure determination and synthesis of androsterone and testosterone; biosynthesis of steroids.

UNIT–IV: Alkaloids, Flavonoids and Isoflavonoids 15 Hrs

Alkaloids. General isolation methods; classification; general methods of structural elucidation; physiological action; structural elucidation and synthesis of papaverine and reserpine.

Flavonoids and Isoflavonoids. Nomenclature; general methods of structure determination; structure elucidation and synthesis of apigenin, luteolin, quercetin and daidzein.

Books Suggested

[1] Medicinal Chemistry and Pharmaceutical Chemistry, H. Singh and V. K. Kapoor (Vallab Prakashan, 2017)
[2] An Introduction to Medicinal Chemistry, G. L. Patrik, 4th Ed (Oxford, 2013),
[3] Fundamentals of Medicinal Chemistry, Gareth Thomas (Wiley, 2003)
[4] Biochemical Approach to Medicinal Chemistry, Thomas Nogrady (Oxford University Press, 1988)
[5] Principles of Medicinal Chemistry, William Foye, 7th Ed (Lippincot 2012)
[6] Medicinal Chemistry, AshutoshKar (New age, 2005)
[7] Organic Chemistry Natural Products, O. P. Agrawal, Vols. 1 &2, Goel Pubs.
[8] Natural Products Chemistry K. B. G. Torssell, John Wiley, 1983.
[9] Chemistry of Natural products P. S. Kalsi, Kalyani Publishers.

CHE45034B: INDUSTRIAL ORGANIC CHEMISTRY

UNIT – I: Industrial Organic Syntheses – Petrochemicals UNIT – II: Dyes

UNIT – III: Oils, Fats, Waxes and Soaps

UNIT – IV: Natural and Synthetic Polymers

Course Objectives:
The main objectives of this course are:

1. To understand the basic principles of industrial organic synthesis.
2. To understand the nomenclature, classification, synthesis and applications of dyes.
3. To understand the classification and properties of oils, fats, and waxes and their applications in the manufacture of soaps.
4. To learn the about natural and synthetic polymers with respective to their properties and utility.

Expected Course Outcomes:

On the successful completion of the course, student will be able:

1. To learn the basic principles of industrial organic synthesis and petrochemicals.
2. To gain detailed knowledge on the nomenclature, classification, synthesis and applications of dyes.

3. To gain knowledge about classification and properties of oils and fats and general aspects on soap manufacturing.
4. To gain understanding on types of polymerization, mechanism of preparation, properties and utility of natural and synthetic polymers.

UNIT – I: Industrial Organic Syntheses – Petrochemicals **15 Hrs**

Introduction; raw material and basic processes; chemical processes used in industrial organic synthesis; petrochemicals; methanol, ethanol, rectified spirit from beer; methylated spirit; proof spirit; preparation of absolute ethanol from rectified spirit; acetaldehyde; acetic acid; isopropanol; ethylene glycol; glycerin; acetone; phenol; ethyl acetate.

UNIT – II: Dyes 15 Hrs

Introduction; sensation of colour; colour and constitution; nomenclature; basic operations in dyeing; classification of dyes according to the mode of application; synthesis, reactions and applications of diphenyl methane dyes, triphenylmethane dyes, phthalein dyes, xanthenes dyes, acridine dyes, sulphur dyes, and cyanine dyes. Fluorescent Dyes**:** synthesis, reactions and applications of Coumarin fluorescent dyes

UNIT – III: Oils, Fats, Waxes and Soaps 15 Hrs

Introduction; distinction between oils and fats; properties and classifications; animal fats and oils; difference between, animal, vegetable and mineral oils; isolation of essential oils and their uses; saponification value; ester value; acid value; iodine value; Wijs method; Reichert meissl value; Henher value; elaiden test; hydrogenation of oils; soap and its manufacture; general consideration in soap making; manufacture of toilet and transparent soaps; oil to be used for soap; cleansing action of soap.

UNIT – IV: Natural and Synthetic Polymers 15 Hrs

Introduction; types of polymerization and their utility; mechanism involved in preparation; hermoplastic and thermosetting polymers; phenolic resins; polyurethanes; epoxy resins; alkyl resins; natural and synthetic rubber; types and their utility; polymer properties and structure.

Books Suggested

[1] Industrial Chemistry (Including Chemical Engineering), B. K. Sharma (10th Ed., 1999).
[2] Outlines of Chemical Technology – For the 21st Century, M. Gopala Rao, M. Sittig (3rd Ed., 1997).

CHE45034C: BIO-ORGANIC CHEMISTRY

UNIT – I: Amino Acids and Peptides UNIT – II:

Carbohydrates

UNIT – III: Vitamins

UNIT – IV: Nucleic acids and Prostaglandins

Course Objectives:
The main objectives of this course are:

1. To understand the synthesis and properties of amino acids; classification and nomenclature of peptides and peptide synthesis.

2. To learn the about naturally occurring sugars general methods of structure elucidation degradation and biological functions of carbohydrates.
3. To understand the structure and synthesis of vitamins.
4. To understand the structure and biological importance of nucleic acids.
5. To learn the nomenclature and classification, structure and biological role of prostaglandins.

Expected Course Outcomes:

On the successful completion of the course, student will be able:

1. To learn about general aspects of amino acids; classification and nomenclature of peptides and peptide synthesis.
2. To gain knowledge on the naturally sugars, general methods of structure elucidationdegradation and biological functions of carbohydrates.
3. To gain knowledge about structure and synthesis of vitamins.
4. To gain understanding on structure and biological importance of nucleic acids.
5. To have awareness on nomenclature and classification, structure and biological role of prostaglandins.

UNIT – I: Amino Acids and Peptides 15 Hrs

Synthesis and reactions of amino acids; classification and nomenclature of peptides; Sanger and Edman methods of sequencing; cleavage of peptide bond by chemical methods; peptide synthesis: protection of amino group (Boc-, Cbz- and Fmoc-) and carboxyl group as alkyl and aryl esters; use of DCC, T_3P, HOBt and active esters; acid halides; acid azides; anhydrides in peptide bond formation reactions; deprotection and racemization in peptide synthesis; solution and solid phase techniques; synthesis of oxytocin; introduction to peptidomimetics.

UNIT – II: Carbohydrates 15 Hrs

Types of naturally occurring sugars: deoxy sugars, amino sugars, branched chain sugars, methyl ethers and acid derivatives of sugars; general methods of structure elucidation and ring size determination with particular reference to maltose, lactose and sucrose; structure, degradation and biological functions of starch, cellulose and chitin.

UNIT – III: Vitamins 15 Hrs

Structure and synthesis of vitamin B complex: vitamin B_1 (aneurin), vitamin B_2 (riboflavin), vitamin B_5 (pantothenic acid), vitamin B_9 (folic acid), vitamin H (biotin), vitamin B_6 (pyridoxine), vitamin B_{12} (cyanocobalamin) structure only - vitamin E (α-tocopherol) - vitaminK_1 (phylloquinone) and vitamin K_2.

UNIT – IV: Nucleic acids and Prostaglandins 15 Hrs

Nucleic acids. Purine and pyrimidine bases; structure of nucleosides and nucleotides; methods of formation of internucleotide bonds (DCC and phosphotriester approaches); structure of DNA (WatsonCrick model) and RNAs; biological importance of DNA and RNA; protein-nucleic acid interaction; chromatin and viral nuclear capsid.

Prostaglandins. Nomenclature and classification; structure and biological role of PGE_1, PGE_2 and PGE_3.

Books Suggested

[1] Peptides Chemistry: A practical text book, M. Bodansky, Springer-Verlag NY, (1988).

[2] Solid-phase peptide synthesis: A practical approach-E. Artherton, R.C. Sheppard, Oxford UniversityPress (1989).
[3] Peptides: Chemistry and Biology, N. Selwad, H.-D. Jakubke, Wiley-VCH, (2002).
[4] Biochemistry, J. David Rawn, Neil Pattuson publishers, North Carolina, (USA), (1989).
[5] Organic Chemistry. Vol I and Vol II, I. L. Finar, 6th Ed., ELBS & Longman (London), (1975).
[6] Introduction to Lipids, D. Chapman, McGraw-Hill, (1969).
[7] Advanced General Organic Chemistry, S. K. Ghosh, D.K. and Allied publishers (UBS), Calcutta (1998).
[8] Text book of Biochemistry, E. S. West, W. R. Todd, H. S. Mason, J. T. Van Bugen, 4th Ed., AmerindPublishing Co. (New Delhi) (1974).
[9] Total Synthesis of Natural Products Vol. IV, Apsimon, John Wiley, New York (1981).

CHE45035: SPECTRAL IDENTIFICATION OF ORGANIC COMPOUNDS (UV, IR, ^{1}H & ^{13}C NMR AND MASS)

Course Objectives:

The main objectives of this course are:

1. To understand the basic applications of UV, IR, ^{1}H &^{13}C NMR and Mass spectra.
2. To understand the structural elucidation of organic compounds using combination of UV, IR, ^{1}H &^{13}C NMR and Mass spectral data.

Expected Course Outcomes:

On the successful completion of the course, student will be able:

1. To get skill in the assignment of different spectral values to the relevant groups in organic molecules.
2. To attain hands on experience in the structural elucidation of organic molecules with the aid of combination of UV, IR, ^{1}H &^{13}C NMR and Mass spectral data analysis.
3. To attain hands on experience in the identification of products in a sequence of reactions using spectral data.

Composite spectral problems in three modes, 10 examples in each mode:

i. Propose the structures for compounds that fit the given spectral data and assign the spectral values.

ii. For the given scheme and spectroscopic data, deduce the structure of compounds I, II and III, and assign the data.

iii. Extract data from the given spectra and elucidate the structure from the obtained data with appropriate discussion.

Books Suggested

[1] Organic Spectroscopy, W. Kemp, 5th Ed. (ELBS.2).
[2] Spectrometric Identification of Organic Compounds, R.M. Silverstein, F.X. Webster, D.J. Kiemle, 7thEd. (Wiley).
[3] Introduction to Spectroscopy, A Guide for Students of Organic Chemistry, D. L. Pavia, G. M. Lampman, G. S. Kriz, 3rd Ed. (Thomson).

CHE45036A: Project Work

Course Objectives:

The main objectives of this course are:

1. To perform research based laboratory work in the topic of interest.
2. To compile the outcome of work done, in the form of dissertation for submission for valuation.

Expected Course Outcomes:

On the successful completion of the course, student will be able:

1. To get skill in the literature survey, designing of research work and its execution in the laboratory.
2. To attain hands on experience in the data analysis and compilation of data in the form of dissertation.
3. To attain presentation skills on the field of research work done.

Research based project and need to submit a dissertation for evaluation. Further, a finalpresentation of dissertation work and viva need to be conducted.

CHE45036B: Multidisciplinary Course

Course Objectives:

The main objectives of this course are:

1. To perform research based laboratory work in the multidisciplinary topic of interest.
2. To compile the outcome of research done, in the form of dissertation for submission for valuation.

Expected Course Outcomes:

On the successful completion of the course, student will be able:

1. To get skill in the literature survey, designing of research work and its execution in the laboratory in collaboration with other departments.
2. To attain hands on experience in the data analysis of multidisciplinary experiments and compilation of obtained data in the form of dissertation.
3. To attain presentation skills on the multiple fields of research work done.

The candidate may be undertaken any one of the following four courses.

a) Design, preparation, morphological characterization and applications of nanomaterials. (In collaboration with Life Sciences, Physics and Material Science & Nanotechnology)

b) Design, synthesis, structural characterization and applications of organic molecules. (In collaboration with Life Sciences, Physics and Material Science & Nanotechnology)

c) Design, fabrication, morphological characterization and applications of biomaterials. (In collaboration with Life Sciences, Physics and Material Science & Nanotechnology)

d) Extraction, isolation, structural characterization and biological applications of natural products (In collaboration with Life Sciences).

Model Question Paper
M.Sc. DEGREE EXAMINATION
Chemistry
PAPER I-INORGANIC CHEMISTRY

Time: 3 Hours Max. Marks: 75

(No additional sheet will be supplied)

PART – A 5 x 3 =15

Answer any five questions
Each question carries 3 marks
Answer should not exceed one page

1. UNIT-I
2. UNIT-I
3. UNIT-II
4. UNIT-II
5. UNIT-III
6. UNIT-III
7. UNIT-IV
8. UNIT-IV

.

PART – B 4 x 15 =60

Answer all the questions
Each Question Carries 15 Marks

Answer should not exceed *six* pages

9. UNIT-I
(OR)

10. UNIT-I

11. UNIT-II
(OR)

12. UNIT-II

13. UNIT-III
(OR)

14. UNIT-III
15. UNIT-IV
(OR)

16. UNIT-IV

Model Question Paper

M.Sc. DEGREE EXAMINATION

THIRD SEMESTER

Chemistry

CHE35036: Molecular Modeling and Pharmaceuticals

Time: 2 Hours Max. Marks: 40

(No additional sheet will be supplied)

PART – A 4 x 3 =12

Answer any ***Four*** questions

Each Question Carries 3 Marks

Answer should not exceed one page

1. UNIT-I
2. UNIT-I
3. UNIT-I
4. UNIT-II
5. UNIT-II
6. UNIT-II

PART – B 4 x 7 =28

Answer all the questions

Each Question Carries 7 Marks

Answer should not exceed *three* pages

7.	UNIT-I (OR)
8.	UNIT-I
9.	UNIT-I (OR)
10.	UNIT-I
11.	UNIT-II (OR)
12.	UNIT-II
13.	UNIT-II (OR)
14.	UNIT-II

MASTER OF COMMERCE

Program Code: COMYVU

SYLLABUS

With effect from the Academic Year 2021-2022

YOGI VEMANA UNIVERSITY

A State University, Accredited with **"B"** Grade by NAAC

VEMANAPURAM

YSR (KADAPA) DISTRICT - 516005

VISION

The **M.Com** Course Structure is designed for imparting the specialized skills and applied competencies in both the theoretical and practical mode with regard to the commerce subjects which will help to the student to cater the contemporary needs of industry and academia in the present-day business era.

Program Educational Objectives (PEOs)	
PEO1	To impart professional / entrepreneurial skills needed for undertaking the trade and commerce related activities and to promote entrepreneurship
PEO2	To foster computer literacy and its application related to Accounting package - tally, online trade promotion and web page development
PEO3	To imbibe the practical knowledge on accounting, taxation, management, marketing, human resource management and legal aspects of business enterprises.
PEO4	To enrich the student abilities to become project trainer, consultant in the field of accounts and tax, banking & finance and financial markets.
PEO5	The curriculum serves as a foundation to the students for pursuing research programmes in future.

Program Specific Outcomes (PSOs)	
After the successful completion of **M.Com** program, the students are expected to	
PSO1	Develop the skills for preparation of financial statements
PSO2	Gain knowledge about avenues of research through speciallectures/international conferences/case analysis, etc.
PSO3	Seek an opportunity as an accountant, marketing expert, financial advisor, HR practitioner, production manager and tax consultant and the like
PSO4	Develop the teaching skills on various aspects related to commerce subjects
PSO5	Improve the professional competency and computing skills
PSO6	Enhance the knowledge through hands on practice on various subjects

Program Outcomes (POs)	
On successful completion of the **M.Com** program, students can	
PO1	Acquire technical and decision making skills in the area of accounting, securities and online trade practices to make student industry ready
PO2	Build expertise in auditing, taxation and GST to become practitioners in specific fields
PO3	Identify, analyze and grab the opportunities available in global scenario
PO4	Utilise knowledge for developing accounting packages and software for corporate requirements
PO5	Obtain employment in IT field, Banks, Companies, BPO's and KPO's
PO6	Initiate entrepreneurial activities / Startups
PO7	Seek suitable employment in both private and govt. sectors
PO8	Become consultant in the capital markets
PO9	Get employment in various educational sector
PO10	Excel the investment, marketing and managerial skills in the fields of insurance, stock market, mutual fund for the settlement in executive position at various sectors

RESOLUTION

1. Resolved to recommend the following scheme and structure of syllabi for M.Com., course for each paper in each semester except IT for Business in I Semester and Accounting Package Tally in III semester as under

A. For Theory Papers:

- Internal Assessment (IA) 25 Marks
- Semester End Examinations (SEE) 75 Marks

B. For Practical Papers: (IT for Business in I Semester, Accounting Package- Tally in III Semester)

- Internal Examination 25 Marks
- Practical Examination (SEE) 25 Marks
- Semester End Examinations (SEE) (Theory) 50 Marks

Note: The practical Examinations shall be conducted by an Internal Examiner and External Examiner based on the record, demo and Viva-Voce

C. Project & Viva-Voce in IV Semester

- Viva-Voce Examination 25 Marks
- Project Report (Dissertation) 75 Marks

2. Resolved to recommend the model question paper for **theory papers for 75 Marks *with 3 hours time frame*** as under:

Section – A consist of 8 short questions each question carries 3 marks and student shall answer any 5 questions **total 15 Marks**

Section – B consist of 4 questions each question carries 15 marks and student shall answer all the questions with internal choice i.e. either/or **total 60 Marks**

3. Resolved to recommend the model question papers for **practical papers for 50 Marks *with 2 hours time frame*** (IT for Business in I Semester and Accounting Package – Tally in III Semester) as under

Section – A consist of 8 short questions each question carries 2 marks and student shall answer any 5 questions **total 10 Marks**

Section – B consist of 4 questions each question carries 10 marks and student shall answer all the questions with internal choice i.e. either/or **total 40 Marks**

4. Resolved to undertake Study Tour / Industrial Visit once in a year to impart practical knowledge among the students.

* Model Question Papers for theory and practical papers is enclosed

M.COM – Course structure (CBCS) Scheme of Syllabus and Evaluation Pattern

Minutes of the Board of Studies (BOS) Meeting

Minutes of the meeting of the BOS meeting in Commerce (PG) held in the Chamber of Chairperson, Board of Studies, Department of Commerce on 29-06-2022 at 10.00 AM

1. Dr.G.Vijaya Bharathi	Chairperson
2. Prof.S.Raghunatha Reddy	Internal Member
3. Dr.G.Haranath	Internal Member
4. Prof.P.V.Narasaiah	External Member
5. Prof.C.Viswanatha Reddy	External Member
6. Sri.S.V.Rama Murthy	Industrialist
7. Ms.G.Eawaramma	PG Meritorious Student

The Board discussed at length the agenda of the meeting covering the M.Com course and its structure, content of syllabi, pattern of the question paper, allocation of the marks both for internal & external assessment including choice based credit system(CBCS) papers, guidelines for submission of project report, conduct of viva-voce examination and panel of subject experts.

The Board of Studies in Commerce (PG) , unanimously resolved to recommend the university authorities to :

1. Approve the M.Com., course structure, title of subjects and syllabi as appended
2. Approve to incorporate financial and marketing as specilisations which are more relevant to business and industry.
3. Approve the existing guidelines relating to question paper pattern, internal and external assessment, project report and viva-voce examination including the practical paper of IT for Business in I Semester and Accounting Package- Tally in III Semester
4. Approve the papers offered for the other department students on choice based credit system (CBCS)
5. Approve the panel of subject experts as appended

Signature of Members:

1. Dr.G.Vijaya Bharathi
2. Prof.S.Raghunatha Reddy
3. Dr.G.Haranath
4. Prof.P.V.Narasaiah
5. Prof.C.Viswanatha Reddy

6. Sri.S.V.Rama Murthy
7. Ms.G.Eawaramma

YOGI VEMANA UNIVERSITY

A State University, Accredited with "B" Grade by NAAC

M.Com Course Curriculum

(For the students admitted during the academic year 2021 – 22 onwards)

	Components of study	Course Code	Title of the Course	No. of Credits	No. of Hours per week	Tutorial/ Practical per week	Internal Assessme	Semester End Exams	Total Marks
Semester - 1	**Core**	COMYVU101	Organisational Behaviour	4	4	2	25	75	100
		COMYVU102	Managerial Economics	4	4	2	25	75	100
		COMYVU103	Business Environment and Policy	4	4	2	25	75	100
	Foundation	COMYVU104	(A) Communication Skills (B) Business Ethics	4	4	2	25	75	100
	Internal Elective 1	COMYVU105	(A) Corporate Financial Accounting (B) Techniques of Cost Accounting	4	4	2	25	75	100
	Internal Elective 2	COMYVU106	(A) IT For Business (B) Corporate Governance	4	4	2	25	75(50+25P*) 75	100
			Total	**24**	**24**	**12**	**150**	**450**	**600**
Semester - 2	**Core**	COMYVU201	Human Resource Management	4	4	2	25	75	100
		COMYVU202	Marketing Management	4	4	2	25	75	100
		COMYVU203	Financial Management	4	4	2	25	75	100
	Foundation	COMYVU204	(A) Soft skills for Career Development (B) Modern Banking	4	4	2	25	75	100
	Internal Elective	COMYVU205	(A) Quantitative Techniques for Business Decisions (B) Direct tax	4	4	2	25	75	100
	Open Elective	COMYVU206	(A) Basics of Accounting & Auditing (B) Basics of Savings and Investment	4	4	2	25	75	100
			Total	**24**	**24**	**12**	**150**	**450**	**600**
Semester - 3	**Core**	COMYVU301	Accounting for Managerial Decisions	4	4	2	25	75	100
		COMYVU302	Security Analysis and Portfolio Management	4	4	2	25	75	100
		COMYVU303	Corporate Tax and GST	4	4	2	25	75	100
	Skill Oriented Course	COMYVU304	(A) Accounting Package – Tally (B) Rural and Agricultural Marketing	4	4	2	25	75(50+25P*) 75	100
	Internal Elective	COMYVU305	(A) Financial Institutions, Markets and Services (B) Service Marketing	4	4	2	25	75	100
	Open Elective	COMYVU306	Basics of Stock Markets Basics of Income tax	4	4	2	25	75	100
			Total	**24**	**24**	**12**	**150**	**450**	**600**
Semester - 4	**Core**	COMYVU401	Entrepreneurship and Innovation	4	4	2	25	75	100
		COMYVU402	Legal Aspects of Business	4	4	2	25	75	100
		COMYVU403	International Business	4	4	2	25	75	100
	Internal Elective 1	COMYVU404	(A) Financial Derivatives (B) Retail Marketing Management	4	4	2	25	75	100
	Internal Elective 2	COMYVU405	(A) International Financial Management (B) International Marketing Management	4	4	2	25	75	100
	Project	COMYVU406	Project Report & Viva–Voce	4	4	2	-	100**	100
Sub-Total				**24**	**24**	**12**	**150**	**450**	**600**
Grand Total				**96**	**96**	**72**	**600**	**1800**	**2400**

* The practical examination shall be conducted by External Examiner and Internal Examiner based on Record, Execution and Viva-Voce

** A Faculty member can guide maximum of eight students. Guidance of eight students by a faculty member will be equivalent to the teaching work load of one paper per semester

COMYVU 101: ORGANISATIONAL BEHAVIOUR

Program Educational Objectives

This enables the students in understanding of :

1. Various management concepts and theories of organization behavior.
2. Human behavior in business organizations and its influence on organizational change, development and effectiveness.
3. Individual behavior, communication, conflict and various management styles, motivational theories and coordination in the work environment structure, culture and change human resources.
4. Behaviour in organisations including diversity, attitudes, job satisfaction, emotions, moods, personality, values, perception, decision making and motivational theories.
5. Group behaviour in organizations, including communication, leadership, power and politics, conflict and negotiations.

Expected Course Outcomes

After successful completion of this paper, the students are able to:

1. Describe how people behave under different conditions and understand why people behave as they do.
2. Analyze individual and group behavior, and understand the implications of organizational behavior on the process of management.
3. Evaluate the appropriateness of various leadership styles and conflict management strategies used in organizations.
4. Explain how organizational changes and culture affect working relationships within organizations.
5. Build the team spirit for institutional advancement and professional growth.

UNIT-I: Organisational Behaviour (OB): Nature and Scope – Fundamental Concepts - Significance and Limitations of Organisational Behaviour - OB as an Interdisciplinary Approach - Models of OB - Emerging Challenges ofOB in the 21st Century.

UNIT-II: Individual Dynamics: Personality - Perception - Factors Influencing Personality and Perception - Motivation – Concept – Types - Theories - Maslow's Need Hierarchy- Two factor theory; Vrooms Expectancy Theory – ERG Theory.

UNIT-III: Group Dynamics: Features - Types of Groups - Group Formation - Group Cohesiveness - Determinants of Group Cohesiveness; Leadership – Concept - Qualities of a leader - Leadership Theories – Trait Theory – Behavioural Theory – Contingency Theory – Fiedler Contingency Theory - Managerial Grid Theory – 3D Leadership Theory – Conflict Management - Causes and Consequences of Organisational Conflicts – Conflict Management Techniques

UNIT-IV: Organisational Dynamics: Organisational Culture – Cross Culture – Managerial response - Organisatonal Change - Concept – Planned Change – Resistance to Implementation of Change –Organisational Effectiveness – Factors Influencing Organisational Effectiveness - Organizational Development: Concept - Organizational Development Interventions.

Suggested Books

1. Prasad, L.M., Oganinational Behaviour, S.Chand Publications.
2. Aswathappa .K, Oganinational Behaviour, HPH, New Delhi.
3. Fred Luthans, Oganinational Behaviour,Tata McGraw Hill.
4. Stephen P.Robbins, Oganinational Behaviour , Pearson Education.
5. Arun Kumar N Meenakashi., Oganinational Behaviour, VPH.
6. Dale, Oganinational Behaviour, Sage Publications.
7. Hersey, Paul, Kenneth H. Blanchard and Dewey E. Johnson, Management ofOrganisational Behaviour, Utilising Human Resources, PHI.

COMYVU 102: MANAGERIAL ECONOMICS

Program Educational Objectives

This enables the students in understanding of :

1. Concepts of managerial economics and its role in business decisions
2. Demand & supply analysis and its applications in business
3. Functions of production, price strategies and profit theories
4. Impact of competition in various types of markets
5. Nexus between Macro-economic factors and managerial decisions

Expected Course Outcomes

After successful completion of this paper, the students are able to:

1. Apply principles of economics in day-to-day business activities
2. Understand the demand and supply conditions and assess the position of a company
3. Develop thorough knowledge on the production theories and cost while dealing with the factors of production.
4. Analyze real-world business problems with a systematic theoretical framework.
5. Design competition strategies, including costing, pricing, product differentiation, and market environment

UNIT-I: Introduction: Managerial Economics - Nature and Scope - Principles – Significance and Limitations - Objectives of the Firm - Theory of the Firm (or) Profit Maximization Model - Managerial and Behavioral Theories - Role and Responsibilities of a Managerial Economist.

UNIT-II: Demand and Supply Analysis: Law of Demand - Demand Schedule- Demand Function -

Determinants and Distinctions - Demand Estimation - Methods of forecasting for Existing and New Products - Criteria for an Effective Forecasting Method; Law of Supply - Determinants of Supply.

UNIT-III: Cost and Production Analysis: Cost Concepts - Cost Output Relationship in Short run and Long run - Cost Control and Reduction; Production Function - Laws of Production - Production Function with One,

Two and All Variables Input Factors - Cobb Douglas Production Function – Linear Programming

UNIT-IV: Profit and Price Analysis: Nature of Profit - Kinds of Profit - Theories of Profit - Cost Volume Profit Analysis - Managerial uses - Profit Planning and Forecasting; Competition - Types of Competition: Perfect Competition - Imperfect Competition; Pricing - Concept - Pricing Polices and Strategies - Pricing Methods - Product Line Pricing - Transfer Pricing - Pricing by Retailers - Dual Pricing - Administered Pricing - Export Pricing - Price Forecasting - Uses

Suggested Books

1. Craig Peterson and Lewis: Managerial Economics, Pearson Education Publication 2008
2. Mankiw, Principles of Macroeconomics, 4e, TL 2007.
3. Mehta, P.L., Managerial Economics, Text and Cases, S.Chand & Co., Publishers, NewDelhi
4. Varshney, R.L., and Maheswari, K.L., Managerial Economics, S.Chand & Co.,Publishers, New Delhi
5. Battacharya & Chakravarthy, Fundamentals of Business economics BS Publications2002.
6. Ahuja, H.L., Managerial Economics, S. Chand, New Delhi
7. Trivedi, M.L. Managerial Economics, Tata Mc-Graw Hills, New Delhi.
8. Mithani, D.M, Managerial Economics – Theory and Applications , Himalayas PublishingHouse, New Delhi.

COMYVU 103: BUSINESS ENVIRONMENTS AND POLICY

Program Educational Objectives

This enables the students in understanding of :

1. Concepts of Business Environment.
2. Economic Environment in Industrial Development Policies -Industrial policy, Fiscal policy, monetary policy, Economic Reforms in India
3. Socio-Cultural Environment.
4. Technological Environment and Modernisation of Technology.
5. In-depth knowledge about different environment in the business climate and the current issues affecting business.

Expected Course Outcomes

After successful completion of this paper, the students are able to:

1. Acquire basic knowledge of Business environment
2. Obtain acquaintance of the influencing factors of business environment in India.
3. Enhance the knowledge on economic environment and economic policies in India.
4. Improve the awareness on Socio-Cultural, Political and Legal Environment of Business.
5. Gain familiarities about the technological and global environment of business.

UNIT-I: Business Environment: Concept - Nature and Scope - Significance - Limitations - Elements & Types

- Internal and External Business Environment - Techniques of Environmental Analysis - Changing Dimensions of Business Environment.

UNIT-II: Economic Environment of Business: Introduction - Significance - Elements - Economic Systems and Business Environment - Economic Policies - Fiscal Policy - Monetary Policy - Role of Public Sector in Economic Development - Economic Reforms - Liberalization - Privatization & Globalisation - SEZs - Impact of New Economic Policy on Business.

UNIT-III: **Socio-Cultural, Political and Legal Environment:** Introduction - Elements of Socio-cultural

Environment - Impact of Socio-cultural Environment on Business - Political Environment - Role of Government in Business - Social Institutions and Systems - Social Values and Attitudes - Social Responsibilities of Business - Corporate Social Responsibility; Legal Environment - Changing Dimensions of Legal Environment in India - Consumer Protection Act.

UNIT-IV: Technological and Global Environment: Technological Environment - Impact of Technology on Business - Management of Technology – Implications; Global Environment: Importance - Nature and Scope - Rationale for Global Environment - Multi National Corporations (MNCs) - Problems and Benefits - Emerging Challenges of Global Business - FEMA.

Suggested Books

1. Aswathappa. K, Essentials of Business Environment, Himalaya Publishing House, New Delhi.
2. Francis Cherunilam, Business Environment, Himalaya Publishing House, New Delhi.
3. Kohli.S.L. andResutra N.K, Business Environment, Kalyani Publishers, New Delhi 2005.
4. Fernando A.C, Business Environment, Pearson Education, New Delhi.
5. Misra.S.K, and V.K.Puri, Indian Economy, Himalaya Publishing House, New Delhi, 2008.
6. Agrawal. A.N., Indian Economy: Problems of Development and Planning, New Age Publications, New Delhi, 2008.
7. Misra.S.K., and V.K.Puri, Economic Environment of Business, Himalaya Publishing House, New Delhi, 2008.
8. Raj Agrawal, Business Environment, Excel Books, New Delhi, 2008.

COMYVU 104 (A): COMMUNICATION SKILLS

Program Educational Objectives

This enables the students in understanding of :

1. Effective listening skills to become a critical listener.
2. Requires abilities to speak confidently in large groups.
3. Skills needed for effective writing
4. Importance of group discussions, debates, and public speech
5. Effective presentation skills

Expected Course Outcomes

After successful completion of this paper, the students are able to:

1. Develop the speaking skills
2. Apply necessary skills for drafting letters
3. Improve communication skills that integrate written, verbal and technical communication
4. Prepare CVs and be well versed with Interview and group discussion with creativity
5. Identify methods and formats of report preparation including graphical presentation

UNIT-I: **Communication**: Meaning and Definition - Importance - Means of Communication - Modes of Communication: Verbal, Non Verbal, Written & Visual - Communication Process - Principles - Barriers to Communication - Etiquettes of Communication - Effective Reading - Importance - Techniques of Reading - Reading Skills - Vocabulary Building

UNIT-II: Effective Listening: Listening - Art of listening – Principles - Types - Process - Guidelines for effective listening - Difference between hearing and listening - Qualities of good listener.

UNIT-III: Effective Writing: Importance of Written Communication - Writing Skills – Avoidance of Redundancy and Common Errors in Writing - Paraphrasing and Essay Writing - Personal and Professional Letters - Writing Memos - Minutes of the Meeting - Preparation of Curriculum Vitae.

UNIT-IV: Effective Presentation: Importance – Types – Qualities of Good presentation – Ways to improve presentation Skills - Effective Power Point Presentation Skills - Types and techniques of Interview

Suggested Books

1. Ramesh,MS & C.C.Pattanshetti, Madhumathi M.K.Kulkarni, "Business Communication", Sultan Chand and Sons , Educational Publishers,23, Daryagani, New Delhi, 2011
2. Rajendra Paul and Koralahalli, "Essentials of Business Communication", EducationalPublishers, 2011.
3. Raman, Meenakshi, & Sharma, Sangeta. (2011). Technical Communication - Principles and practice (2 ed.). Delhi: Oxford University Press.
4. R.C. Sharma & Krishna Mohan Business Correspondence and Report Writing. Tata Mc Graw Hill Publishing Company Limited.
5. K.K. Sinha, Business Communication, Galgotia Publishing Co., Karol Bagh, New Delhi.
6. UrmilaRai (2013).Business communication (2 Ed.).Himalayas Publishing House.
7. Dr.ParthoPratim Roy: Business Communication – The basics, Himalayas Publishing House.
8. C.S.Rayudu (2012), Communication (9 ed.), Himalayas Publishing House

COMYVU 104 (B): BUSINESS ETHICS

Program Educational Objectives

This enables the students in understanding of :

1. Concepts of Business Ethics.
2. Characteristics and importance of Business Ethics.
3. Principles of business ethics.
4. Challenges of Business Ethics.
5. In-depth knowledge about Sources of Ethics.

Expected Course Outcomes

After successful completion of this paper, the students are able to:

1. Get basic knowledge of Business Ethics.
2. Obtain acquaintance of the objectives and scope of business ethics.
3. Enhance the knowledge on principles of business ethics.
4. Improve the knowledge on challenges of business ethics.
5. Learn about the ethical theories of business.

UNIT – I: Business Ethics: Meaning and Definition of Business Ethics - Genesis of Business Ethics - Need -

Objectives of Business Ethics - Characteristics of Business Ethics - Scope of Business Ethics - Significance of Business Ethics - Problems in Adapting Business Ethics.

Elements of Business Ethics - Ethics in Contemporary Business.

UNIT-II: Principles of Business: Ethics - Factors Affecting Business Ethics - Ethical Standards -

UNIT-III: Ethical Theories: Modern Decision Making Model and Ethics - Sources of Ethics - Unethical Practices - Influence of Business Ethics on Business Operations.

UNIT-IV: Business Ethics: Challenges of Business Ethics and corporate leadership - Ethical principles in Business - Business Ethics from Indian perspective.

Suggested Books

1. Manuel G. Velasquez, Business Ethics, concepts, Prentice Hall of India, New Delhi.
2. R.C.Sekhar, Ethical Choices in Business, Response Books, New Delhi.
3. C.S.V. Murthy, Business Ethics, Himalaya Publishing House, New Delhi.

COMYVU 105 (A): CORPORATE FINANCIAL ACCOUNTING

Program Educational Objectives

This enables the students in understanding of :

1. Issues and practices of advanced corporate financial accounting.
2. Methods of accounting for price level changes
3. Concepts of Human Resource, Government and social responsibility accounting
4. Importance of Accounting principles & standards and its applications for business
5. Preparation of consolidated financial statements of different companies

Expected Course Outcomes

After successful completion of this paper, the students are able to:

1. Combine practical and theoretical knowledge of financial accounting.
2. Identify and analyze the price changes in the real life situations.
3. Develop the sufficient insights on the importance of accounting maintenance for different purposes
4. Describe how people analyze the concept of holding company under different conditions
5. Identify reasons for preparing financial statements in different manner.

UNIT-I: Financial Accounting: Introduction - Nature and Scope - Importance - Objectives - Generally Accepted Accounting Principles (GAAP) - Ethical Issues in Accounting Practices - Role of computers in accounting - Indian Accounting Standards and International Accounting Standards. (Theory only)

UNIT-II: Inflation Accounting: Meaning and Definition - Limitations of Historical Accounting - Methods of Accounting for Price Level Changes - Current Purchasing Power (CPP) - Current Cost Accounting (CCA) - Gearing Adjustment. (Theory & Problems)

UNIT-III: Human Resource Accounting: Concept - Advantages and Disadvantages of HR Accounting - Suggested Methods for Valuation of Human Resources; Corporate Social Accounting - Concept and Objectives - Social Accounting Measures - Social Responsibility Accounting; Government Accounting - Structure of Government Accounting - Commercial Accounting Vs Government Accounting (Theory only).

UNIT-IV: Consolidated Financial Statements: Meaning and Definition - Preparation of Consolidated Balance Sheet - Minority Interest - Pre-Acquisition and Post-Acquisition Profits - Cost Control or Goodwill - Inter Company Balances – Bonus Shares - Treatment of Dividends - More Than One Subsidiary - Inter Company Holdings – Preparation of Consolidated Financial Statements. (Theory & Problems)

Suggested Books

1. Gupta, R.L. and Radhaswami, M., Advanced Accountancy, S. Chand & Co., New Delhi.
2. Jain and Narang, Advanced Accountancy, Kalyani Publications, New Delhi
3. M.C. Shukla, T.S. Grewel, Advanced Accountancy, S. Chand & Co., New Delhi.
4. S.N. Maheswari and S.K. Maheswari, Corporate Accounting, Vikas Publishing House,New Delhi.
5. Arulanandam, Advanced Accountancy, Himalaya Publishing House, Delhi.
6. Ghosh, T.P., Accounting Standards and Corporate Accounting Practices, Taxmann.
7. Jawaharlal, Accounting Theory, Himalaya Publishing House.
8. I.M. Pandey, Management Accounting, Vikas Publication.
9. Bhatty J, Management Accounting, ELBS.
10. Khan and Jain, Management Accounting, Tata McGraw Hill.

COMYVU 105 (B): TECHNIQUES OF COST ACCOUNTING

Program Educational Objectives

This enables the students in understanding of :

1. The procedure to determine the cost of production.
2. Equip them in the preparation of various budgets
3. Cost controlling measures and its significance.
4. Enrich the students about the variances of standard costing
5. ABC Analysis used in manufacturing concerns.

Expected Course Outcomes

After successful completion of this paper, the students are able to:

1. Construct cost sheet and apply various techniques for minimizing the cost factor
2. To develop different budgets required for the different concerns
3. To apply the standard costing techniques and evaluate the causes for variance in different elements of cost
4. Able to identify and apply relevant methods used for preparation of financial statements
5. Understand various inventory techniques and its significance for optimum utilization

UNIT- I: Cost Accounting: Nature and Scope, Need, Objectives – Cost Concepts – Installation of Costing System

- Cost Accounting its relationship with Financial Accounting and Management Accounting Cost - Accounting Standards - Cost Classification – Cost Sheet - Books of Accounts – Integral and Non Integral Accounting - Reconciliation of Cost and Financial Accounts (Including Problems).

UNIT-II: Budget: Meaning, Essentials – Budgeting - Budgetary Control: Essentials, Advantages, Limitations – Classification of Budgets: Functional Budget: Sales Budget, Production Budget, Direct Material Budget, Direct Labor Budget, Manufacturing Overheads Budget - Capital Expenditure Budget - Cash Budget –Master Budget – Flexible Budget – Performance Budget – Traditional System of Budgeting – Zero Based Budgeting (Including Problems).

UNIT-III: Standard Costing: Need, Prerequisites, Pros and Cons - Standard Costing and Budgetary Control – Variance Analysis - Revision of Standards - Control and Efficiency Ratios. Marginal Cost: Meaning, Features - Absorption Cost: Meaning, Pros and cons – Marginal Costing Vs Absorption Costing - Preparation of Income Statement under Marginal Costing and Absorption Costing (Including Problems).

UNIT-IV: ABC Analysis: – Objectives - Merits - Limitations- Practical Applications - Stages of ABC Analysis – Differences between traditional cost system and ABC system.

Suggested Books

1. Jain S.P., & K.L.Narang, Cost Accounting Principles & Practice Kalayani Publishers New Delhi.
2. Rathnam P.V., Rathanm,s costing advanced problems and solutions, Kitab Mahal Distributors.
3. Maheswari S.N., Advanced problems and solutions in cost accounting, Sultan Chand & Sons.
4. Bhar B.K., Cost accounting methods and problems, Academic Publishers, Kolkota.
5. Khan M.Y & Jain P.K., "Theory and Problems in Cost Accounting" TMH

COMYVU 106 (A): IT FOR BUSINESS

Program Educational Objectives

This enables the students in understanding of :

1. Basics of information technology and helps to improve managerial performance.
2. Importance of computers and its applications on business.
3. Knowledge on spread sheets for acquisition, processing, and calculation of data.
4. Significance of using digital tools for effective presentation.
5. Creation and utilization of web designing and online payment modes

Expected Course Outcomes

After successful completion of this paper, the students are able to:

1. Understand the technology and infrastructure components of a computer
2. Using formatting skills for effective preparation of the documents
3. Use skills to apply formulas and prepare charts, graphs, generate reports etc., in spreadsheet
4. Preparation and use slide presentation with various details
5. Identify the e-commerce practices and role of website in promoting trade

UNIT-I: Computer in Business Correspondence: Meaning and Definition of Computer – Concept of Hardware and Software – Characteristics – Advantages and Disadvantages – Input Devices – Output Devices – Primary Memory - Secondary Storage. Features of MS Word – Quick Tool Bar- Ribbon Tabs – Groups – Commands – Rulers –Excel application use in MS Word.
Hands on Practice: Curriculum Vitae- Visiting Card – Letter Writing – Sending Letters through Mail Merge – Import data from Excel.

UNIT-II: Spreadsheet Applications in Business: Features – Advantages – Disadvantages of Spreadsheets – Bars and Areas of Worksheet – Statistical Functions – Text Functions – Logical Functions – Financial Functions – Lookup Functions – Conditional Formatting – Filter – Goal seeking – Other Applications Use in Excel.
Hands on Practice: Employee Salary Details – Calculation of data table – Pivot table – Creating Charts.

UNIT-III: Slide Presentations: Features – Advantages – Disadvantages – Types of slides – Slide layout – Applying Themes to a Presentation – Back ground styles – Transitions – Effects adding to data – Add Motion Path – Hyperlink to Slides – Slide Presentation – Custom Slide Show.
Hands on Practice: Departmental Profile and College Profile Using Animation - Audio and Video Presentation – PPTs link to various applications.

UNIT-IV: Role of IT in Online Business: Concept – Features - Advantages and Disadvantages - Environment of Global e-Commerce – Traditional Market Vs Digital Markets – Role of Website in B2C - Digital Advertising – Online Trading – Debit and Credit Card System – Digital Wallets.
Hands on Practice: E mail Creation – Web Page Designing – Creating Digital Signature –Payment through Debit Card.

Suggested Books

1. Fundamentals of Computer: Dr. K. Kiran Kumar, Sri Vaibhava Publications, Hyderabad.
2. Fundamentals of Information Technology: Saha RG and IL Narasimha Rao, Himalaya Publications, New Delhi.
3. Fundamentals of Information Technology: N.V.N.Chary & Lalitha S., Kalyani Publishers, Hyderabad.
4. Electronic Commerce – A managerial perspective, Efraim Turban, Jae Lee, David King and H.Michael Chung, Pearson Education, New Delhi.

COMYVU 106 (B): CORPORAT GOVERNANCE

Program Educational Objectives

This enables the students in understanding of :

1. Role of corporate governance in maintaining transparency of business transactions.
2. Importance of commitment to values and ethical conduct of business.
3. Emergence of corporate governance framework for corporate management
4. Specific ideas about the recommendations of various committees in different parts of world
5. Knowledge on corporate governance standards and practices for improving the quality of transparency

Expected Course Outcomes

After successful completion of this paper, the students are able to:

1. Identify and analyse the regulation of corporate governance including national and international codes of practice
2. Apply the knowledge of corporate governance theories and policy imperatives to bring transparency
3. Gain awareness of governance regulation to assess and propose solutions for corporate governance problem
4. Communicate factual and legal issues in relation to corporate governance arrangements
5. Appraise the corporate governance standards for developing corporate social responsibility

UNIT-I: Corporate Governance: Meaning and Definition – Need – Importance – Mechanism – Corporate governance Systems – Indian Model of Corporate Governance – Issues in Corporate Governance - Principles of Good CG - Code of Best Practices – World Committees on Corporate governance – Developments in USA and UK (Theory only)

UNIT-II: Corporate Governance in India: Need and Importance - Historical Perspective – Indian Committees and Guidelines on Corporate Governance - Naresh Chandra Committee - Narayana Murthy Committee - J.J Irani Committee - Kumara Mangalam Birla Committee – SEBI initiative – Corporate Governance Practices in India. (Theory only)

UNIT-III: Board of Directors and Audit Committee: Board of Directors and their role in CG – Composition of Board – CG Issues relating to Board – Independent Directors – Clause 49 of Listing Agreement – Audit Committee: Duties and Responsibilities of Auditors – Composition of Audit Committee – CG and internal auditors – Indian Situation. (Theory only)

UNIT-IV: Corporate Governance Standards and practices in India: CG Standards – Methods for Examining the Quality and Effectiveness of CG – CG Standards in Indian Context – CG in IT Sector – Pioneers in Good CG Practices – Problems of CG in India – CG and Business Ethics – CG and Corporate Social Responsibility (CSR) – Future of CG in India. (Theory only)

Suggested Books

1. Fernando A.C – Corporate Governance – principles, Policies and practices – Pearson Education – New Delhi -2006.
2. Subash Chandra Das – Corporate Governance – Codes, Systems, Standards and Practices –PHI Learning New Delhi-2009
3. Kesho Prasad – Corporate Governance – PHI Learning - New Delhi-2009
4. Singh S - Corporate Governance – Global Concepts and Practices – Excel Books -New Delhi-2005.
5. Donald H. Chew Jr. Staurt L.Gillan – Corporate Governance at Crossroads – Tata McGraw –Hill Co. Ltd. New Delhi-2006

COMYVU 201: HUMAN RESOURCE MANAGEMENT

.

Program Educational Objectives

This enables the students in understanding of :

1. Basic knowledge of Human Resource Management in business.
2. Concepts, practices and functions within the field of human resource management.
3. Necessary HR skills that are required by HR professionals
4. Effective management and planning of HR functions within organizations
5. Contribution of employee performance management and organizational effectiveness

Expected Course Outcomes

After successful completion of this paper, the students are able to:

1. Know about the nature of human resource management, the broad range of influences acting on human resource management.
2. Understand the methods of recruitment, selection process.
3. Recognize the performance appraisal of human resources in business and also on Knowledge and application of performance assessment methods, improvements and resultant in terms of employee service condition reviews.
4. Analyze various compensation plans and benefits and services.
5. Gain familiarity about the importance of training and development and its methods.

UNIT-I: Introduction to Human Resource Management: Definition and Concept of Human Resource Management –Role of Human Resource Management - Functions of Human Resource Management – Contemporary Issues in HRM – Strategic Human Resource Management – Horizons and Challenges of Challenges in the 21st Century.

UNIT-II: Acquisition of Human Resources: Human Resource Planning – Definition – Objectives – Process – Growing Importance – Job Analysis – Recruitment – Factors Affecting Recruitment – Recruitment Policy- Prerequisites of a good recruitment Policy- Source of Recruitment-Internal Sources –external sources.

UNIT-III: Employee Selection: The Process of Selection – Selection Policy- Essentials of Selection procedure- Steps in selection procedure- Selection Tests – Placement and Induction- Employer and Employee Relations – Need and Importance –Workers Participation in Management -Collective Bargaining -Negotiation- stress management.

UNIT-IV: Employee Training and Development: Need and Importance of Training – Principles of Training On the Job Training and Off – The Job Training Methods Performance Appraisal System – Objectives and Methods of Performance Appraisal – 360 Performance Appraisal — Compensation Management: Definition and Objectives of Job Evaluation -Incentives and fringe benefits.

Suggested Books

1. Aswathappa K. Human Resource and Personnel Management Text and Cases, Tata McGraw Hill.
2. Edwin B. Flippo, Principles of Personnel Management, McGraw Hill.
3. VenkataRatnam C.S. Managing People, Global Business Press, New Delhi.
4. N.K. Singh, Human Resource Management, Excel Publications.
5. P.Subbarao, Human Resource Management, Himalaya Publishing House, New.
6. David Ulrich, Human Resource Management Champions, Harvard Business Scholl Press.

COMYVU 202: MARKETING MANAGEMENT

Program Educational Objectives

This enables the students in understanding of :

1. Conceptual framework of marketing and its applications in decision making
2. Requirements for effective segmentation to sustain product demand in the market
3. Factors determining consumer behavior and various decision models
4. Significance of 4P's in marketing of goods and services.
5. Day-to-day contemporary developments and challenges in marketing of goods and services

Expected Course Outcomes

After successful completion of this paper, the students are able to:

1. Obtain awareness about the current trends in marketing
2. Build conceptual knowledge on the life cycle stages of a new product.
3. Analyse the decision process and factors influencing buying behavior
4. Design the promotion-mix strategies, advertising campaigns and distribution channels.
5. Take proactive measures while taking marketing decisions after the sales.

UNIT-I: Introduction: Market - Types - Marketing Concepts- Marketing Myopia - Nature, Scope, Importance - Elements of Marketing - Functions of Marketing - Approaches to Study Marketing - Rural Marketing - Urban Marketing - Modern Marketing - Traditional Vs. Modern Marketing - Tele Marketing - Digital Marketing - Services Marketing - Social Marketing - Functions- Process.

UNIT-II: Market Targeting: Selecting Target Markets; Market Segmentation - Bases for Segmenting Consumer and Industrial Markets – Requirements for Effective Segmentation; Product Concept - Product Classification- Rationale for Product Mix - PLC Stages - New Product Development Process.

UNIT-III: **Consumer Behavior and Marketing Research:** Concept- Types of Buyer Behavior- Factors Influencing Consumer Behavior – Buying Decision Process - Buyer Behaviour Models; Marketing Research - Characteristics – Process – Problems Limitations – Ethical Issues in Marketing Research

UNIT-IV: Channel and Promotion Management: Types of Channel Members - Importance of Distribution Channels - Factors Involved in Creating Distribution Channels – Sales Promotion – Objectives – Importance – Sales Promotion Methods – Sales Promotion Vs Advertising - After Sales Management - Ecological Aspects of Marketing.

Suggested Books

1. Philip Kotler; Marketing Management, Pearson 2007 New D elhi.
2. S.A. Sherlekar, R.Krishna mooethi, Marketing management- 2015 HPH Hyderabad.
3. Biplab Bose, Marketing Management, Himalaya Publication, New Delhi.
4. William. J. Stanton, Charles Futrell, Fundamentals of Marketing, Tata McGraw Hill.
5. E. Jerome, McCarthy, Essentials of Marketing, PHI.
6. Cundiff EW, Richard RS, Norman, A.P, Govani, Fundamentals of Modern Marketing,TMH.
7. David .J L Hugh. G, Donald. A. Taylor, Ronald. S. Rubin, Marketing Research, PearsonPublication.
8. Ralph Wesfall, Stanley F. Starch, Marketing Research (Text and Cases), Prentice Hall.
9. Boyd and Westfall, Marketing Research-Text and Cases, Dreamtech Press.
10. S.A. Sherlekar, Marketing Management, Himalaya Publishing House.

COMYVU 203: FINANCIAL MANAGEMENT

Program Educational Objectives

This enables the students in understanding of :

1. Key issues involved in financial management and effective decision making
2. How corporations make effective investment decisions regarding the working capital and capital budgeting
3. Measures of cost of capital and financial leverage to form long-term financial policies for business.
4. Various policies and theories for taking effective dividend decision
5. Skills required for corporate restructuring to meet the current requirements

Expected Course Outcomes

After successful completion of this paper, the students are able to:

1. Measure the risk and return of the various capital budgeting proposals
2. Estimate the management of cash, inventory and receivables for planning working capital
3. Describe how people analyze the corporate leverage under different conditions
4. Analyze and implement suitable financing decisions for evaluating capital structure and cost of capital
5. Seek employment as financial manager, financial analyst, cash manager, project consultant etc

UNIT-I: Financial Management: Meaning - Scope – Objectives – Finance Function – Functions of Financial Management - Role of Financial Manager – Time Value of Money; Investment Decision - Nature – Scope - Significance of Capital Budgeting – Capital Budgeting Process – Capital Budgeting Techniques: Traditional and Modern (Theory & Problems).

UNIT-II: Working Capital Management: Concept – Need - Operating Cycle – Kinds - Determinants – Approaches; Management of Current Assets - Cash Management – Receivables Management – Inventory Management (Theory & Problems).

UNIT-III: Financing Decisions: Capital Structure – Concept - Determinants of Capital Structure; Leverages: Meaning – Operating, Financial and Combined Leverages; Cost of Capital: Concepts – Specific Cost of Capital for Various Sources of Finance – Overall Cost of Capital (KO) (Theory & Problems).

UNIT-IV: Dividend Decision: Concept – Forms of Dividend - Factors of Dividend Decision – Dividend Theories - Walters Model – Gordon's Model – MM Approach (Theory & Problems) Corporate Restructuring: Corporate Mergers and Acquisitions and Takeovers – Types of Mergers –Different Approaches for Valuation (Theory only).

Suggested Books

1. Van Horne, James C, Financial Management, Prentice Hall of India, New Delhi.
2. Khan M Y and Jain P K, Financial Management, Tata McGraw Hill Publishers. NewDelhi.
3. Prasanna Chandra, Financial Management, Tata McGraw Hill Publishers. New Delhi.
4. Pandey, I.M., Financial Management, Vikas Publishing House, New Delhi.
5. Kulkarni P. V., Financial Management, Himalaya Publishing House, New Delhi.
6. Brealey & Myres, Principles of Corporate Finance, McGraw Hill, New York
7. Ross S.A., Westerfield, R.W. and Jordan, B.D., Fundamentals of Corporate Finance,TMH.
8. Prasanna Chandra, Financial Management, Theory and Practice, Tata McGraw Hill.

COMYVU 204 (A): SOFT SKILLS FOR CAREER DEVELOPMENT

Program Educational Objectives

This enables the students in understanding of :

1. Guidelines for successful career planning
2. Concepts of know yourself and personality development skills
3. Art of developing communication skills and creative writing
4. Significance of time management and interview skills
5. Do and do not's while attending the interview

Expected Course Outcomes

After successful completion of this paper, the students are able to:

1. Identify and strengthen the inherent personality
2. Improve the body language and positive attitude
3. Develop interpersonal skills
4. Face the interviews and participate in group discussion
5. Able to maintain time and cope up with the skills of managing stress.

UNIT-I: Soft Skills: Meaning - Importance –Identifying and Exhibiting Soft Skills – Improving Soft Skills – Train Yourself – Practicing Soft Skills; Career Planning: Meaning and Importance – Guidelines for Choosing a Career – Myths About Choosinga Career – Tips for Successful Career Planning - Goal Setting.

UNIT-II: Personality Development Skills: Self Esteem**:** Characteristics – Causes of Low Self- esteem – steps to build positive self-esteem; Know Yourself – Importance of Know Yourself – Process of Know Yourself – SWOT Analysis – Benefits of SWOT Analysis; Positive Attitude - Steps in Building Positive Attitude – Obstacles in Developing Positive Attitude

UNIT-III: Communication Skills: Art of Listening – Meaning – Benefits of Active Listening – Kinds of Listening

- Factors that Hamper Listening – Poor Listening Habits – Tips For Listening; Art of Public Speaking – Importance of Public Speaking – Benefits of Public Speaking – Tips for Public Speaking; Art of Writing – Meaning and Importance – Creative Writing – Writing Tips – Drawbacks of Written Communication; Art of Letter Writing and E- mail; Resume/CV Preparation

UNIT-IV: Interview Skills : Concept - Types of Interviews - Art of Facing Interview – Common Mistakes Commits at the Time of Interview; Quick Tips - - Final Interview – Time Management- Ideal Way of Spending a Day - Time Savers - Time Wasters.

Suggested Books

1. Alex, K., Soft Skills – Know Yourself and Know the World, S. Chand Publishers, NewDelhi.
2. Parag Diwan, Business Communication, Excel Publications, New Delhi.
3. Hind, D., Transferable Personal Skills: A Student's Guide, Sunderland.
4. C. S. Rayudu, Communication, Himalaya Publishing House, New Delhi.
5. Biswajit Das, Business Communication and Personality Development, Excel Books.
6. K. Srinivasa Krishna & B. Kuberudu: Business Communication and soft skills, excel,Hyderabad, 2008.

COMYVU 204 (B): MODERN BANKING

Program Educational Objectives

This enables the students in understanding of :

1. New trends in banking and electronic payment systems.
2. Monetary policy and its impact
3. Policy reforms on Non-performing Assets and capital adequacy Norms
4. New requirements on opening and closing of accounts.
5. Recent and current payment and settlement systems.

Expected Course Outcomes

After successful completion of this paper, the students are able to:

1. Apply the modern e-banking services
2. Understand the central bank's monetary policy.
3. Utilise their knowledge of policy reforms on NPAs
4. Understand the KYC policy of the bank
5. Apply the new methods of payment system

UNIT-I: Emerging Trends in Commercial Bank: Emerging Trends in Commercial Banking in India: E-Banking

– Mobile Banking - PhoneBanking – Payment Banking - Teller Machines – Branch Teller Machines [BTMs] and Automated Teller Machines [ATMs], Debit Cards, Credit Cards & Smart Cards, Advantages of Debit & Credit Cards -Core Banking solutions - NEFT- RTGS- ECS -SWIFT transfer –Banking ombudsman Scheme.

UNIT-II: Central Bank & Monetary Policy: Central Bank – Functions of Central Bank – Role of RBI in Regulating and ControllingBanks. Monetary policy: Bank rate, CRR, SLR, Repo rate, Reverse repo rate - Open Market Operation (OMO), Liquidity Adjustment Facility (LAF), Market Stabilization Scheme (MSS), Margin Standing Facility (MSF).

UNIT-III: Policy Reforms: Recent Developments Banking Sector Reforms: Non-Performing Assets - Introduction, Classification of NPAs, Provision for NPA's, management of NPA's. Capital Adequacy Norms– Introduction, new capital adequacy framework. RBI Guidelines on Know your Customer (KYC) –Anti Money Laundering (AML)- Combating Financing of Terrorism (CFT) – KYC Policy - Identification/ KYC Documents for different types of Individuals - Customer Identification Procedures (CIP) for Non- Individuals - Freezing and closure of KYC Non - compliant Accounts -Indicative List of KYC Documents - Monitoring of Transactions in Accounts.

UNIT-IV: New Payments and Settlement Systems: Overview of domestic Payment systems – Role of RBI in e-payments - NCPI –Meaning – Role and Responsibilities of NCPI – UPI- RuPay - CTS –IMPS– NACH- Bharat Bill Pay – AePS – Cyber Security.

Suggested Books

1. O.P.Agarwal, "Modern Banking of India", Himalaya Publishing House, Mumbai, 2017
2. P.N.Varshney, S.L.Gupta and T.D.Malhotra, "Principles of Banking", S.Chand & Sons
3. Publisher, New Delhi, 2005
4. Muraleedhran, "Modern Banking Theory and Practice", PHI Learning Pvt Ltd, New Delhi,
5. 2014
6. K.C. Shekhar and Lakshmy Shekhar, "Indian Banking System", Vikas Publishing House.

COMYVU 205 (A): QUANTITATIVE TECHNIQUES FOR BUSINESS DECISIONS

Program Educational Objectives

This enables the students in understanding of :

1. Various statistical tools used in business decision making
2. Basic framework of the research process and designs
3. To identify the various sources of information for data collection
4. Data sources and its analysis through using parametric and non parametric tools
5. How to write research reports and research proposal.

Expected Course Outcomes

After successful completion of this paper, the students are able to:

1. Apply a range of quantitative and qualitative research techniques to solve business issues.
2. Select the appropriate sample to draw the meaningful results in research
3. Find the optimal solutions with given constraint through the application of statistical tools
4. Demonstrate data analytical skills to draw the meaningful interpretation
5. Prepare various research reports.

UNIT-I: Introduction: Concept and Classification of Quantitative Techniques - Importance of Quantitative Techniques in Research - Types of Research - Steps in Research Process - Research Design - Hypothesis - Sampling - Factors Determining Sample Size. (Theory only)

UNIT-II: Data Source: Data Collection: Primary Data: Methods Primary Data: Observation - Experimentation - Interview - Schedules - Survey; Choice between Primary and Secondary data; Questionnaire: Types of Questionnaire - Steps in Designing Questionnaire - Essentials of a Good Questionnaire - Data Processing: Editing - Coding - Classification - Tabulation and Graphical Presentation (Theory only)

UNIT-III: Descriptive Stats: Measures of Central Tendency - Dispersion, Skewness & Kurtosis, Correlation & Regression (Theory & Problems)

UNIT-IV: Data Analysis and Interpretation : Statistical Tools and Techniques for Analysis - Parametric Test: t test - F test - z test; Non Parametric Test: Chi square test - ANOVA; Interpretation of Data - Significance - Precautions in Data Interpretation Research Report Writing - Importance – Essentials - Structure / Layout - Report Writing Types (Theory & Problems)

Suggested Books

1. Krishna Swamy, O.R., Methodology of Research in Social Sciences, HPH, New Delhi.
2. Kothari,C. R., Research Methodology, New Age International Publications.
3. Anand Sharma, Quantitative Techniques for Decision Making, Himalaya Publishing House,
4. Panneer Selvam, R., Research Methodology, Prentice Hall of India, New Delhi.
5. Sachdeva, J.K., Business Research Methodology, Himalaya Publishing House, New Delhi.

COMYVU 205 (B): DIRECT TAX

Program Educational Objectives

This enables the students gain understanding of :

1. Basics of Income Tax Act and its implications.
2. Various provisions and how to compute taxable income of an individual.
3. Different sources of income and the tax provision.
4. The hierarchy of Income tax authorities, TDS and e-filing procedures.
5. Qualified savings eligible for deduction u/s 80C.

Expected Course Outcomes

After successful completion of this paper, the students are able to:

1. Understand the basic concept and procedures of Income Tax Act, and how to determine the Residential Status, Scope of Total Income, Capital, Revenue and Exempted Incomes.
2. Recognize the tax provisions and computations of taxable income from salary.
3. Compute taxable income from Profits and Gains ofBusiness or Profession and capital gain.
4. Determine the Income from Other Sources, Deduction from Gross Total Income and Assessment of Individuals
5. Gain awareness about the duties of Income Tax Authorities, PAN Card, Tax Deducted at Source and Practical Applications of E-Filing

UNIT-I: Introduction: Meaning – Brief History of Tax – Types of Taxes – Basic Concepts – Objectives – Principles – Advantages and Disadvantages of Direct Taxation – Person - Assessee – Previous year – Assessment year – Residential Status – Exempted Incomes (Theory).

UNIT-II: Income from Salaries and House Property: Basic Salary – DA – HRA – Other Allowances, perquisites

– Deductions from salary income – Computation of salary income – Qualified savings eligible for deduction u/s 80C. Income from House Property: Annual value – Let-out – Self occupied – Computation of income from house property (Theory & Including problems).

UNIT-III: Income from Capital Gains and Business & **Professions:** Income from Short term capital gain – Long term capital gain – Income from business – Income from Professions (Theory & Including problems).

UNIT-IV: Income from Other Sources & Computation of Total Income: Computation of Income from Other Sources – Gross Total Income – Set-off and carry Forward of Losses -Tax Deducted at Source (TDS) –Tax Collected at Source (TCS) – Assessment of Individuals – PAN Card – Advance tax – Refunds – Penalties - Practical Applications of E- Filing (Theory & including problems).

Suggested Books

1. Dr. V.K. Singhania & Dr. Kapil Singhania, Direct Taxes Law and Practice, Taxman Publications Pvt. Ltd., New Delhi.
2. H.C.Mehorotra, “Income Tax Law & Practice”, Prentice Hall Pvt Ltd, New Delhi.
3. Bhagavati Prasad, Direct Taxes Law and Practice, Wishwa Prakashan, New Delhi.
4. Dr. Mehrotra and Dr. Goyal; Direct Taxes – Law and Practice; Sahitya Bhavan Publication.
5. Gaur and Narang; Income Tax, Kalyani Publishers, New Delhi.
6. Dinkar Pagare, Income Tax and Practice, Sultan Chand and Sons, New Delhi.

COMYVU 206 (A): BASICS OF SAVINGS AND INVESTMENT

Program Educational Objectives

This enables the students in understanding of :

1. Habit of savings and investments
2. Usage of banking facilities
3. Benefits of financial planning which improves standard of living
4. Risks and returns associated with the investments
5. Basic principles for managing personal finance.

Expected Course Outcomes

After successful completion of this paper, the students are able to:

1. Follow a disciplined approach to improve their income
2. Know the ways for diverting the money from spending to savings
3. Inculcate the habit of banking to mobilize the money
4. Make arrangement of fund for starting entrepreneurship
5. Able to obtain insurance policies to protect their life with security

UNIT-I: Basics of Savings and Investment: Savings Vs Investment, Power of Compounding, investment objectives - Risk and Return, Inflation effects on Investment, Investor's Age and Assets Allocation

UNIT-II: Banking Activities: Deposits and Types of Deposits-Saving Bank Accounts, Fixed Deposit Accounts, Recurring Deposit Account, Special Term Deposit Schemes, Loans and Types of loan advanced by Banks and Other secondary functions of Bank. Banking structure in India and Role of Reserve Bank of India

UNIT-III: Financial Markets: Capital Market Vs Money Market, Securities and its types, i.e., Equity, Debentures or Bonds, IPOs and FPOs, Mutual Funds, Types of Mutual Funds, Brokers, sub-brokers, Process for becoming a capital market investor

UNIT-IV: Protection Related products: Insurance Policies, Life Insurance, Term Life Insurance, Endowment Policies, Pension Policies, ULIP, Health Insurance and its Plans, Understanding of Ponzi scheme.

Suggested Books

1. Investment Planning by SEBI
2. Indian financial System, by T. R. Jain and R. L .Sharma, VK Global Publisher
3. Money and Banking by T. R. Jain and R. K. Kaundal, VK Global Publisher
4. Personal Finance by Jack R. Kapoor, Les R. Dlabay and Robert J. Hughes, Tat McGraw-Hill Publishing Company Ltd. New Delhi.
5. Internet Sources- BSE, NSE, SEBI, RBI, IRDA, AMFI etc.

COMYVU 206 (B): BASICS OF ACCOUNTING & AUDITING

Program Educational Objectives

This enables the students in understanding of :

1. Accounting principles and book keeping
2. Financial concepts as well as to know the management action relating to the finance
3. Preparation of final accounts in different concerns
4. Significance of auditing in managing the financial dealings of the organization
5. Procedure of accounts maintenance in the businesses.

Expected Course Outcomes

After successful completion of this paper, the students are able to:

1. Understand the accounting standards and apply in relevant areas
2. Prepare final accounts of various organisations
3. Identify the errors raised in maintenance of accounts
4. Assess the correctness of accounts maintained by the firm through internal audit
5. Expertise in preparing the Audit report as per the relevant provisions of companies act 2013

UNIT-I: Journalizing Accounts: Definition of Accounting – Need of Accounting – Objectives of Accounting – Accounting concepts and conventions – Classification of Accounts – Double Principles – Journal entries – Posting to Ledgers – Balancing of ledger Accounts **(**Theory & Problems).

UNIT-II: Books of Accounts: Types of Subsidiary Books – Three-column Cash– Book– Errors –Types of Errors – Rectification of Errors – Preparation of Trail balance - Preparation of Final Accounts: Trading and Profit and Loss account – Balance Sheet – Final Accounts with adjustments (Theory &Problems).

UNIT-III: Auditing: Meaning – Objectives – Importance of Auditing – Internal check – internal audit and internal control – Vouching of cash and trading transactions – Auditing v/s Investigation – Auditor's Qualifications – Appointment – Rights – duties (Theory).

UNIT-IV: Audit Report: Contents – Preparation - Relevant Provisions of Companies Act, 2013 (Theory).

Suggested Books

1. S.P. Jain & K.L Narang, Accountancy-I, Kalyani Publishers.
2. R L Gupta & V. K Gupta, Principles and Practice of Accounting, Sultan Chand & Sons.
3. Tulasian, Accountancy -I, Tata McGraw Hill Co.
4. V.K.Goyal, Financial Accounting, Excel Books.
5. K. Arunjothi, Fundamentals of Accounting; Maruthi Publications.

COMYVU 301: ACCOUNTING FOR MANAGERIAL DECISIONS

Program Educational Objectives

This enables the students in understanding of :

1. Various tools and techniques available in Management Accounting.
2. Accounting for Decision making
3. In-depth knowledge about the applications of Marginal Costing Techniques.
4. Divisional performance and transfer pricing.
5. Responsibility accounting and management reporting.

Expected Course Outcomes

After successful completion of this paper, the students are able to:

1. Relate and select appropriate tools for managerial decision making.
2. The applications of various marginal costing techniques for managerial decision making.
3. The cost behaviour for managerial decision making.
4. Evaluate divisional performance and transfer pricing of businesses.
5. Analyse and apply the responsibility accounting and importance of management reporting.

UNIT-I: Managerial Accounting: Concept – Nature and Scope – Functions – Uses and Limitations - Cost Break-Even Pricing Analysis for Pricing Decisions: Full Cost Pricing - Mark Up Pricing - - Target Pricing - Conversion Cost Pricing - Differential Cost Pricing.

UNIT-II: Business Decisions: Cost Behavior – Relevant Costs –Determination of Sales Mix – Exploring New Markets – Discontinuance of Product Line – Make or Buy Decisions – Equipment Replacement Decision – Change Vs Status Quo – Expand or Contract – Shut Down or Continue; Marginal Costing.

UNIT-III: **Divisional Performance and Transfer Pricing:** Decentralized Operations - Performance Measurement – Financial Performance– Non Financial Performance - Transfer Pricing – Meaning – Methods of Transfer Pricing – Issues in Transfer Pricing.

UNIT-IV: Responsibility Accounting (RA): Concept of RA – Assumptions of RA – Types of Responsibility Centres – Responsibility Accounting Reports – Advantages of RA – Issues in RA; Management Reporting: Concept – Modes of Reporting – Essentials of Good Report – Reporting Practices of Indian Companies.

Suggested Books

1. Atkinson, Banker, Kalpan and Young, Management Accounting, Prentice Hall of India, New Delhi.
2. Made Gowda, Accounting for Managers, Himalaya Publishing House, New Delhi.
3. Arora, M.N., Advanced Cost and Management Accounting, Himalaya Publishing House, New Delhi.
4. Manash Gupta, Cost Accounting Principles and Practices, Pearson Education, New Delhi.
5. Kulshrestha, N.K.., Management Accounting, Tata McGraw Hill New Delhi.
6. Maheswari, S.N., Principles of Management Accounting, S. Chand Publications, New Delhi.
7. PrashanthaAtma, Cost and Management Accounting, HPH.
8. Sharma, R.K. and Guptha, S.K. Management Accounting, Kalyani Publishers, Ludhiana.

COMYVU 302: SECURITY ANALYSIS & PORTFOLIO MANAGEMENT

Program Educational Objectives

This enables the students in understanding of :

1. Techniques for measuring risk and return of various securities
2. Different kinds of investment and valuation of securities
3. Rules of analyzing the economic, industry and company factors in investment
4. Technical indicators and signals to study the market behavior of stocks
5. Procedure for developing an ideal portfolio for various investors based on portfolio theories

Expected Course Outcomes

After successful completion of this paper, the students are able to:

1. Analyse the various investment Avenues and Risk and return on Investments.
2. Develop and evaluate the Time value of money and Bond valuation
3. Apply and analyze the tools while taking the investment decisions.
4. Create and develop a portfolio for an investor based on few theories.
5. Understand and evaluate the portfolio performance.

UNIT-I: Investment: Concept - Nature and Scope of Investment - Investment Avenues - Investment Process – Investment categories – Investment Vs. Speculation – Risk and return – Factors Influencing Risk - Measuring Risk and Return (Theory and Problems)

UNIT-II: Fundamental Analysis: Economic analysis - Industry analysis - Company Analysis: Analysing the Financial Statements; Technical Analysis: Fundamental Analysis Vs Technical Analysis – Dow Theory- Trend Analysis – Moving Averages – Relative Strength Index -Efficient Market Hypothesis – Random Wall (Theory and Problems).

UNIT- III: Valuation of Securities: Preference shares – Features – Types – Valuation of Preference Shares; Equity Shares – Features of Equity Shares – Valuation of Equity shares; Debt Securities – Features of Debt Securities – Types of Debt Securities – Valuation of Debt Securities. (Theory and Problems)

UNIT-IV: Portfolio Management: Definition of Portfolio - Portfolio Management - Nature and Scope of Portfolio Management - Process of Portfolio Management- Portfolio Analysis - Markowitz's Model – Sharpe's Index Model; Capital Market Theory - CAPM – Performance Evaluation : Sharpe Index - Trainer and Jensen Models – Portfolio Revision. (Theory and Problems)

Suggested Books

1. Donald E.Fischer and Ronald J.Jordan, Security Analysis and Portfolio Management, 6thEd., Prentice Hall of India, 2000.
2. Prasanna Chandra, Security Analysis and Portfolio Management, 2th Ed., Tata McGrawHill.
3. Bhalla, V.K. Investment Management, S. Chand Publications
4. Rustagi, R.P., Investment Management -Theory and Practice, Sulthan Chand & Sons,New Delhi.
5. Punithavathy Pandian, Security Analysis and Portfolio Management,
6. Preeti Singh, Security Analysis and Portfolio Management, Himalaya Publishing House-New Delhi
7. V.A.Avadhani, Security Analysis and Portfolio Management, Himalaya Publishers –New Delhi

COMYVU 303: CORPORATE TAX AND GST

Program Educational Objectives

This enables the students in understanding of :

1. Various tax issues for decision making and innovative ideas in Corporate Tax in India
2. Basics and latest developments in the areas of Indirect taxes
3. Importance of enhancing the national revenue through GST.
4. Classification of goods and services exempted from tax
5. Procedure for registration and collection of taxes

Expected Course Outcomes

After successful completion of this paper, the students are able to:

1. Understand the Constitutional provisions pertaining to corporate taxes in India.
2. Design the effective tax planning for managing the profitability
3. Assess the need for one nation, one tax and one market through GST
4. Prepare and submit the returns of GST
5. Seek employment avenues in corporate sector or GST Domain.

UNIT-I: Company Taxation: Introduction – Definition- Features – Types of Companies – Residential Status of a Company – Incidence of Tax – Income Sources – Agricultural and Nonagricultural – Income Computation of Gross Total Income of a Company – Tax Deductions U/S 80 – Carry Forward and Set off - Accumulated Tax (Theory & Problems).

UNIT-II: Tax Planning and Incentives for Export Promotion: Tax Planning for new business - Schemes for encouraging exports – Import duty relief schemes – Free Trade Zones (FTZs) – Special Economic Zones (SEZs) – Export Processing Zones (EPZs) – Salient features of Software Technology Parks (STPs) – Electronic Hardware Technology Parks (EHTPs) – Other Export Promotions schemes under EXIM Policy (Theory & Problems).

UNIT-III: Goods and Service Tax (GST): Concept – Types of GST – Features of GST -Advantages and Disadvantages – Comprehensive structure of GST Model in India – Registration process for GST – GST Migration - GST Slabs in India – Transactions Covered under GST – Items Exempted from GST - Changes in GST since Beginning (Theory only).

UNIT-IV: GST Execution: Input Tax Credit – Distribution of Tax – Tax Invoice in GST – GST Composition Scheme – GST Returns - Reverse Change Mechanism in GST - GST on Exports and Imports –Taxes on Outside the Purview of GST - Global Tax System (Theory and problems).

Suggested Books

1. Monica Singhania Vinod K Singhania, Students Guide to Income Tax, 57th Edition(2017-18), July 2017,
2. Vinod K. Singhania, Indirect Tax Laws, Taxmann Publications.
3. Gaur, V.P. Narang, D.B. Gaur, Puja Puri, Rajeev, Income tax Law and Practice, KalyaniPublishers
4. R.G. Saha, Taxation, Himalaya Publishing House Pvt. Ltd.
5. Joy Dhingra, Goods and Services Tax Fundamentals, 2017, Kalyani Publishers.
6. Dr. Thomas Joseph Thoomkuzhy, Dr. Jaya Jacob M., Ms. Chinnu Mariam Chacko, GSTThe Essentials of Goods and Services Tax: 2017, Himalaya Publishing House.

COMYVU 304 (A): ACCOUNTING PACKAGE – TALLY

Program Educational Objectives

This enables the students in understanding of :

1. Accounting packages and its applications.
2. Concepts of inbuilt groups related to the ledgers generation and posting voucher entries
3. Preparation of financial statements, calculating ratios and various reports generation.
4. Commerce and accounting software for corporate requirements
5. Accounting package of Tally ERP with GST application

Expected Course Outcomes

After successful completion of this paper, the students are able to:

1. Understand the fundamentals of computerized accounting
2. Equip the basic skills about inventory valuation and stock in warehouses
3. Generate financial reports including charts and graphs.
4. Apply technical and decision making skills in the area of accounting, taxation, portfolio analysis and online business
5. Secure entry level jobs in the field of Accounting at industries

UNIT-I: Computerized Accounting: Meaning - Concept – Manual Accounting Vs Computerized Accounting – Significance of Computerized Accounting – Advantages and Disadvantages - Different Software Available in the Market; Tally ERP 9: Features – Components of Gateway of Tally – Creation of Company - Creation of Group - Voucher – Ledger.

Hands on Practice: Creation of a Company – Ledger Creation – Voucher entries

UNIT-II: Vouchers: Voucher – Recording of Transactions - Types of Vouchers – Accounting Voucher – Inventory Voucher – Contra Voucher - Customizing the Existing Vouchers – Alteration of Voucher. **Hands on Practice:** Voucher entries – Voucher alteration – Customizing Voucher

UNIT-III: Report Generation: Generating the Reports from Tally: Trial Balance – Account Books – Profit and Loss Account – Balance Sheet; Statement of Accounts: Funds Flow Statement – Cash Flow Statement – Bank Reconciliation Statement – Ratio Analysis.

Hands on Practice: Generation of Trial Balance – Profit and Loss Account – Balance Sheet - Funds Flow Statement – Cash Flow Statement – Bank Reconciliation Statement – Ratio's

UNIT-IV: Goods and Service Tax: Central Goods and Service Tax – Central Excise Service Tax – Surcharge and Cess – State Goods and Service Tax – VAT/Sales Tax – Entry Tax – Tax on Lottery - Surcharge and Cess – Purchase Tax – Entertainment and Luxury Tax – Integrated Goods and Service Tax. **Hands on Practice:** Creation of CGST – SGST – IGST - Entry Tax – Surcharges

Suggested Books

1. Sulochana, M., Kameswar Rao, K., and Kishore, R., Kumar, Accounting Systems, Kalyani Publishers, Hyderabad.
2. Dr. Kiran Kumar, K.Tally ERP 9, Sri Vaibhava Publications, Hyderabad.
3. Arora J.S, Tally ERP 9 A Financial Accounting Package, 3rd 2017, Kalyani Publishers, Hyderabad.
4. . Dr. Prajnadipta Das, Mr. Rasananda Mohanty, Mr. Debiprasad Dash, Computer Applications in Business: 2017, Himalaya Publishing House Pvt. Ltd.
5. Saha R. G., Computer Applications in Business: 2016, Himalaya Publishing House Pvt. Ltd.
6. Kiran kumar K., Tally 9, Laasya Publishers, Hyderabad.
7. Firewall Media, Tally 9.

8. Vishnu Priya Sing, Tally 9, Computech Publications Ltd. New Delhi.

COMYVU 304 (B): RURAL AND AGRICULTURAL MARKETING

Program Educational Objectives

This enables the students in understanding of :

1. Concepts of rural and agricultural marketing
2. Procedures used by successful rural marketers
3. Marketing facilities available in rural areas
4. Sense of grading and packaging of agricultural products
5. Role of social media in advertising the rural and agricultural products.

Expected Course Outcomes

After successful completion of this paper, the students are able to:

1. Apply marketing concepts in rural areas
2. Apply the suitable rural marketing principles in contemporary world
3. Confidently use their expertise to establish the agricultural super markets
4. Explore possibilities to establish portable rural markets
5. Gain expertise in grading and packaging practices

UNIT-I: Rural marketing: Concept, nature, Significance of Rural Marketing, characteristics and potential of rural markets in India; Factors contributing to growth of rural markets, phases of rural market, rural market vs. urban Market - Issues in Rural Marketing – e Rural Marketing and application of IT.

UNIT-II: Marketing of products and commodities in rural areas: planning, pricing, promotion and management of distribution channels for marketing of products in rural areas; media planning and organizing personal selling in rural markets

UNIT-III: Marketing of agricultural inputs: marketing of fertilizers, pesticides, seeds, tractors and other agricultural implements in rural India - Agricultural marketing and economic development – Role of Social media in advertising the products

UNIT-IV: Grading and Packaging of agricultural products: Grading - advantages and disadvantages of grading

- standards in Grading; concept of packaging: types of materials used for packaging; advantages and disadvantages of different packing materials

Suggested Books

1. Ministry of Agriculture, Government of India, Annual Reports and Survey Reports
2. Gopalaswamy, Rural Marketing, Wheeler Publishers
3. Nayyar and Ramaswamy, Globalization and Agricultural Marketing, Rawat Publications
4. Rajagopal, Managing Rural Business, Wheeler Publishers
5. Rajagopal, Organising Rural Business, Sage Publishers

COMYVU 305 (A): FINANCIAL INSTITUTIONS, MARKETS AND SERVICES

Program Educational Objectives

This enables the students in understanding of :

1. The concepts of financial markets and institutions involved in providing services to the organizations.
2. Various fundamentals of Financial Instruments and services and its functions in business and stock market.
3. Modern concepts related to ease of banking services and its uses
4. Basic knowledge of risk management through insurance facilities
5. Importance of savings and investments with the support of mutual fund schemes

Expected Course Outcomes

After successful completion of this paper, the students are able to:

1. Gain fundamental knowledge about Indian financial system and its functions
2. Deal trading at money market and capital markets
3. Find the resources for establishing a venture through various sources of financing
4. Use their expertise on SEBI guidelines related to Stock market, factoring, credit rating, credit cards, hire purchase, leasing, mutual funds and merchant banking
5. Seek jobs as financial analyst, stock broker, merchant bankers, factoring agents, portfolio mangers

UNIT-I: Financial Institutions: Concept – Components - Structure of Indian Financial System – Financial Sector Reforms - Indian Banking System – RBI and its Functions – Monetary Policy - Role of RBI in Banking System - Commercial and Public Sector Banks – Private Sector Banks – Foreign Banks – Co-operative Banks - Development of Commercial Banking in UK, USA and India.

UNIT-II: Financial Markets: Money Market - Concept – Instruments – Recent Trends in Indian Money Market. Capital Market - Concept – Primary and Secondary Markets – Capital Market Mechanism – Listing and Delisting – Trading and Settlement – Government Securities Market – Role of SEBI in Financial Markets.

UNIT-III: Financial Services: Concept – Classification - Lease Finance - Consumer Credit and Hire Purchase Finance - Factoring Service – Venture Capital Finance – Housing Finance –Stock Broking, Credit Rating - Insurance: Life Insurance – Non life insurance.

UNIT-IV: Mutual Funds and Merchant Banking: Concept – Structure - Types - Designingand Marketing of Mutual Funds Schemes – SEBI Guidelines; Merchant Banking: Concept - Functions and Growth – SEBI Guidelines

– Merchant Banking in India.

Suggested Books

1. Guruswamy, Financial Services and Markets, Thomson , New Delhi
2. Pathak: Financial Markets and Services, Pearson Educations.
3. Gordon and Natarajan, Financial Markets and Services, Himalaya Publishing House,New Delhi
4. Avadhani, Marketing of Financial Services, Himalaya Publishing House.
5. Khan M.Y, Indian Financial Markets & Institutions, TMH.
6. Bhole L.M, Financial Markets & Institutions, THM.
7. Clifford G, Financial Markets, Institutions, and Financial Services, PHI.
8. Meir Kohn, Financial Institutions and Markets, Oxford University Press.
9. Mandura Jeff, Financial Markets and Institutions, West Publishing Company.

COMYVU 305 (B): SERVICES MARKETING

Program Educational Objectives

This enables the students in understanding of :

1. Service marketing of companies in offering services as a product.
2. Importance of services in the modern Indian economy
3. New trends in service marketing
4. Service operations and service quality related to the customer experience
5. Issues faced by the service firms in customer attraction and retention

Expected Course Outcomes

After successful completion of this paper, the students are able to:

1. Know and understand how the service industry works
2. Analyse and apply the knowledge for enhancing service quality in industry
3. Evaluate the pros and cons of Service Delivery in Cyberspace
4. Prepare and present case studies on application service marketing
5. Gain practical knowledge in marketing of service products

UNIT-I: Services Marketing: Introduction – Characteristics - Importance of Services - Classification of Services; Marketing Vs Physical Services - Services in the Modern Indian Economy –Growth of Services Sector

UNIT-II: Service Products and Pricing of Services - Introduction to 8 Ps of Marketing Mix – Services Market Segmentation - Service Products – Product Life Cycle Services - Branding of Services – Pricing of Services - Objectives – Methods - Problems in Pricing – Putting Service Pricing Strategies into Practice

UNIT-III: Distribution and Promotion of Services: Distribution in a Services Context- Service Delivery in Cyberspace - Decisions about Time and Place of Delivery - Modes of Delivery - Role of Intermediaries - Distribution Channels – Designing Communication Mix for Services - Objectives of Communication. Challenges and Opportunities

UNIT-IV: Service Quality Management: Service Quality Audit - GAP Model of Service Quality – Total Quality Services Marketing - Services Excellence.

Suggested Books

1. Christopher Lovelock, Services Marketing People, Technology, Strategy, Pearson Education, New Delhi.
2. Ramamohan Rao, K., Service Marketing , Pearson Education, New Delhi
3. The S.M., Services Marketing – Himalaya Publishing House, New Delhi
4. Bhattacharya – Services Marketing – Excel Publishers, New Delhi

COMYVU 306 (A): BASICS OF STOCK MARKETS

Program Educational Objectives

This enables the students in understanding of :

1. Capital market institutions and instruments
2. Ways for raising capital though primary markets
3. Recent developments in the Indian stock market
4. Regulations of SEBI on stock market operations
5. Various stock broking services

Expected Course Outcomes

After successful completion of this paper, the students are able to:

1. Understand and analyse the Indian Stock Markets and its Operations
2. Analyse different stock market operations and risk management practices.
3. Develop a practical approach towards clearing and settlement processes in stock market.
4. Learn and Analyse the working of SEBI
5. Pursue job avenues and seek opportunity as service provider for stock broking companies

UNIT-I: Stock Market: Concept - Importance of Stock Markets - Functions of Stock Markets - Types of Stock Markets - Bombay Stock Exchange – National Stock Exchange Other Stock Exchanges - Primary and Secondary Markets – Functions of SEBI in Stock Market Operations.

UNIT-II: Primary Market: Concept – Features - Types of New Issues - Initial Public offer (IPO) – Placement of Issues – Recent trends in Primary Market – SEBI Guidelines.

UNIT-III: Secondary Market: Concept - Features – Listing of Securities – Registration of Stock Brokers – Trading methods - Settlement – Stock Indices – Speculation - SEBI Guidelines.

UNIT-IV: Stock Exchange: Concept – Nature – Functions – Growth of Stock Exchanges – Dealings in Stock Exchanges – Organisation of Stock Market – Securities Contracts (Regulation)Act - NSDL – CSDL – Irregularities in Stock Market.

Suggested Books

1. Guruswamy, Financial Services and Markets, Thomson , New Delhi
2. Pathak: Financial Markets and Services, Pearson Educations.
3. Gordon and Natarajan, Financial Markets and Services, Himalaya Publishing House,New Delhi
4. Avadhani, Marketing of Financial Services, Himalaya Publishing House.
5. Aswathappa, Essentials of Business Environment, Himalya Publishing House 2008
6. Punithavathy Pandian, Financial services and markets, Vikas Publishing House

COMYVU 306 (B): BASICS OF INCOME TAX

Program Educational Objectives

This enables the students in understanding of :

1. Basics of income tax Act and its implications
2. Nature of residential status of an individual
3. Income from salary with detailed note of allowances, perquisites and deductions
4. Income from house property in various sources
5. Difference between short term and long term capital gains

Expected Course Outcomes

After successful completion of this paper, the students are able to:

1. Prepare the taxable income files.
2. Gain knowledge on special provisions, deductions and exemptions of Tax
3. Plan for advance tax, TDS and its procedure for the assessment.
4. Expand efficiency in tax planning
5. Get employment as Tax assistant / tax return preparer for filing tax returns

UNIT-I: Introduction to Tax : Direct and Indirect Taxes- Income Tax Act 1961: Definitions of: Previous Year - Assessment Year- Income- Deemed Income - Basis for Charge of Income Tax- Residential Status - Special Provisions and Exemptions in Sec.10 (Theory and Problems).

UNIT-II: Income from Salary: Salary Income: Basis of Charge- Allowances - Perquisites - Deductions from Salary income – taxable salary calculation (Theory and Problems).

UNIT-III: Income From House Property: Chargeability- Determination of Annual Value - Allowable deductions- Unrealized rent and Subsequent Collection – Rental Income calculation (Theory and Problems).

UNIT-IV: Income from Capital gain: Computation of capital gains - Transfer of capital Assets - Deductions

- Exempted capital gains – Calculation of capital gain income (Theory and Problems)

Suggested Books

1. S.Rajaratnam and BV Venkatramaiah., Tax Planning Issues and Innovations., Lexis Nexis; Firstedition (1 June 2015)
2. Taxmanns., Income Tax Act., Taxmann; 63rd Edition 2019 edition (2019)
3. Vinod K.Singhania., Direct Taxes: Law & Practice., Taxmann; 62nd Edition A.Y.2019-20 edition (2019)
4. Dr. Girish Ahuja & Dr. Ravi Gupta., Direct Taxes., Wolters Kluwer India Pvt. Ltd.; tenth edition (1 March 2018)
5. Boomi F.Daruwala., Direct Taxes., Bharat Law Publishers., Direct Taxes Code., 28th edn., 2019

COMYVU 401: ENTREPRENEURSHIP AND INNOVATION

Program Educational Objectives

This enables the students in understanding of :

1. Different dimensions of entrepreneurship and to inculcate the spirit of entrepreneurship in students.
2. Conceptual framework of entrepreneurship development along with the support of financial institutions
3. Challenges and opportunities for entrepreneurial career and to establish the start ups.
4. Scenario of financial support for promoting entrepreneurship development
5. Aspects of government schemes and policy initiatives for launching new ventures.

Expected Course Outcomes

After successful completion of this paper, the students are able to:

1. Understand the entrepreneurship concepts, qualities and risk taking.
2. Identify and apply the principles of entrepreneurship and growth strategies on family business
3. Recognize and select the best financial resources to start new venture
4. Become expertise through Entrepreneurship Development Programmes
5. Provide employment opportunities through startups

UNIT-I: Entrepreneurship: Concept – Characteristics of an Entrepreneur – Functions – Types of Entrepreneur – Entrepreneur Vs. Manager - Entrepreneur Vs. Intrapreneur - Myths about Entrepreneurship – Role of Entrepreneurship in Economic Development - Problems of Entrepreneurship; Rural Entrepreneurship; Women Entrepreneurship.

UNIT-II: Entrepreneurship Development: Economic and Non-Economic Factors affecting Entrepreneurship Development - Government Actions - Entrepreneurial Motivation – Competencies - Mobility – Entrepreneurship Development Programmes (EDPs) - Growth of Entrepreneurship in India.

UNIT-III: Small Enterprises: Meaning - Objectives – Opportunities for Entrepreneurial Career

Role of Small Enterprises in Economic Development – Problems of Small Enterprises - Small Enterprise Process - Project Identification and Selection – Project Formulation – Project Appraisal – Financing - Government Policy for SSIs- Need for Tax Benefits- Tax Holiday; Investment Allowance; Tax Concessions for SSIs in Rural and Backward Areas; Startups – Role of Startups in Industrialization.

UNIT-IV: Institutional and Policy Initiatives for Promotion of ED: Introduction - Need for Institutional Finance

– Commercial Banks - Other Financial Institutional**:** Central Level Institutions- KVIC; SIDO; NSIC Ltd; MUDRA, SIDBI; State Level Institutions – DIC - SFC- SSIDC - Venture Capital Institutions - Industrial Estates.

Suggested Books

1. Thomas, W. Zimmerer, Norman, M. Scarborough, Essentials of Entrepreneurship andSmall Business Management, Pearson Education, New Delhi
2. Nandan, H., Fundamentals of Entrepreneurship, Prentice Hall of India, New Delhi
3. Vasant Desai, Dynamics of Entrepreneurship Development and Management, HimalayaPublishing House, New Delhi
4. Madhurima Lall, Shiksha Sahai, Entrepreneurship, Excel Books, New Delhi.
5. S.S.Khanka, Entrepreneurship Development, S.Chand publications, New Delhi.
6. Developing Entrepreneurship-Issues and Problems, NISIET, Hyderabad.
7. Jain and Varshney, Entrepreneurship Development-An Indian Perspective, HPH.
8. Schumpeter J, The Theory of Economic Development, Harvard University Press.

COMYVU 402: LEGAL ASPECTS OF BUSINESS

Program Educational Objectives

This enables the students in understanding of :

1. Salient features and provisions of Indian contract Act
2. Various negotiable instruments in business transactions
3. Issues related to the fraudulent practices in sales
4. Importance of cyber crimes and penalties
5. Legal aspects on companies and partnership act

Expected Course Outcomes

After successful completion of this paper, the students are able to:

1. Gain knowledge on various contracts and its applications
2. Aware and evaluate the various fraudulent transactions in trade and commerce
3. Identify and Control the unfair trade practices
4. Assess and identify the overcoming measures on cybercrimes
5. Comprehensive awareness about companies and partnership acts

UNIT-I: Indian Contract Act, 1872: Elements of a valid contract; Capacity of parties; Free consent; Discharge of a contract; Breach of contract and remedies against breach; Quasi contracts; Special contracts: Contracts of indemnity and guarantee; contracts of bailment and pledge; Contracts of agency

UNIT-II: Negotiable Instruments Act, 1881: Types of negotiable instruments; Negotiation and assignment; Dishonour and discharge of negotiable instruments;

UNIT-III: Sale of Goods Act, 1930: Sale and agreement to sell; Doctrine of Caveat Emptor; Rights of unpaid seller and rights of buyer; The Information Technology Act, 2000: Objectives and main provisions; Cyber crimes and penalties

UNIT-IV: The Companies Act, 2013: Nature and kinds of companies; Company formation; Management, meetings and winding up of a joint stock company; Limited Liability Partnership: Structure and procedure of formation of LLP in India

Suggested Books

1. Gulshan, S.S & Kapoor, G.K. A Handbook of Business law.
2. Kapoor ND, Mercentile Law , Sultan Chand
3. Sen Mitra : Commercial and Industrial law.
4. Pillai Bhagavathi, Business Law , S.Chand.
5. Business Laws, Maruthi Publishers

COMYVU 403: INTERNATIONAL BUSINESS

Program Educational Objectives

This enables the students in understanding of :

1. Basic knowledge of International business.
2. Concept and theories of International business.
3. Foreign Direct Investment and Foreign Portfolio Investment.
4. Regional Economic Integration and levels of Regional Economic Integration.
5. Role of International Economic Institutions

Expected Course Outcomes

After successful completion of this paper, the students are able to:

1. Gain basic knowledge of international Business
2. Get acquainted with the theories of international business
3. Analyse the importance of Foreign Direct Investment and Foreign Portfolio Investment
4. Develop the understanding on Regional Economic Integration and levels of Regional Economic Integration.
5. Gain familiarity about the function and role of International Economic Institutions.

UNIT-I: International Business: Scope and importance of International Business – Globalization and its drivers – modes of entry into international business – Theories of International Trade – Government intervention in International trade – Tariff and non-tariff barriers – India's foreign trade policy.

UNIT-II: Foreign Direct Investment (FDI) and Foreign Portfolio Investment(FPI): Types of FDI – costs and benefits of FDI to home and host countries – trends in FDI – India's FDI policy – Balance of Payments(BOP) – Importance and components of BOP.

UNIT-III: Regional Economic Integration: Levels of Regional Economic Integration – trade creation anddiversion affects – Regional Trade Agreements – European Union (EU) – ASEAN – SAARC – NAFTA.

UNIT-IV: International Economic Institutions: IMF – World Bank – UNCTAD – World Trade Organisation(WTO): Functions and objectives of WTO – Agriculture Agreement – GATS – TRIPS – TRIMS.

Suggested Books

1. P. SubbaRao, International Business, Himalaya Publishing House, New Delhi.
2. Chary, Elements of International Business, Wiley Publications.
3. Charles W.L. Hill, G. Thomas M. Hult&RohitMehtani, International Business-Competing in the global market place, McGraw Hill Education.
4. SumathiVarma, Fundamentals of International Business, Pearson Publications.

COMYVU 404 (A): FINANCIAL DERIVATIVES

Program Educational Objectives

This enables the students in understanding of :

1. Concept of derivatives and its types and functions of derivatives market in India.
2. Forward contract and future contracts and its trading mechanism, differences between forwards and futures.
3. Options and its pricing model and dealing with derivate instruments in derivative market.
4. Swaps and evaluation of swaps.
5. Hedge management process, designing the hedge strategy, evaluating and monitoring the hedge position.

Expected Course Outcomes

After successful completion of this paper, the students are able to:

1. Apply knowledge of derivate markets and its function in India.
2. Utilise the knowledge on forward contract and various future contracts and its trading mechanism, and able to differentiate forwards and futures
3. Trade in options market using option strategies.
4. Use their acquaintance on swaps and evaluation of swaps in derivate markets.
5. Evaluate and monitor hedging process in derivative market

UNIT-I: Financial Derivatives: Introduction- Meaning - Characteristics of Derivatives - History of derivatives market, Types of Derivatives: Forwards – Futures – Options - Swaps – Benefits and Risks of Derivative Markets – Market participants and their roles in the derivatives markets - Use of derivatives - Hedging: Meaning – Objectives – Risk Management Strategies.

UNIT-II: Futures Forward Contract: Forward Contract- Features, Limitations; Futures contract- Features, Types; Uses of Forward and Futures Contracts –Distinction between Forward Contract and Future Contract.

UNIT-III: Options: Meaning - Features - Options - Option Terminology -Advantages and Disadvantages of Options-Types of Options Contracts- option Payoff - Option Strategies -Distinction between Options and Futures Contracts; Options Valuation: Option Pricing Models: Black Scholes Model - Option contract in India

UNIT-IV: Swaps: Meaning of Swaps-Concept of Swaps- Structure of Swaps - Types of Swaps - Interest Rate Swap - Types of Interest Rate Swaps - Uses of Interest Rate Swaps - Currency Swaps - Credit Swaps.

Suggested Books

1. Keith Redhead Financial Derivatives – An introduction to Futures Forward, Options, Prentice Hall of India.
2. John C. Hull, SankarshanBasu, Options, Futures and Other Derivatives, Seventh Edition, Pearson Education, New Delhi.
3. SL Gupta, Financial Derivatives: Theory Concepts and Problems, Prentice Hall India.

COMYVU 404 (B): RETAIL MARKETING MANAGEMENT

Program Educational Objectives

This enables the students in understanding of :

1. Deeper insights for motivation towards retail sector.
2. Decisions involved in running a retail firm
3. Concepts and principles of merchandise management
4. Impact of retailing on the economy and its society
5. Policies, methods and procedures used by successful retailers to gain the customer satisfaction

Expected Course Outcomes

After successful completion of this paper, the students are able to:

1. Understand the importance of retailing and its strategic dimensions
2. Identify the factors and management tools that retailers adopt when developing their merchandise mix
3. Evaluate the integration of merchandise management and supply chain strategies
4. Know about shopping experience that builds customer loyalty
5. Identify, hire and retain the talent of a retail manager

UNIT-I: Retailing: Meaning – Functions - Types of Retailing – Retailing Process - Factors affecting Retailing - Retail Management Strategy –Strategic Retail Planning Process - Emerging Trends in Indian Retailing

UNIT-II: Merchandise Management: Merchandise Planning – Sources of Merchandise - Allocation of Merchandise; Retail Pricing Strategies Promoting the Merchandise –Implementing an Advertising Plan

UNIT-III: Store Management: Objectives of a Good Store Design - Store Layout - HRM in Retail Organizations - Designing the Organization Structure for Retail Firm.

UNIT-IV: CRM in Retail Management: Prompt Delivery - Customer Satisfaction after Sales Services – Factors affecting Retailing in India - Retailing Opportunities in India

Suggested Books

1. Bajaj, Retail Management, Oxford University Press.
2. Gilberto, Retail Marketing Management, Pearson Education
3. Retail Management, Suja Nair, Himalaya Publishing House, New Delhi.
4. Retail Management, Swapna Pradhan, Tata McGraw Hill, New Delhi.

COMYVU 405 (A): INTERNATIONAL FINANCIAL MANAGEMENT

Program Educational Objectives

This enables the students in understanding of :

1. Theory of international finance and its real world applications in business decision making
2. Recent changes in global financial markets (banking, debt and equity)
3. Conceptual framework of international monetary system and its regimes
4. Concepts of Forex market, and its operation in the world market
5. Foreign exchange risk, factors affecting risk and its exposure.

Expected Course Outcomes

After successful completion of this paper, the students are able to:

1. Gauge the factors responsible for emergence of globalized financial markets.
2. Identify and use the importance of international financial management and its instruments
3. Use their awareness of clearing and settlement (offshore) procedures at international trade.
4. Applying the currency exchange mechanism involved in and handle risk management techniques in forex market.
5. Secure jobs in Multi National Corporations with the knowledge on foreign currency

UNIT-I: International Financial Management: Concept – Importance - Nature and Scope – International Financial Environment – International Financial Instruments - Role of International Financial Manager – Finance Function – Emerging Challenges – Global Financial Markets – Recent Changes in Global Financial Markets.

UNIT-II: International Monetary System: Objectives – Regimes – Role of InternationalMonetary Fund(IMF)

– Sources of IMF – IBRD (World Bank) – International Liquidity - Domestic Vs Offshore Markets – Euro Markets - Economic Integration and Regional Trade Blocks – Types: SAARC – ASEAN – SAFTA – NAFTA – European Union.

UNIT–III: **Foreign Exchange Market:** Components of Foreign Exchange Market – Functions - Structure of the Forex Markets, Major Participants – Foreign Exchange Rate Mechanism – Factors Influencing Exchange Rates – Exchange Rate Quotations and Arbitrage –Foreign Exchange Market in India – Exchange Controls in India.

UNIT–IV: **Foreign Exchange Risk and Exposure:** Exchange Risk Management – Concept - Types of Risk – Tools and Techniques of Foreign Exchange Risk Management; Exposure – Types of Exposures – Economic Exposure – Operating Exposure – Transaction Exposure.

Suggested Books

1. P.G.Apte, International Financial Market, Tata McGraw Hill Publishing House, NewDelhi
2. Eun Choel and Risnick Bruce, International Financial Management, Tata Mcgraw Hill.
3. Madhu Vij, International Financial Market, Excel Books, New Delhi
4. V.K.Bhalla, International Financial Management, Anmol Publications, New Delhi
5. V.A. Avadhani, International Financial Management, Himalaya Publishing House.
6. Srivastava, R.M., Multinational Financial Management, Excel Publishers.
7. Jeff Madura, International Financial Management, Cengage Publishers.
8. Machi Raju, International Financial Management, Himalaya Publishing House.

COMYVU 405 (B): INTERNATIONAL MARKETING MANAGEMENT

Program Educational Objectives

This enables the students in understanding of :

1. The concept of International Marketing, its environment and complexities.
2. Market entry strategies at international level
3. Life cycle stages at international product management
4. Factors affecting the channels of distribution in international marketing
5. Role of global branding and advertising in Indian marketing scenario

Expected Course Outcomes

After successful completion of this paper, the students are able to:

1. Know the political, social and cultural environment factors affecting to the international marketing
2. Comprehend concepts of International market entry strategies and its effect on Indian firms
3. Analysis the trends in product management at international level
4. Apply the knowledge on physical distribution of product at international market and to overcome the barriers if any
5. Create awareness about the lifestyle of the consumers through the support of international marketing

UNIT-I: International Marketing: Scope and Significance of international marketing, The Strategic Importance of International Marketing, Differences between International and Domestic Marketing – International Market Environment – International Political, Social and Culture Environment.

UNIT-II: International Market Entry Strategies: Indirect Exploring - Domestic Purchasing - Direct Exporting - Foreign Manufacturing Strategies without Direct investment - Foreign Manufacturing Strategies with Direct Investment – International market Segmentation - Entry Strategies of Indian Firms.

UNIT-III: International Product Management: International product Positioning – Product Saturation Levels in global market - International Product Life Cycle. Global Advertising and Brand – Selecting an Advertising Agency – Personal Selling – Sales promotion – Public Relations and Publicity – Sponsorship Promotion.

UNIT-IV: International Marketing Channels: Channels – Distribution Structures – Distribution Patterns – Factors Effecting Choice of Channels – The Challenges in Managing an International Distribution Strategy – The Management of Physical Distribution of Goods.

Suggested Books

1. Michael Czinketa; International Marketing, 8/e, Thomson, 2007.
2. Philip R. Cateora, John L. Graham, International Marketing, Tata Mc Graw Hill Co.,New Delhi
3. Subhash, C. Jain, International Marketing, 6/e, South-Western, 2006.
4. Vern Terstra, Ravi Sarathy, International Marketing, 8/e, Harcourt ASIA PVT. LTD

COMYVU 406: PROJECT REPORT & VIVA-VOCE

YOGI VEMANA UNIVERSITY

I/II/III/IV Semester, M.Com Degree Examination, Month, Year
(Semester Scheme – CBCS as per NEP)

COMMERCE

MODEL QUESTION PAPER (For all Theory Papers)
Paper No: Title of the Paper

Time: 3hrs **Total Marks: 75**

SECTION A

Answer any **FIVE** of the following
Each question carries 3 marks (5x3=15 Marks)
Each answer should not exceed one page

1.
2.
3.
4.
5.
6.
7.
8.

SECTION B

Answer **ALL** the following questions
Each question carries 15 marks (4x15=60 Marks)
Each answer should not exceed six pages

9.

Or

10.

11.

Or

12.

13.

Or

14.

15.

Or

16.

I/II/III/IV Semester, M.Com Degree Examination, Month, Year(Semester Scheme – CBCS as per NEP)

YOGI VEMANA UNIVERSITY

COMMERCE

MODEL QUESTION PAPER (For Practical Papers)Paper No: Title of the Paper

Time: 2hrs **Total Marks: 50**

SECTION A

Answer any **FIVE** of the following
Each question carries 2 marks (5x2=10 Marks)Each answer should not exceed one page

1.
2.
3.
4.
5.
6.
7.
8.

SECTION B

Answer **ALL** the following questions
Each question carries 10 marks (4x10=40 Marks)Each answer should not exceed four pages

9.

Or

10.

11.

Or

12.

13.

Or

14.

15.

Or

16.

YOGI VEMANA UNIVERSITY

Kadapa (A.P)-516005

(A State University Established by the Govt. of A.P)

YOGI VEMANA UNIVERSITY

DEPARTMENT OF COMPUTER SCIENCE AND TECHNOLOGY

TWOYEAR (4-SEMESTER) Master of Computer Applications

To come into effect from the academic Year 2020-21

ACADEMIC REGULATIONS, COURSE STRUCTURE AND DETAILED SYLLABI

For pursuing Two year Post graduate Degree of study in Master of Computer Applications (MCA) offered by Yogi Vemana University.

All the rules specified herein approved by the Dean of Academic affairs will be in force and applicable to students admitted from the Academic Year 2020-21 onwards.

All the rules and regulations, specified hereafter shall be read as a whole for the purpose of interpretation as and when a doubt arises, the interpretation of the Chairman, Board of studies is final. As per the requirements of statutory bodies, the Dean of Academic Affairs, Yogi Vemana University, Kadapa shall be the Chairman, Academic Council.

Academic Regulations 2020 for MCA (Regular)

(Effective for the students admitted into first year from the Academic Year 2020-2021). The MCA Degree of the Yogi Vemana UniversityUniversity, Kadapa shall be conferred on students who are admitted to the program and fulfill all the requirements for the award of the Degree.

1: Admission into the Program

a) A candidate seeking admission into the first semester of the MCA program should passed the graduate degree examination of this university or any other recognized university or as equivalent thereto and should have passed Intermediate examination conducted by the Board of Intermediate Education (BIE) or 10+2 examination conducted by Central Board of Secondary Examination (CBSE) or any other equivalent examination recognized by BIE or CBSE with mathematics as one of the optional subjects

b) Candidates shall be selected for admission on the basis of their performance in the entrance test, the guidelines of which shall be framed by the executive council of this university or convener of common entrance test conducted by any other university at state level.(admission procedure guidelines are followed by APSCHE)

2: Scheme of Instructions

a) The Scheme of instructions shall be for duration of two academic years, eachyear consisting of two semesters, i.e., four semesters for the entire course. In each semester there shall be 90 instruction days of 6 hours a day including days allotted for Internal assessment tests and seminars, but excluding preparation holidays. The inter-semester break in any academic year shall be one week only.

b) The scheme of instructions for the degree shall be according to the scheme of examination, syllabi, list of text books and reference books prescribed by the university from time to time.

3: Attendance

a) The student shall be deemed to have eligibility to write End Semester examinations if he has secured a minimum of 75% of attendance in aggregate of all the subjects.

b) Condonation of shortage of attendance up to 10%, i. e. 65% and above, and below 75% may be given by the College academic committee.

c) Condonation of shortage of attendance shall be granted only on genuine and valid reasons on representation by the student with supporting evidence.

d) A prescribed fee shall be payable for condoning shortage of attendance after getting the approval of College Academic Committee for the same. The College Academic Committee shall maintain relevant documents along with the request from the student.

e) Shortage of attendance below 65% shall in no case be condoned.

f) The student shall not be promoted to the next semester unless he fulfills the attendance requirements of the previous semester.

4: Scheme of Examination

a) There shall be five theory papers and three practical papers in first, second and third and in fourth semesters there shall be three theory papers, and Major project. Each student should submit an individual Major projectin fourth semester.

b) Each theory paper andpracticalshall carry 100 marks of which 25 marks are allotted for internal assessment and 75 marks are allotted for university semester end examinations.

c) The project work at the end of the fourth semester carry 300 marks of which 50 marks are allotted for internal assessment by the respective project guide and 250 marks are allotted for assessed by the committee which consist of head of the Department, Professors , internal and external examiners.

d) There shall be two internal assessment tests for each theory paper and the better performed of the two shall be considered for the award of marks.

e) If any student fails to appear in both the internal assessment tests for whatsoever the reason, he/she shall be deemed to have secured zero and no supplementary internal assessment test shall be conducted.

f) He / She secures 4 credits for each theory paper & 2 credits for each practical paper/exam of all semesters end examinations and project report secures 12 credits in IV semester.

5:Schema of Evaluation

a) The performance of a student in each semester shall be evaluatedsubject- wise (irrespective of credits assigned for a maximum of 100 marks.

b) For theory subjects, the distribution shall be 25 marks for Internal Evaluation and 75 marks forthe End-Examination.

c) In the first three semestersout of five theory papers, each paper shall be valued by two examiners(one will be internal and other will be external) and same for the three theory papers in fourthsemester.Each internal examiner within the university can evaluate two papers per semester andthe remaining shall be by the external examiners. Average of two examinersmarks for eachsubject shall be taken into considerations. If difference of internal examiner and externalexaminer is more than 15 marks it should send for third valuation. The practical papers shall bevalued by both external and internal examiners. The setting of question papers shall be always bythe other university expert members approved by the Board of Studies (BOS).

d) Internal assessment test shall be conducted by the concerned faculty of the department on thedate communicated by the Principal of College. These internal assessment marks shall be communicated to the Controller of Examinations one week before the commencement of the semester end university examinations.

e) Each Internal Test question paper shall contain 6questions. Four questions are to be answeredfrom the six questions. Each question carries 6.25(six and one by four) marks. The duration of internal test willbe for 2 hours. First test to be conducted in two units in the middle of the semester and second test to be conducted in the remaining two units of each subject at end of thesemester.For awarding of 25internal marks the performance of the student in two internal examinations conducted will be considered by which one are highest marks.

f) The End External Examination question paper shall be for a maximum of 75 marks, it contains twosections namely section-A and Section-B. The duration of External Exam will be for 3 hours.

Inthe section-A contains 8 short questions, 5 questions are to be answered from 8 questions, and eachquestion carries 3 marks. The section-B contains 4 questions each of 15 marks, two questions from each unit, having an internal choice.

g) For Practical External examination maximum marks of 75, the examination shall be conducted by the faculty member handling the laboratory (Internal Examiner) and another outside faculty member (External Examiner) appointed by the controller of Examinations. For external Record 10marks, designing of the Program 20 marks Program execution 30 marks and Viva Voce 15 marks

h) Internal evaluation for laboratory courses will be done for a total of 25 marks which includes Day-to-Day evaluation for 15 Marks and Practical test for 10 marks at the end of semester.

6. Evaluation of Project Work:

Every candidate shall be required to submit thesisor dissertation after takingup a topic approvedby the Department for 300 marks. 50 marks for internal assessment and 250 marks for external assessment.

c) A candidate is permitted to register for the project work after satisfying the attendance requirement of all the courses (theory and practical courses of 1 to 3 Semesters).

d) The Project Review Committee (PRC) consisting of HOD, Supervisor and one senior internal faculty member shall monitor the progress of the project work.

e) After registration for Project Work, a student, in consultation with his Project Supervisor, has to present the title, problem definition, objectives, scope of work in the same domain of his project work during Project Work Review - I to the Project Review Committee (PRC) for approval within four weeks from the commencement of 4^{th} semester. The student can initiate the Project Work only after obtaining the approval of the PRC. If a student fails to register for project work or did not get the PRC approval to initiate the Project Work, he has to register for Project Work or get the PRC approval during Project Work Review – III in 4^{th}Semester.

f) The project work review – II shall be scheduled within one month from the commencement of 4^{th}Semester. During this review the PRC will examine the progress of the proposed project work in project work review - I.

g) The Project Work Review – III carries 50 Internal Marks. The Project Supervisor will evaluate for 20 Marks and PRC will evaluate for remaining 30 marks. The Project Work Review – III evaluation will be done after four months from the commencement of IV Semester. The PRC will examine the overall progress of the Project Work. The student shall make an oral presentation before the PRC. A student has to secure minimum of 50% marks to be declared successful in Project Work Review – III and then only permitted to submit project thesis. A

draft copy of thesis should be submitted to the Head of the Department. Marks shall be awarded based on Problem identification and literature survey (20)+ Presentation(20)+ Viva Voce(10)

h) Three copies of the Thesis / Dissertation certified in the prescribed form by the supervisorand HOD shall be presented to the HOD.

i) The Viva-voce examination shall be conducted by the board consisting of the Supervisor, Head of the Department and the external examiner nominatedby the Controller of Examinations. The board shall jointly award the marks for 250 out of for Execution of the project code(100)+Project Document preparation(50)+ Presentation (50)+ Viva Voce (50)

j) There shall be a Technical Seminar during 4th semester. For Seminar, a student shall collect the literature on the advanced topic in relevant fields and critically review the literature and submit it to the department in the form of report and shall make an oral presentation before the Department Academic Committee consisting of Head of the Department, Seminar coordinator and two other senior faculty members of the department.

7: Qualifying marks for Pass

A candidate shall fulfil the following requirements for a pass:

a) A candidate appearing for the first time for any semester end university examination shall register for the whole examination. A candidate shall be declared to have passed the whole examination, if he/she secures a minimum grade of 4 on 10 point scale in each theory paper/practical/dissertation/comprehensive viva-voce in semester end university examination and internal assessment tests put together after revaluation of marks of all the students including supplementary student who have appeared for the examination.

b) A candidate shall be declared to have failed in the examination in such paper(s) when he/she could not get a minimum grade of 4 on 10 point scale in semester end university examinations and internal assessment tests put together.

c) A candidate shall be declared to have been exempted from appearing once again in such theory paper(s) and/practical(s) in which he/she has secured a minimum grade of 4 on 10 point scale in semester end university examinations and internal assessment marks put together.

d) Supplementary candidates who failed shall register in all papers in which he/she failed and he/shall be declared to have passed the examination when he/she fulfills the requirements

e) There shall be no separate supplementary examinations. The failed candidates shall register and reappear for the examinations along with the regular candidates of next batch.

f) A candidate who failed and wishes to appear for the whole of the theory examinations of any semester shall be allowed only after the completion of the all subjects passed in previous semester.

g) A student shall register for all the 102 credits as specified and listed in the course structure, put in required the attendance and earn all the 102 credits. Grade points obtained in all the 102 credits shall be considered for the calculation of the DIVISION based on CGPA.

h) A student who fails to earn 102 credits as indicated in the course structure within FOUR academic years from the year of their admission shall forfeit his seat in M.C.A Program and his admission stands cancelled.

8: Classification of Successful Candidates

The classification of successful candidates shall be based on the total marks obtained in all the semesters and then computing the percentage. The following formula shall be adopted for converting the final percentage of marks into letter grade as given below:

Marks Range	Letter Grade	Grade Point	Qualitative Meaning
90 – 100	O	10	Outstanding
80 – 89	A +	9	Excellent
70 – 79	A	8	Very Good
60 – 69	B +	7	Good
50 – 59	B	6	Above Average
45 – 49	C	5	Average
40 – 44	P	4	Pass
< 40	F	0	Fail
0	AB	0	Absent

The classification of students in on 10 point scale based on Semester Grade Point Average(SGPA) at the end of each Semester and Cumulative Grade Point Average (CGPA) at the end of the Course as explained below.

Semester Grade Point Average (SGPA) $Si=\sum(Ci*Gi)/\sum Ci$

Where Ci is the number of credits of the i^{th} Course and Gi is the grade point scored by the student in the i^{th}Course.

Cumulative Grade Point Average (CGPA) $\sum(Ci*Si)/\sum Ci$

Where Si is the SGPA of the i^{th}Semester and Ci is the total number of credits in that Semester. The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcript.

The marks obtained by the candidates shall be evaluated and given the grades/points on the 10point scale as given in the above table.

Aggregate Percentage = CGPA X 10

9: Choice Based Credit System (CBCS)

Two Non-Core papers shall be introduced in II and III Semesters as Non-Core I and Non- Core II respectively as a part of CBCS. These papers shall be taught by other departments as per the choice of the student. The candidate shall pass in these Non-Core paper on par with other papers but the marks shall not be included in awarding the Grade Point. These papers shall be evaluated by the single examiner either internal or external.

10: Award of Rank

There shall be no award of rank at the time of publication of results. However the names of gold medal awardees, Fellowship programmes, etc shall be announced at the time of convocation only in their subject in the university on the basis of total marks obtained in all semesters put together and who passed all the semester examinations in one attempt. Supplementary / Improvement candidates are not eligible for the award of ranks.

11: Improvement

The candidates are permitted to improve their marks in one or more theory papers of any semester as per the regulations and syllabi in force. If the candidate fails to improve his / her marks / class, the original marks / class are unaltered. There is no provision for improving the marks of internal assessment / practical / project.

12: Conditions of Award of Degree

A candidate for the award of MCA degree shall be required:

a) To have undergone the course of study in the university college/affiliated college over a period of two academic years consisting of foursemesters.
b) To have passed the examination for the MCA as prescribed above

13: Transitory Regulations

YOGI VEMANA UNIVERSITY

a) The Course of study for the Master of Computer Applications Degree shall cover normally a period of 2 academic years comprising of four semesters.

b) No candidate shall be permitted to obtain degree earlier than four semesters and shall not be permitted to appear to any semester of examination after four years.

c) The university shall have the right to amend or modify any or all of the above regulations whenever necessary.

YOGI VEMANA UNIVERSITY

ACADEMIC YEAR 2020-2021FOR MASTER OF COMPUTER APPLICATIONS (MCA) COURSE

(Accordance to CBCS System)

FIRST SEMESTER						
Paper Code	Title	Marks			No. of Credits	No. of Hours/ week
		Internal	External	Total		
13001	Data Structures Using C	25	75	100	4	4
13002	Database Management system	25	75	100	4	4
13003	Operating System	25	75	100	4	4
13004	Computer Organization	25	75	100	4	5
13005	Discrete Mathematical Structures	25	75	100	4	5
13001P	Data Structures Using C Laboratory	25	75	100	2	4
13002P	Database Management system Laboratory	25	75	100	2	4
13003P	Operating System Laboratory	25	75	100	2	4
Total				**800**	**26**	**34**

SECOND SEMESTER						
Paper Code	Title	Marks			No. of Credits	No. of Hours/ week
		Internal	External	Total		
23001	Object Oriented Programming through Java	25	75	100	4	4
23002	Web Technology	25	75	100	4	4
23003	Python Programming	25	75	100	4	4
23004	Computer Networks	25	75	100	4	5
23005	Software Engineering	25	75	100	4	5
***23006 Non-Core I**	Introduction to computers and MS-Office	25	75	--	--	4
23001P	Object Oriented Programming through	25	75	100	2	4

	Java Laboratory					
23002P	Web Technology Laboratory	25	75	100	2	4
23003P	Python Programming Laboratory	25	75	100	2	4
Total				**800**	**26**	**38**

THIRD SEMESTER						
Paper Code	Title	Marks			No. of Credits	No. of Hours/ week
		Internal	External	Total		
33001	Data Mining and Data Warehousing	25	75	100	4	4
33002	Cloud Computing	25	75	100	4	4
33003	Cryptography and Network Security	25	75	100	4	4
33004	Elective-I	25	75	100	4	5
33005	Elective-II	25	75	100	4	5
***33006 Non-Core II**	Internet and World wide Web	25	75	--	--	4
33001P	Data Mining and Data Warehousing Laboratory	25	75	100	2	4
33002P	Cloud Computing Laboratory	25	75	100	2	4
33003P	Cryptography and Network Security Laboratory	25	75	100	2	4
Total				**800**	**26**	**38**

Elective-I (Choose any one of Subject)	**Elective-II** (Choose any one of Subject)
33004A: Design & Analysis of Algorithms 33004B: Theory of Computation 33004C: Internet of Things 33004D: Object Oriented Analysis and Design	33005A: Data Science 33005B: Mobile Application Development 33005C: Computer Graphics 33005D: MOOCS-1 (NPTEL / SWAYAM)

FOURTH SEMESTER						
Paper Code	Title	Marks			No. of Credits	No. of Hours/ week
		Internal	External	Total		
43001	Artificial Intelligence and Machine Learning	25	75	100	4	4
43002	Elective-III	25	75	100	4	4
43003	Elective-IV	25	75	100	4	4
43001D	Project dissertation	50	250	300	12	3x6=18
Total				**600**	**24**	**30**

Elective-III(Choose any one of Subject)	**Elective-IV**(Choose any one of Subject)
43002A: Digital Image Processing 43002B: Ethical Hacking 43002C: Big Data Analytics 43002D: Complier Construction	43003A: Human Computer Interaction 43003B: Artificial Neural Networks 43003C: Block Chain Technologies 43003D: MOOCS-2 (NPTEL / SWAYAM)

SCHEME OF EXAMINATION AND MAXIMUM MARKS

Semester	**No. of Papers**	**Max. Marks in Each Paper**				**Total Marks**	**Total Credits**
		Internal	External	Total			
I Semester	Theory -5	25	75	100	500	800	26
	Practical-3	25	75	300	300		
II Semester	Theory -5	25	75	100	500	800	26
	Practical-3	25	75	300	300		
III Semester	Theory -5	25	75	100	500	800	26
	Practical-3	25	75	100	300		
IV Semester	Theory -3	25	75	100	300	600	24
	Project dissertation	50	250	300	300		
TOTAL						**3000**	**102**

13001 PAPER I: DATA STRUCTURES USING C

YOGI VEMANA UNIVERSITY

UNIT I

Introduction: Primitive and Composite data Types, Abstract Data Type, Data Structure, Storage Structure, File Structure, Complexity of an algorithm, Big O Notation.
Arrays: Sparse matrix representation and operations. Linked lists: Single, double, Circular lists and Operations.

UNIT II

Stacks: Representation, Operations, Array and Linked List Implementation, Applications.
Queues: Representation, Operations, Array and Linked list Implementation of single, multiple, priority, dqueue and circular queues, Applications.

UNIT III

Trees: Definitions and concepts, Storage representation and manipulation of general trees, Binary trees, Conversion of general tree to binary tree, AVL tree, Tries, B-Trees, Tree traversing techniques
File Organization: Sequential file organization; ISAM, Direct Files, Inverted Lists, Multi lists.Graphs: Representation, Warshall and Minimal algorithm, Traversal and other operations, Topological sorting; Minimum Spanning tree;

UNIT IV

Hashing: Access table handling, Choosing a hash function, Collision resolution methods, Analysis of hashing.
Sorting: Internal Sorting Techniques: Selection sort, Bubble sort, Merge sort, Quick sort, heap sort and Radix sort External Sorting Techniques: Run lists, Tape sorting, sorting on disks, generating extended run lists.
Searching Techniques: Linear and Binary search.

TEXT BOOKS:

1. J.P. Trembly and P.G. Sorensen, "An Introduction to Data Structures with Applications", Tata McGraw Hill, Second edition.
2. ReemaThareja "Data Structures using C" , Oxford publication

Reference Books:

1. E. Horowitz and S. Sahani, "Fundamentals of Data Structures", Galgotia Book Source, 1996.
2. SartajSahni, "Data Structures, Algorithms, and Applications in C++", Tata McGraw-Hill International Editions, 1999.

13002 PAPER-II: DATA BASE MANAGEMENT SYSTEM

YOGI VEMANA UNIVERSITY

UNIT I

Database System Concepts and Architecture: Database Systems vs. File Systems- -Data Models, Schemas, and Instances; Three-Schema Architecture and Data Independence;Database Languages and Interfaces; Centralized and Client/Server Architectures for DBMS.

Data Modeling: Entity-Relationship Diagram, Relational Model - Constraints, Languages, Design, and Programming, Relational Database Schemas, Update Operations and Dealingwith Constraint Violations;

UNIT II

SQL: Data Definition and Data Types; Constraints, Queries, Insert, Delete, and Update Statements; Clauses, Views, Stored Procedures and Functions; Database Triggers, SQL Injection.
Normalization for Relational Databases: Relational Algebra and Relational Calculus; Codd Rules: Functional Dependencies and Normalization; Algorithms for Query Processing and Optimization;

UNIT III

Transaction Management: Transaction Processing, Concurrency Control Techniques, Database Recovery Techniques, Object and Object-Relational Databases; Database Security and Authorization.

UNIT IV

Enhanced Data Models: Temporal Database Concepts, Multimedia Databases, Deductive Databases, XML and Internet Databases; Mobile Databases, Geographic Information Systems, Genome Data Management, Distributed Databases and Client-Server Architectures.

TEXT BOOKS

1. Abraham Silberschatz, HentryF.Korth and S.Sudharssan,"Database System Concepts", 4th Edition, Tata McGraw Hill, 2002.
2. Raghu Ramakrishnan&Johannesgerhrke, "Data Base Management Systems", Mc Graw Hill International Edition, 2000.

13003 PAPER- III: OPERATING SYSTEMS

YOGI VEMANA UNIVERSITY

UNIT I

Operating System: Basic elements of computers, instruction execution, operating system objectives and functions. Evaluation of operating systems, System components, Operating-System services, System Calls, Virtual Machines.
Process and Threads: Process concepts and scheduling, Operation on processes, Cooperating Processes, Threads, and Interposes Communication

UNIT II

Concurrency: principles of concurrency mutual exclusion, The Critical Section Problem, Critical Regions, semaphores, monitors, message passing, Readers/Writers Problems
Deadlocks: System Model, Dead locks Characterization, Methods for Handling Dead locks Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock.

UNIT III

Memory Management: Requirements of main memory, Partitioning, Placement Algorithms, Page replacement algorithms, Logical versus Physical Address Space.
Virtual Memory: Real address & Virtual address, Thrashing, Paging, Virtual address, Page table entry, Address translation in paging Swapping, Translation lookaside buffer, Segmentation, Virtual address, Segment table entry, Address translation in segmentation, Combined paging and segmentation. Contiguous Allocation, Paging, Segmentation, Segmentation with Paging. Demand Paging and prepaging.

UNIT IV

I/O management and Disk Scheduling: I/O Devices, Organization of I/O Functions, I/O Buffering, Disk Scheduling, Disk Cache

File System Interface and Implementation: Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management, Directory Management, Directory Implementation, Efficiency and Performance.

TEXT BOOKS:

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.
2. Operating Systems – Internals and Design Principles Stallings, Fifth Edition–2005, Pearson Education/PHI.

Reference books:

1. Operating System A Design Approach-Crowley,TMH.
2. Modern Operating Systems, Andrew S Tanenbaum 2nd edition Pearson/PHI
3. Operating Systems, Dhamdhere, TMH

13004 PAPER-IV: COMPUTER ORGANIZATION

YOGI VEMANA UNIVERSITY

UNIT I

Digital Logic Circuits: Digital Computers, Functional units of computers, Logic Gates, Universal gates, Boolean Algebra, Sum of Product forms, Product of Sum forms, Map Simplification, Combinational circuits, half adder, full adder, half subtractor, full subtractor, Sequential Circuits, Decoders, 3X8 line decoder, Encoders, multiplexers, de-multiplexer, Flip-flops, SR flip-flop, JK flip-flop, D flip flop, T flip flop, Master Slave JK Flip flop, Registers, shift Registers, Binary Counters, Data Representation – number system, Data Types, conversions, Complements, Fixed Point Representation, Floating Point Representation, BCD Codes, Error detecting Codes.

UNIT II

Programming the Basic Computer: Introduction, Machine Language, Assembly Language, The Assembler, Program Loops, Programming Arithmetic and Logic Operations, Subroutines, Input – Output Programming. Micro Programmed Control – Control Memory, Address Sequencing, Micro program Example, Design of control Unit.

UNIT III

CPU Organization: block diagram of complete processor, General Register Organization – Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction set Computer.

Input-Output Organization: Peripheral devices, Input Output Interface, Asynchronous Data Transfer, strobe control, handshaking signals, Modes of Transfer, programmed I/O system, Interrupt initiated I/O, DMA, Input-Output processor.

UNIT IV

Memory Organization: Memory Hierarchy, characteristics of memory devices, Main Memory – RAM – ROM chips, auxiliary memory, Memory Address Map, Memory Connection to CPU, Associative Memory, Cache Memory, Virtual Memory, paged virtual memory system

Multiprocessors: Characteristics of Multi processors, Inter Connection Structures – Time shared connection bus, multiport memory, crossbar switch, multistage network, Inter Processor Arbitration, Inter processor Communication and Synchronization, Cache coherence.

TEXT BOOKS:

1. Morris Mano -Computer System Architecture –3rd Edition-Pearson Education.
2. Douglas V.Hall Intel 8086-Programming- McGraw-Hill International studies.

REFERENCE BOOKS:

Computer Organization – Car Hamacher, ZvonksVranesic, SafeaZaky, Vth Edition, McGraw Hill.

Fundamentals or Computer Organization and Design, - SivaraamaDandamudi Springer Int. Edition.

Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI.

13005 PAPER -V: DISCRETE MATHEMATICAL STRUCTURES

YOGI VEMANA UNIVERSITY

UNIT I

Logic and proof, sets and Functions – Logic, Propositional equivalence, Predicates and Quantifiers, Nested quantifiers, Methods of proof, Sets operations, functions.

UNIT II

The integers and Division, Integers and Algorithms, Applications of Number theory, Mathematical reasoning, Induction and Recursion – Proof strategy, Sequences and summations, Mathematical induction, Recursive definitions and structural induction, Recursive algorithms, Program correctness.

UNIT III

The basics of counting, The Pigeonhole principle, Permutations and combinations, Binomial Coefficients, generalized permutations and combinations, Generating permutations and combinations, Recurrence relations, Solving recurrence relations.

UNIT IV

Graphs – Introduction to Graphs, Graph terminology, Representing graphs and graph isomorphism, Connectivity, Euler and Hamilton paths, shortest path problems, Planar graphs, Graph coloring.

Text Book:

Rosen K H. Discrete Mathematics and its Applications, 5th edition. Tata McGraw-Hill, 2003.

Vijay Lakshmi and Bhupender, Discrete Mathematics.

Reference Books :

1. Johnson Baugh R, and Carman R, Discrete Mathematics, 5th edition, Pearson Education, 2003.
2. Mott J L. Kandel A, and Baker T P, Discrete Mathematics for Computer Scientists and Mathematicians, 2nd edition, Prentice-Hall of India, 2002.

3. Gary Haggard, John Schipf and sue whitesides, Discrete Mathematics for Computer Science, Thomson, 2005.

PRACTICALS

YOGI VEMANA UNIVERSITY

13001P: DATA STRUCTURES LABORATORY

The following assignments shall be implemented in C

1. Create a singly linked list and perform operations on it.
2. Create a doubly linked list and perform operations on it.
3. Create a stack and perform operations on it.
4. Create a queue and perform operations on it.
5. At least three classical applications of linked lists.
6. At least three classical applications of stacks.
7. At least three classical applications of queues.
8. Create a binary tree and traverse it in in-order, pre-order and post-order using iterative and recursive methods.
9. Create a binary search tree and perform search, insert and delete operations.
10. Create an AVL tree and perform search, insert and delete operations.
11. Create a priority queue and perform insert and delete operations.
12. Implement graph traversals: BFS and DFS
13. Implement Dijkstra‘s algorithm.
14. Implement Prim‘s algorithm.
15. Implement Kruskal algorithm.
16. Represent sparse matrices using multi-linked structures and perform addition, subtraction and multiplication operations.
17. Implement quick, heap, radix and address calculation sorting techniques.

13002P: DATABASE MANAGEMENT SYTEMS LABORATORY

YOGI VEMANA UNIVERSITY

1. Programs in SQL covering all the SQL Queries.

2. a) Write a program in PL/SQL to determine Statistical functions.
   b) Write a program in PL/SQL to demonstrate functions.
   c) Write a program in PL/SQL to demonstrate cursors.
   d) Write a program in PL/SQL to demonstrate parameterized cursors.
   e) Write a program in PL/SQL to demonstrate procedures.
   f) Write a program in PL/SQL to demonstrate packages.
   g) Write a program in PL/SQL to demonstrate overloading packages.
   h) Write a program in PL/SQL to demonstrate exceptions.
   i) Write a program in PL/SQL to demonstrate triggers.

13003P: OPERATING SYSTEMS LABORATORY

YOGI VEMANA UNIVERSITY

Operating System Lab:

1. Demonstrate creation of Threads and Synchronization in C++
2. Implement Banker's Algorithm for deadlock prevention in C++
3. Design and develop C++ program for FCFS & SJF CPU Scheduling compare for same set of jobs.

Process	Burst Time
P1	10
P2	1
P3	2
P4	1
P5	5

4. Design and develop C++ program for Round Robin Scheduling for a given set of jobs (above table) and Show average waiting time, turnaround time.
5. Demonstrate producers and Consumers problem for Inter process communication in C++.
6. Design and develop C++ program for FIFO page replacement algorithm for following set of page references 1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6 and show no. of page faults.
7. Design and develop C++ program for LRU page replacement algorithm for following set of page references 1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6 and show of no. of page faults and belady's anomaly if it occurs.
8. Design and develop C++ program for Optimal page replacement algorithm for following set of page references 1,2,3,4,2,1,5,6,2,1,2,3,5,5,3,4,1 and show of no. of page faults and belady's anomaly if it occurs.

23001 PAPER-I: OBJECT ORIENTED PROGRAMMING THROUGH JAVA

YOGI VEMANA UNIVERSITY

UNIT 1:

Java Basics - History of Java, Java buzzwords, comments, data types, variables, constants, scopeand life time of variables, operators, operator hierarchy, expressions, type conversion and casting, enumerated types, control flow-block scope, conditional statements, loops, break and continue statements, simple java program, arrays, input and output, formatting output, Review of OOP concepts, encapsulation, inheritance, polymorphism, classes, objects, constructors, methods, parameter passing, static fields and methods, access control, this reference, overloading methods and constructors, recursion, garbage collection, building strings, exploring string class, Enumerations, autoboxing and unboxing, Generics.

UNIT 2:

Inheritance –Inheritance concept, benefits of inheritance, Super classes and Sub classes,Member access rules, Inheritance hierarchies, super uses, preventing inheritance: final classes and methods, casting, polymorphism-dynamic binding, method overriding, abstract classes and methods, the Object class and its methods.
Interfaces –Interfaces vs. Abstract classes, defining an interface, implementing interfaces,accessing implementations through interface references, extending interface.
Packages-Defining, Creating and Accessing a Package, Understanding CLASSPATH, importingpackages.

UNIT 3:

Exception handling –Dealing with errors, benefits of exception handling, the classification ofexceptions-exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, rethrowing exceptions, exception specification, built in exceptions, creating own exception sub classes, Guide lines for proper use of exceptions.
Multithreading - Differences between multiple processes and multiple threads, thread states,creating threads, interrupting threads, thread priorities, synchronizing threads, interthread communication, thread groups, daemon threads.

UNIT 4:

GUI Programming with Java - The AWT class hierarchy, Introduction to Swing, Swing vs.AWT,MVC architecture, Hierarchy for Swing components, Containers – Top-level containers – JFrame, JApplet, JWindow, JDialog, Light weight containers – JPanel, A simple swing application, Overview of several swing components-Jbutton, JToggleButton, JCheckBox, JRadioButton, JLabel, JTextField, JTextArea, JList, JComboBox, JMenu, Java‘s Graphics capabilities – Introduction, Graphics contexts and Graphics objects, color control, Font control, Drawing lines, rectangles and ovals, Drawing arcs, Layout management - Layout manager types – border, grid, flow, box.
Event Handling - Events, Event sources, Event classes, Event Listeners, Relationship betweenEvent sources and Listeners, Delegation event model, Semantic and Low-level events, Examples: handling a button click, handling mouse and keyboard events, Adapter classes.

TEXT BOOKS:

1. Java: the complete reference, 7th editon, Herbert Schildt, TMH.
2. Java for Programmers, P.J.Deitel and H.M.Deitel, Pearson education / Java: How to Program P.J.Deitel and H.M.Deitel, 8th edition, PHI.

REFERENCE BOOKS:

1. Core Java, Volume 1-Fundamentals, eighth edition, Cay S.Horstmann and Gary Cornell, Pearson education.
2. Java Programming, D.S.Malik, Cengage Learning.
3. Object Oriented Programming with Java, B.Eswara Reddy, T.V.Suresh Kumar, P.Raghavan, Pearson-Sanguine.
4. An introduction to Java programming and object oriented application development, R.A. Johnson- Cengage Learning.
5. Advanced Programming in Java2, K.Somasundaram, Jaico Publishing House.
6. Starting out with Java, T.Gaddis, dreamtech India Pvt. Ltd.
7. Object Oriented Programming with Java, R.Buyya, S.T.Selvi, X.Chu, TMH.
8. Object Oriented Programming through Java, P.Radha Krishna, Universities Press.
9. An introduction to programming and OO design using Java, J.Nino, F.A.Hosch, John Wiley & Sons.
10. Java and Object Orientation, an introduction, John Hunt, second edition, Springer.
11. Maurach‘s Beginning Java2,D.Lowe, J.Murach, A. Steelman, SPD.
12. Programming with Java, M.P.Bhave, S.A.Patekar, Pearson Education

23002 PAPER II: WEB TECHNOLOGIES

UNIT I

Introduction to XHTML: Introduction – First XHTML –XHTML Validation service – Headers – Linking – Images – Unordered Lists – Nested and Ordered Lists – Basic XHTML Tags – Intermediate XHTML Tables and Formatting – XHTML Forms – Internal Linking – Creating and Using Image maps – meta-Elements – frameset element – Nested framesets.

Cascading Style Sheets – Introduction –Inline Styles – Embedded Style Sheets – Conflicting Styles – Linking External Style Sheets – Positioning Elements – Backgrounds – Element dimensions – Text flow and the Box Model – User Style Sheets

UNIT II

Java Script: Introduction to Scripting: Introduction – A Sample Program: Printing a Line of Text in a Web Page – Obtaining user with prompt Dialogs

Functions: Introduction – Program Modules in JavaScript – Programmer-Defined Functions – Function Definitions – Random Number Generation – Example – Scope Rules – JavaScript Global Functions – Recursion vs. Iteration

Arrays: Declaring and Allocating Arrays – Examples Using Arrays – References and Reference Parameters – Passing Arrays to Functions – Sorting Arrays – Searching Arrays : Linear Search and Binary Search – Multidimensional Arrays.

Objects: Introduction – Thinking About Objects – Math Object – String Object – Date Object – Boolean, Number, document, window Object

UNIT III

Dynamic HTML – Object Model and Collections: Introduction – Object Referencing – Collections all and Children – Dynamic Styles – Dynamic Positioning – Using the frames Collection – navigator Object Event Model – Event Onclick – Event onload – Error Handling with onerror – Tracking the Mouse with Event onmousemove – Rollovers with onmouseover and onmouseout – Form Processing with onfocus and onblur – More Form Processing with onsubmit and onreset – Event Bubbling – More DHTML Events.

Filters and Transitions: Flip filters: flipv and fliph – Transparency with the chroma Filter – Creating Image masks – Miscellaneous Image filters: invert, gray and xray – Adding shadows to Text – Creating Gradients with alpha – Making Text glow – Creating Motion with blur – Using the wave Filter – Advanced Filters: dropshadow and light – blendTrans Transitions – revealTrans Transitions

UNIT IV

XML (Extensible Markup Language): Introduction – Structuring Data – XML Namespaces DocumentType Definitions (DTDs) and schemas– XML vocabularies- Document Object Model – DOM methods – Simple API for XML - Extensible Style Language(XSL) – Simple Object Access Protocol(SOAP) Web Servers (IIS, Apache): Introduction – HTTP request Types – System Architecture – Client sidescripting vs Server Side Scripting - Microsoft Internet Information Server (IIS) – Apache Web Server –Requesting documents

Text Book:

1. DEITEL & DEITEL: *Internet & World Wide Web - How to Program*, Pearson Education -Third Edition

Reference Books

1. Ivan Bayross :*HTML, DHTML , Java Script , Perl, CGI*, BPB
2. Web Technologies by Achyut S Godbole and AtulKahate, TMH

23003 PAPER III: PYTHON PROGRAMMING

YOGI VEMANA UNIVERSITY

UNIT-1:

Python programming Language Fundamental: Keywords and Identifiers, statemts and Comments, python variables and operators, python input and output statements
Python Data types: Numbers, list-data structure, tuple-datastructure, set-data structure and dictionary, string

UNIT-II:

Python Functions: Python Functions, Function Argument, Python Recursion Python Modules, Python packages
Advanced Python: Python OOP, Python class, python inheritance, multiple inheritance, operator overloading, Python File Handling: File Operation, python Directory, python exception,python exception handling ,python user-defined Exception.

UNIT-III:

Regular Expressions: Introduction, Special Symbols and Characters, Res and Python Multithreaded Programming: Introduction, Threads and Processes, Python, Threads, and the Global Interpreter Lock, Thread Module, Threading Module, Related Modules

UNIT-IV:

GUI Programming: Introduction, Tkinter and Python Programming, Brief Tour of Other GUIs, Related Modules and Other GUI

TEXT BOOK:
1. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.

REFERENCE BOOKS:
1. Think Python, Allen Downey, Green Tea Press.
2. Introduction to Python, Kenneth A. Lambert, Cengage.
3. Python Programming: A Modern Approach, VamsiKurama, Pearson.
4. Learning Python, Mark Lutz, O' Really.

23004 PAPER IV: COMPUTER NETWORKS

YOGI VEMANA UNIVERSITY

UNIT-I

Introduction, Uses of Computer Networks, Network Hardware-Transmission technology, Network topology, Transmission mode, scale, Network software-protocol hierarchies, Design issues for layers, interface and services, connection oriented and connection less services service primitives, Reference Models- OSI reference model, TCP/IP reference Model, Example of data communication services- X.25 networks, Frame relay,Physical Layer: Transmission media, Guided media and unguided media, Wirelesstransmission,

UNIT-II

Data Link Layer: Data Link Layer Design Issues- services provided to the network layer, framing, error control, flow control, Error Detection and Correction – types of errors, Error detection, error correction, , Elementary data link protocols- An unrestricted simplex protocol, A simplex stop and wait protocol, simplex protocol for noisy channel, Sliding Window Protocol- one bit sliding window protocol, A protocol using Go back N ARQ, Selective repeat protocol, HDLC, multiple access protocol- Aloha, carrier Sense multiple access protocol, IEEE Standard 802 for LANs and MANs- 802.4 token bus, 802.5 token ring.

UNIT-III

Network Layer: Network layer design issues, Routing algorithms- classification, routig table, Shortest path routing, Flooding, Distance Vector routing, Link state routing, Hierarchical routing, Broadcast routing, Multicast routing. Congestion control algorithms- general principles to congestion control Open loop control, Closed loop control, Network layer in the Internet- IP protocol, IPV4, IPV6 addressing, subnet addressing.

UNIT-IV

Transport layer: The Transport Service, Elements of Transport Protocols, Internet Transport Protocols(TCP and UDP).
Application Layer: Network Security, Traditional cryptography- substitution ciphers, Transpositionciphers, DNS, Electronic Mail, World Wide Web, Multimedia.

TEXT BOOKS:

Computer Networks -- Andrew S Tanenbaum, 4th Edition. Pearson Education/PHI

Reference Books:

1. Computer Communications and Networking Technologies –Michael A.Gallo, William M .Hancock - Thomson Publication

Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH

23005 PAPER V: SOFTWARE ENGINEERING

YOGI VEMANA UNIVERSITY

UNIT 1:

Introduction to Software Engineering: The evolving role of software, Changing Nature of Software,Software myths.

A Generic view of process: A layered technology, A process framework, TheCapability Maturity ModelIntegration (CMMI), Process patterns, process assessment, personal and team process models.
Process models: The waterfall model, Incremental model, Rad model, Spiral model, Evolutionaryprocess models, TheUnified process.
An Agile View of process: Agility, Agile process models- Scrum process model, Extreme programming (XP).

UNIT2:

Software Requirements: Functional and non-functional requirements, User requirements, Systemrequirements, Interface specification, the software requirements document.
Requirements engineering process: Feasibility studies, Requirements elicitation andanalysis,Requirements validation, Requirements management.

System models: Context Models, Behavioral models, Data models, Object models, structured methods.

UNIT 3:

Product metrics: Software Quality, Metrics for Analysis Model, Metrics for Design Model, Metricsforsource code, Metrics for testing, Metrics for maintenance.
Testing Strategies: A strategic approach to software testing, test strategies for conventionalsoftware,Black-Box and White-Box testing, Validation testing, System testing, the art of Debugging.
Metrics for Process and Products : Software Measurement, Metrics for software quality.

UNIT 4:

Risk Management: Reactive vs Proactive risks strategies, software risks, risk identification, riskprojection, risk refinement, RMMM, RMMM plan.
Quality Management: Quality concepts, software quality assurance, software reviews, formal technicalreviews, statistical software quality assurance, software reliability.

TEXT BOOKS:

1. Software Engineering, A practitioner‘s Approach- Roger S. Pressman, 6th edition. McGrawHill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson education.
3. Designing Flexible Object Oriented systems with UML-Charles Ritcher
4. Object Oriented Analysis & Design, Sat/.inger. Jackson, Burd Thomson

REFERENCE BOOKS:

1. Software Engineering- K.K. Agarwal & Yogesh Singh, New Age International Publishers
2. Software Engineering, an Engineering approach- James F. Peters, WitoldPedrycz, John Wiely.
3. Systems Analysis and Design- ShelyCashmanRosenblatt,Thomson Publications.
4. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill Companies.

23006 Non Core –I INTRODUCTION TO COMPUTERS AND MS-OFFICE

YOGI VEMANA UNIVERSITY

Unit 1:

Exploring Computers and their Uses: Computers in our World, the Computer defined, Computer for individual users, Computer for Organizations, Computer in Society, Why was Computers so important. **Types of Storage Devices**: An ever-growing need, Categorizing storage devices, Magnetic Storage Devices-How data is stored on a disk, how data is organized on magnetic disk, how the operating system finds data on a disk, Diskettes, hard disks, removable high-capacity magnetic disks, tape drives, optical storage devices, solid-state storage devices, smart cards, solid-state disks.

Operating System Basics: Introduction to OS, Types of Operation System, Evolution of OS, purpose of operating systems, functions of an OS, Modern OS (windows 9x, Windows XP, NT, Some Windows server OS),Introduction to UNIX OS, Introduction to LINUX OS, Basic commands.

Unit2:

MS-Word Word Basics: Starting word, creating a new document, operating preexisting document, the parts of a word window, typing text, selecting text, deleting text, undo, redo, repeat, inserting text, replacing text, formatting text, cut, copy, paste-formatting text and document: Auto format, Line spacing margins, Boards and shading.

Header and Footer: Definition of header and footer, creating basic header and footer, creating different headers and footers for odd and even pages.

Tables: Creating a simple table, creating a table using the table menu. Entering and editing text in the table, selecting table, adding rows, deleting rows, changing row height, inserting columns, deleting columns, changing column width.

Graphics: Importing graphics, Clip Art, insert picture, Clip Art Gallery. Using word's drawing features, drawing objects, text in drawing.

Macros: Macro. Record Macros, Editing macros, running a macro.

Mail Merge: Mail Merge Concept, Main document, data sources, merging data source and main document, overview of word menu options word basic tool bar.

Unit 3:

MS-Excel Excel Basics: Overview of Excel features, Getting Started, creating a new worksheet, selecting cells, Entering and editing text, entering and editing numbers, entering and editing formulas, Referencing cells, moving cells, copying cells, sorting cell data.

Formatting: Page setup, changing height and width of row & column. Auto format, changing font sizes and attributes, centering text across columns, using boarders buttons and commands, changing colors and shading, hiding rows and columns.

Introduction to Functions: Parts of Functions, Functions requiring add-ins, the function wizard, examples functions by category: Date and Time functions, Engineering Functions, Math and Trig Functions, Statistical Functions, Text Functions.

Excel Charts: Chart parts and technology, instant charts with the chart wizard, creation of different types of charts,printing charts, deleting charts, linking in excel.

Unit 4:

MS-Power Point Power Point Basics: Terminology, Getting Started, Views. Creating Presentations: Using auto content wizard, Using blank presentation option, Using design template option, Adding and deleting slides, Importing image from the outside world, Drawing in power point, Transitions and build effects, Deleting a slide, numbering a slide saving presentation. Closing presentation, printing presentation elements.

TEXT BOOKS:

1. Peter Norton, Introduction to Computers, Sixth Edition, Tata MC Graw Hill (2007)
2. Ran Mansfield. Working in Microsoft Office, Tata MC Graw Hill (2008)

REFERENCE BOOKS :

1. Michael Miller, Absolute Beginner‘s guide to computer Basics, Fourth Edition, Pearson Education (2007)
2. Deborah Morly, Charles S. Parker, understanding computers to day and tomorrow , 11th edition, Thomson
3. Ed Bott, woody Leonhard, using Microsoft Office 2007, Pearson Education (2007)

23001P OBJECT OREINTED PROGRAMMING THROUGH JAVA LABORATORY

YOGI VEMANA UNIVERSITY

1. Programs to illustrate constructors.
2. Programs to illustrate Overloading & Overriding methods in JAVA.
3. Programs Illustrate the Implementation of Various forms of Inheritance. (Ex. Single, Hierarchical, Multilevel inheritance...)
4. Program which illustrates the implementation of multiple Inheritance using interfaces in JAVA.
5. Program to illustrate the implementation of abstract class.
6. Programs to illustrate Exception handling
7. Programs to create packages in Java.
8. Program to Create Multiple Threads in Java.
9. Program to Implement Producer/Consumer problem using synchronization.
10. Program to Write Applets to draw the various polygons.
11. Create and Manipulate Labels, Lists, Text Fields, Text Areas & Panels
12. Handling Mouse Events & Keyboard Events.
13. Using Layout Managers.
14. Create & manipulate the Following Text Areas, Canvas, Scroll bars, Frames, Menus, Dialog Boxes.
15. Programs, which illustrate the manipulation of strings.
    a. Ex. 1. Sorting an array of Strings.
       2. Frequency count of words & Characters in a text.
16. Programs, which illustrate the use of Streams.
17. Java Program that reads on file name from the user and displays the contents of file.
18. Write an applet that displays a simple message.
19. Write an applet that computes the payment of a loan based on the amount of the loan, the interest rate and the number of months. It takes one parameter from the browser: Monthly rate; if true, the interest rate is per month; Otherwise the interest rate is annual.
20. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the + - X % operations. Add a text field to display the result.
21. Write a Java program for handling mouse events.
22. Write a Java program for creating multiple threads
23. Write a Java program that correctly implements producer consumer problem using the concept of inter thread communication.
24. Write a Java program that lets users create Pie charts. Design your own user interface (with AWT)
25. Write a Java program that allows the user to draw lines, rectangles and ovals.
26. Write a Java program that illustrates how run time polymorphism is achieved.

23002P WEB TECHNOLOGIES LABORATORY

YOGI VEMANA UNIVERSITY

1. Create your own Resume using HTML 5 Tags
2. Debug and validate your HTML document (Resume) using W3C validator and fix the issues.
3. Add Styles to your Resume using CSS 3 Properties.
   a. Add External, Internal and Inline CSS styles to know the priority.
   b. Add CSS3 Animation to your profile.
4.
   a. Add functionalities that use any 2 of HTML 5 API‟s.
   b. Create a student Registration form for Job Application and validate the form fields using JavaScript
5.
   a. Create a CGPA Calculator in Web Brower using HTML, CSS and JavaScript. Use functions in JavaScript.
   b. Create a Quiz Program with adaptive questions using JavaScript.
6. Create a Pan Card Validation form using Object Oriented JavaScript, consider the 10th character to be an alphabet.
   a. Get the user‟s First Name, Last Name and other required fields as input
   b. Assume the last digit of the Pan Number to be an alphabet
   c. Validate the PAN Number
7.
   a. Create an online Event Registration form and validate using JQuery
   b. Create an online video Player which will allow you to play videos from the system and also create custom playlist using JQuery.
8. Construct a JSON Structure for a bookstore and validate it using JSON Validator such as http://jsonlint.com/ and parse the Json file to list the books under the category “Fiction”. Use Javascript or JQuery for parsing
9. Using PHP and MySQL, develop a program to accept book information viz. Accession number, title, authors, edition and publisher from a web page and store the information in a database and to search for a book with the title specified by the user and to display the search results with proper headings.
10. Develop a Social Media Web Application using HTML5, CSS3, JQuery, AJAX & PHP.

23003P PYTHON PROGRAMMING LABORATORY

YOGI VEMANA UNIVERSITY

1. Write a program to demonstrate different number data types in Python
2. Write a program to perform different Arithmetic Operations on numbers in Python.
3. Write a program to create, concatenate and print a string and accessing sub-string from a given string.
4. Write a python script to print the current date in the following format “Sun May 29 02:26:23 IST 2017”
5. Write a program to create, append, and remove lists in python.
6. Write a program to demonstrate working with tuples in python.
7. Write a program to demonstrate working with dictionaries in python.
8. Write a python program to find largest of three numbers.
9. Write a Python program to convert temperatures to and from Celsius, Fahrenheit. [Formula: c/5 = f-32/9]
10. Write a Python program to construct the following pattern, using a nested for loop *
11. Write a Python script that prints prime numbers less than 20.
12. Write a python program to find factorial of a number using Recursion.
13. Write a program that accepts the lengths of three sides of a triangle as inputs. The program output should indicate whether or not the triangle is a right triangle (Recall from the Pythagorean Theorem that in a right triangle, the square of one side equals the sum of the squares of the other two sides).
14. Write a python program to define a module to find Fibonacci Numbers and import the module to another program.

33001 PAPER I: DATA MINING AND DATA WAREHOUSING

YOGI VEMANA UNIVERSITY

UNIT I:

Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issues in Data Mining.

Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

UNIT II:

Data Warehouse and OLAP Technology for Data Mining: Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Further Development of Data Cube Technology, From Data Warehousing to Data Mining.

Data Cube Computation and Data Generalization: Efficient Methods for Data Cube Computation, Further Development of Data Cube and OLAP Technology, Attribute-Oriented Induction.

UNIT III:

Classification and Prediction: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification,Classification by Back propagation, Support Vector Machines, Associative Classification, Lazy Learners, Other Classification Methods, Prediction, Accuracy and Error measures, Evaluating the accuracy of a Classifier or a Predictor, Ensemble Methods

UNIT IV:

Cluster Analysis Introduction :Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Clustering High-Dimensional Data, Constraint-Based Cluster Analysis, Outlier Analysis.

Applications and Trends in Data Mining: Data Mining Applications, Data Mining System Products and Research Prototypes, Additional Themes on Data Mining and Social Impacts of Data Mining.

TEXTBOOKS:

1. Data Mining – Concepts and Techniques - Jiawei Han &MichelineKamber, Morgan KaufmannPublishers,Elsevier,2ndEdition,2006.
2. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson education.

REFERENCE BOOKS:

1. Data Mining Techniques-Arun K Pujari,2nd edition, Universities Press.
2. Data Warehousing in the Real World-Sam Aanhory& Dennis Murray Pearson Edn Asia.
3. Insight into Data Mining,K.P.Soman,S.Diwakar,V.Ajay.PHI,2008.
4. Data Warehousing Fundamentals-PaulraiPonnaiah Wiley student Edition.

33002 PAPER II: CLOUD COMPUTING

YOGI VEMANA UNIVERSITY

UNIT-I:

Introduction: Cloud models-Evolution of Cloud Computing –System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture – On-demand Provisioning – Elasticity in Cloud – deployment models – service models-cloud service providers **Virtualization:** Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization -Virtualization Structures - Tools and Mechanisms – resource sharing and resource pooling - Desktop Virtualization – Server Virtualization.

UNIT-II:

Cloud Infrastructure: Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development– Design Challenges - Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources.

UNIT-III:

Programming Model: Parallel and Distributed Programming Paradigms – Map Reduce, Twister and Iterative Map Reduce – Hadoop Library from Apache – Mapping Applications - Programming Support. **Security in the Cloud:** Security Overview – Cloud Security Challenges – Access control mechanisms – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – VirtualMachine Security.

UNIT-IV:

Enterprise Cloud-Based High-Performance Computing (HPC):

Overview of High Performance Computing (HPC) on Cloud-Enterprises HPC applications (High- performance grid computing, high-performance big data computing/analytics, high performance reasoning)-HPC Cloud vendor solutions: compute grids (Windows HPC, Hadoop, Platform Symphony
,Gridgain), data grids (Oracle coherence, IBM Object grid, Cassendra, HBase, Memcached, HPChardware (GPGPU, SSD, Infiniband, Non-blocking switches)

Text Book

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, Distributed and Cloud Computing, FromParallel Processing tothe Internet of Things, 2012, 1st Edition, Morgan Kaufmann Publishers.

Reference Books

1. Katarina Stanoevska-Slabeva, Thomas Wozniak, SantiRistol, Grid and Cloud Computing – A Business Perspective on Technology and Applications, 2010, Springer.
2. John W.Rittinghouse and James F.Ransome, Cloud Computing: Implementation, Management, and Security", 2010, CRC Press.
3. Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing, A Practical Approach, 2009, TMH.
4. George Reese, Cloud Application Architectures: Building Applications and Infrastructure in the Cloud O'Reilly, 2009.

33003 PAPER III: CRYPTOGRAPHY AND NETWORK SECURITY

YOGI VEMANA UNIVERSITY

UNIT 1:

Introduction: Security trends, OSI Security Architecture, Security Attacks, services and mechanisms, Model for Network Security.
Classical techniques: Symmetric Cipher model, Substitution Techniques, Transposition Techniques, Steganography.
Modern techniques: Simplified DES, block cipher principles, data encryption standard, strength of DES, differential and linear crypt analysis, block cipher design principles and modes of operations. Algorithms: Triple DES, international data encryption algorithm, characteristics of advanced symmetric block ciphers.

UNIT 2:

Conventional encryption: Placement of encryption function, traffic confidentially, key distribution.
Public key cryptography: Principles of public key cryptosystems, RSA algorithm, key management,Diffie-Hellmen key exchange.
Message authentication and hash functions: Authentication requirements and functions, MessageAuthentication, Hash functions, security of hash functions and Macs

UNIT 3:

Authentication applications: Kerbores, X.509 directory authentication service. Electronic mail security:Pretty good privacy, S/MIME.

UNIT 4:

System Security: Intruders, Intrusion detection, Password management. Malicious Software: Virus andrelated threats, Virus counter measures. Firewall: Firewall design principles, Trusted systems.

TEXT BOOKS:

1. Cryptography and Network Security: Principles and Practice – William Stallings, Pearson Education.
2. Network Security Essentials (Applications and Standards) by William Stallings, Pearson Education.

REFERENCE BOOKS:

1. Fundamentals of Network Security by Eric Maiwald (Dreamtech Press)
2. Network Security – Private Communication in a Public World by Charlie kaufman, Radia Perlman and Mike Speciner, Pearson/PHI.
3. Introduction to Cryptography, Buchmann, Springer.

33004A ELECTIVE I: DESIGN AND ANALYSIS OF ALGORITHMS

UNIT 1:

Introduction: Algorithm, Pseudo code for expressing algorithms, Performance Analysis-Space complexity, Time complexity, Asymptotic Notation- Big notation, Omega notation, theta notation and Little notation, Probabilistic analysis, Amortized analysis. Disjoint Sets- disjoint set operations, union and find algorithms, spanning trees, connected components and biconnected components.

UNIT 2:

Divide and conquer: General method , applications-Binary search, Quick sort, Merge sort, Strassen‘s matrix multiplication. Greedy method: General method, applications-Job sequencing with deadlines, 0/1 knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

UNIT 3:

Dynamic Programming: General method, applications-Matrix chain multiplication, Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Travelling sales person problem, Reliability design. Backtracking: General method, applications-n-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles.

UNIT 4:

Branch and Bound: General method, applications - Travelling sales person problem,0/1 knapsack problem- LC Branch and Bound solution, FIFO Branch and Bound solution..

TEXT BOOKS :

1. Fundamentals of Computer Algorithms, Ellis Horowitz,SatrajSahni and Rajasekharam,Galgotia publications pvt. Ltd.
2. Algorithm Design: Foundations, Analysis and Internet examples, M.T.Goodrich and R.Tomassia,Johnwiley and sons.

REFERENCES:

1. Introduction to Algorithms, second edition,T.H.Cormen,C.E.Leiserson, R.L.Rivest,andC.Stein,PHIPvt. Ltd./ Pearson Education
2. Introduction to Design and Analysis of Algorithms A strategic approach,R.C.T.Lee, S.S.Tseng, R.C.Chang and T.Tsai, McGraw Hill.
3. Data structures and Algorithm Analysis in C++, Allen Weiss, Second edition, Pearson education.
4. Design and Analysis of algorithms, Aho, Ullman and Hopcroft,Pearson education. 5. Algorithms – Richard Johnson baugh and Marcus Schaefer, Pearson Education.

33004B ELECTIVE I: THEORY OF COMPUTATION

YOGI VEMANA UNIVERSITY

UNIT I:

Introduction to Automata-Strings, Alphabet, Language, Operations, Finite state machine, definitions,finite automaton model, acceptance of strings, and languages, deterministic finite automaton and non- deterministic finite automaton, transition diagrams and Language recognizers.

UNIT II:

Finite Automata- NFA with Ɛ-transitions - Significance, acceptance of languages. Conversions and Equivalence: Equivalence between NFA with and without Ɛ transitions, NFA to DFA conversion, minimization of FSM, equivalence between two FSM's, Finite Automata with output- Moore and Mealy machines, Equivalence between Moore and Mealy.

UNIT III:

Regular Languages-Regular sets, regular expressions, identity rules, Constructing finite Automata for a given regular expressions, Conversion of Finite Automata to Regular expressions. Pumping lemma of regular sets, Closure properties of regular sets (Proofs not required).
Grammars-Regular grammars: Right linear and left linear grammars, Equivalence between regular linear grammar and FA, Inter conversion, Context free grammar, derivation trees, and sentential forms.Right most and leftmost derivation of strings

UNIT IV:

Context Free Grammars: Ambiguity in context free grammars. Minimization of Context Free Grammars. Chomsky Normal Form, Greibach Normal Form, Pumping Lemma for Context Free Languages. Enumeration of properties of CFL (Proofs omitted). **Push down automata**, definition, model, acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. Equivalence of CFL and PDA, Inter conversion. (Proofs not required).

Text Books:

Hopcroft, J D Ullman "Introduction to Automata and Language Theory", 3rd Edition, 2006
C. Papadimitrou and C. L. Lewis. Elements of Theory of Computation, Prentice-Hall, 1981.

Reference Books:

John.C.Martin, "Introduction to Languages and the Theory of Computation" McGraw-Hill Education,01- May-2010.
Kamala Krithivasan, Rama.R, "Introduction to Formal Languages, Automata Theory and Computation",Pearson Education India, 01-Sep-2009

33004C ELECTIVE I: INTERNET OF THINGS

UNIT-I:

Introduction to IoT:

An Overview of Internet of things, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies. M2M Communication, Examples of IoTs, Difference between IoT and M2M, SDN and NFV for IoT. Design Principles for Connected Devices Internet Connectivity Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet.

UNIT-II:

Business Models for Business Processes in the Internet of Things, IoT/M2M systems LAYERS AND designs standardizations, Modified OSI Stack for the IoT/M2M Systems, ETSI M2M domains and High- level capabilities, Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability

UNIT-III:

Design Principles for the Web Connectivity for connected-Devices, Web Communication Protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected Devices. Data Acquiring, Organizing and Analytics in IoT/M2M, Applications /Services
/Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

UNIT-IV:

Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services, Data Collection, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively (Pachube/COSM), Nimbits and other platforms Sensor, Participatory Sensing, Actuator, Radio Frequency Identification, and Wireless, Sensor Network Technology, Sensors Technology, Sensing the World.

Text Books:

1. Internet of Things: Architecture, Design Principles and Applications, Rajkamal, McGraw Hill Higher Education2.Internet of Things, A.Bahgya and V.Madisetti, Univesity Press, 2015

Reference Books:

1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley
2. Getting Started with the Internet of Things CunoPfister ,Oreilly

YOGI VEMANA UNIVERSITY

33004D ELECTIVE I: OBJECT ORIENTED ANALYSIS & DESIGN

UNIT I :

Introduction to UML: Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture, and Software Development Life Cycle.

Basic Structural Modeling: Classes Relationships, Common Mechanisms, and diagrams.

UNIT II:

Advanced Structural Modeling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages.**Class & Object Diagrams:** Terms, concepts, modeling techniques for class & object diagrams

UNIT III : Basic BehavioralModeling: Interactions, Interaction diagrams, Use cases, Use case diagrams, Activity Diagrams.

UNIT IV : Advanced BehavioralModeling- Events and signals, state machines, processes and threads, time and space, state chart diagrams**.Architectural Modeling-**Component, Deployment, Component diagrams and Deployment diagrams and case study.

Text Books:

1. Grady Booch, James Rumbaugh, Ivar Jacobson: *'The Unified Modeling Language User Guide'*, Pearson Education.

Refernce books:

1. Meilir Page-Jones, *'Fundamentals of Object Oriented Design in UML'*, Pearson Education.

AtulKahate, *'Object Oriented Analysis & Design'*, The McGraw-Hill Companies

33005A ELECTIVE II: DATA SCIENCE

YOGI VEMANA UNIVERSITY

UNIT-I

Introduction to Data Science:

Foundation of Data science, Area and Scope of Data Science, Steps of Data Science Process: Data collection, Preprocessing, training, and testing. Use cases in various domain such Image, Natural Language, Audio and Video.

UNIT-II

Introduction to Artificial Intelligence: Introduction Artificial Intelligence, The Foundations of AI, AI Technique, Production system characteristics, Production systems: 8-puzzle problem. Searching: Uniformed search strategies – Breadth first search, depth first search.

UNIT-III

Searching Algorithms and Learning: Local Search Algorithms: Generate and Test, Hill climbing, simulated annealing search, Constraint satisfaction problems, Greedy best first search, A* search, AO* search. Self-Learning: Propositional logic - syntax & semantics Game Playing: Overview, Minimax algorithm, Alpha-Beta pruning, Additional Refinements

UNIT-IV

Introduction to Data Mining and Machine Learning: Introduction to Data Mining and Machine Learning, Supervised, Unsupervised and Reinforcement learning. Prediction vs Classification v/s Clustering. Association Rule Mining, classification and regression techniques, clustering, Scalability and data management issues in data mining algorithms, measures of interestingness

Text Books:

1. Rachel Schutt, Cathy O'Neil, "Doing Data Science: Straight Talk from the Frontiline" by Schroff/O'Reilly, 2013.
2. S. Russell and P. Norvig, Artificial Intelligence A Modern Approach, 2nd Edition. Pearson Education, 2007.
3. John W. Foreman, "Data Smart: Using data Science to Transform Information into Insight" by John Wiley & Sons, 2013
4. Ian Ayres, "Super Crunchers: Why Thinking-by-Numbers Is the New Way to Be Smart" Ist Edition by Bantam, 2007.
5. Eric Seigel, "Predictive Analytics: The Power to Predict who Will Click, Buy, Lie, or Die", 1st Edition, by Wiley, 2013.
6. Matthew A. Russel, "Mining the Social Web: Data mining Facebook, Twitter, Linkedln,Goole+, 7. Ian Witten, Eibe Frank, Chris Pal and Mark Hall Data Mining: Practical Machine Learning Tools and Techniques.

33005B ELECTIVE II: MOBILEAPPLICATION DEVELOPMENT

UNIT I:

J2ME Overview: Java 2 Micro Edition and the World of Java, Introduction to Mobile app Development, Reasons to Build Mobile App, Mobile Application Development Today, Myths of Mobile Application Design. Diving into Mobile: App or Website? Mobile Web Presence

UNIT II :

Android Platform and Development Environment: Intro to Android, Create your First Android App, Layouts, Views and Resources. Text and Scrolling Views.Activities and Intents. Debugging and Testing your App, UserInput Controls, Menus, Screen Navigation, Recycler View, Drawables, Themes and Styles. Material Design

UNIT III:

Async Task and AsyncTaskLoaders, Connecting to the Internet, Broadcast Receivers, Services, Notifications, Alarm Managers, Transferring Data Efficiently. Shared Preferences, SQLite Primer, Store Data using SQLite, Content Providers, Using Loaders to Load and Display Data, Permissions, Performance and Security.

UNIT IV :

Kotlin : Introduction to kotlin, Environment Setup , Architecture, Functions, Classes, Visibility Control, Inheritance and Interfaces, Extensions, Data and Sealed Classes, Delegation, Example to build basic apps usingKotlin.

Text Books

1. Professional Mobile Application Development by Jeff McWherter, Scott Gowell Wiley indiapvt.ltd 2013
2. https://google-developer-training.gitbooks.io/android-developer-fundamentals-course-practicals/content/en/
3. https://developers.google.com/training/courses/android-fundamentals
4. https://kotlinlang.org/docs/tutorials/edu-tools-learner.html

33005C ELECTIVE II: COMPUTER GRAPHICS

UNIT 1:

A survey of computer graphics: computer aided design-presentation graphics-computer art- entertainment-education and training-visualisation-image processing-graphical user interface, overview of graphics systems, output primitives

UNIT 2:

Bresenham technique – Line Drawing and Circle Drawing Algorithms - DDA - Line Clipping - Text Clipping.
Two dimensional transformations – Scaling and Rotations - Interactive Input methods - Polygons– Splines – Bezier Curves - Window view port mapping transformation.

UNIT 3:

3D Concepts - Projections – Parallel Projection - Perspective Projection – Visible Surface Detection Methods - Visualization and polygon rendering – Color models – XYZ-RGB-YIQ-CMY-HSV Models - animation – Key Frame systems - General animation functions - morphing.

UNIT 4:

Multimedia hardware & software - Components of multimedia – Text, Image – Graphics – Audio – Video – Animation – Authoring.
Multimedia communication systems – Data base systems – Synchronization Issues – Presentation requirements – Applications – Video conferencing – Virtual reality – Interactive video – video on demand.

TEXT BOOKS:

1. Hearn D and Baker M.P, "Computer graphics – C Version", 2nd Edition, Pearson Education, 2004.
2. Ralf Steinmetz, Klarasteinmetz, "Multimedia Computing, Communications and Applications", Pearson education, 2004

REFERENCE BOOKS:

1. Siamon J. Gibbs and Dionysios C. Tsichritzis, "Multimedia programming", Addison Wesley, 1995.
2. John Villamil, Casanova and LeonyFernanadez, Eliar, "Multimedia Graphics", PHI, 1998.

33006 Non Core-II INTERNET AND WORLD WIDE WEB

Unit 1:

YOGI VEMANA UNIVERSITY

Telecommunications and Networks: The Telecommunications system, networks, network communication software, network processing strategies, Telecommunication applications The Internet, Intranets and Extranets: What exactly is the Internet?, the evolution of the Internet, the operation of the Internet, services provided by the Internet, the World Wide Web, Internet Challenges, Intranets, Extranets.

Unit2:

Internet Communication Protocols: Internet hosts, Servers and Clients, Port and Port Numbers, Domain Name System and DNS Servers.

Types of Internet Connections: Dial-up Connection, DSL, ISDN, Leased-lines, Cable-TV Internet, SatelliteInternet, Wireless internet Connections, Connecting LAN to the Internet.

Unit3:

Web Browsers: What is a Web Browser, Main functions, Types of Web Browsers, Main Elements of Web Browsers, Browsing the Web, Search Engines Web Directories, Navigating Web Pages, Domain Name System, and Uniform Resource Locator.

Unit4:

Email Concepts: How do you get your email, Email Addressing, Message Headers, Email Netiquette, General Information about attachments, Downloading and Storing Data.

TEXT BOOKS:

1. EFRAIM Turban, R.Kelly Rainer, Richard E.Potter, ―Introduction to Information Technology‖, John Wiley(2008)
2. Margaret Levine Young, Internet: The Complete Reference, Second Edition, McGrawHill/Osborne

REFERENCE BOOKS

1. ITL Education Solutions Ltd., ―Introduction to Information Technology‖, Pearson India(2008).

33003P CRYPTOGRAPHY AND NETWORK SECURITY LABORATORY

1. write a programme to implement Ceaser Cipher.
2. write a programme to implement hill cipher.
3. write a programme to implement Simplified DES.
4. write a programme to implement Double EES
5. write a programme to implement Triple DES.
6. write a programme to implement different Modes of DES.
7. write a programme to implement RSA Algorithms.
8. write a programme to implement Diffie-Hellman Key exchange Algorithm.

43001 PAPER I: ARTIFICAL INTELLIGENCE AND MACHINE LEARNINGUNIT-I:

Introduction to artificial intelligence: Introduction , history, intelligent systems, foundations of AI, applications, tic-tac-tie game playing, development of AI languages, current trends in AI.

Problem solving: state-space search and control strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative-deepening a*, constraint satisfaction

UNIT-II:

Problem reduction and game playing: Introduction, problem reduction, game playing, alpha beta pruning, two-player perfect information games.

Logic concepts: Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, resolution refutation in proportional logic, predicate logic

UNIT-III:

Knowledge representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames.
Expert system and applications: Introduction phases in building expert systems, expert system versus traditional systems, rule-based expert systems blackboard systems truth maintenance systems, application of expert systems, list of shells and tools

UNIT-IV:

Machine learning paradigms: Introduction, machine learning systems, supervised and Unsupervised learnings, inductive learning, deductive learning, clustering, support vector machines, case based reasoning and learning.
Artificial neural networks: Introduction, artificial networks, single layer feed forward networks, multi layered forward networks, design issues of artificial neural networks.

Text Books:

1. Artificial Intelligence- Saroj Kaushik, CENGAGE Learning,
2. Artificial intelligence, A modern Approach, 2nd ed, Stuart Russel, Peter Norvig, PEA
3. Artificial Intelligence- 3rd ed, Rich, Kevin Knight, Shiv Shankar B Nair, TMH
4. Introduction to Artificial Intelligence, Patterson, PHI

Reference Books:

1. Artificial intelligence, structures and Strategies for Complex problem solving, 5th ed, George F Lugar, PEA
2. Introduction to Artificial Intelligence, Ertel, Wolf Gang, Springer
3. Artificial Intelligence, A new Synthesis, Nils J Nilsson, Elsevier

43002A ELECTIVE III: DIGITAL IMAGE PROCESSING

UNIT 1:

INTRODUCTION: What is Digital Image Processing, the origins of Digital Image Processing, Examples of Fields that use Digital Image Processing, Fundamentals steps in Digital Image Processing, Components of an Image Processing System

DIGITAL IMAGE FUNDAMENTALS: Elements of Visual Perception, Light & Electromagnetic spectrum, Image sensing and acquisition, Image sampling & quantization, some basic relationships between pixels, Linear and nonlinear operations.

UNIT2:

IMAGE ENHANCEMENT IN THE SPATIAL DOMAIN: Background, some gray level transformations, histogram processing, enhancement using arithmetic/logic operations, basics of spatialfiltering, smoothing spatial filters, sharpening spatial filters, combining spatial enhancement methods IMAGE ENHANCEMENT IN THE FREQUENCY DOMAIN: Background, Introduction to fouriertransform and frequency domain, smoothing frequency domain filters, sharpening frequency domainfilters, homomorphism filtering, implementation.

UNIT 3:

IMAGE RESTORATION: A model of the image degradation, restoration process, noise models, restoration in the presence of noise only spatial filtering, periodic noise reduction by frequency domain filtering, Linear, position invariant degradation, Estimating the degradation function, inverse filtering, minimum mean square error filtering, constrained least squares filtering, geometric mean filter, geometrictransformation

UNIT 4:

IMAGE COMPRESSION: Fundamentals, image compression models, elements of information theory,error free compression, lossy compression, image compression standards

TEXT BOOKS:

1. Digital Image Processing by Rafael C. Gonzalez & Richard E. Woods, Second Edition, Pearson Education.

REFERENCE BOOKS:

1. Image Processing, Analysis, and Machine Vision, Milan Sonka, Vaclav Hlavac and Roger Boyle, Second Edition, Thomson Learning.
2. Digital Image Processing by S Jayaraman, S Esakkirajan, T VeeraKumar (Tata McGraw Hill Education Pvt Ltd)
3. Computer Vision and Image Processing, Adrian Low, Second Edition, B.S.Publications
4. Digital Image Processing using Matlab, RafealC.Gonzalez, Richard E.Woods, Steven L. Eddins, Pearson Education.
5. Digital Image Processing, William K. Prat, Wily Third Edition
6. Digital Image Processing and Analysis, B. Chanda, D. DattaMajumder, Prentice Hall of India.

43002B ELECTIVE III:ETHICAL HACKING

Unit I

Introduction to hacking: what is hacking, pros and cons of hacking, types of hacking, types of hackers, hacker vs. cracker, why hackers hack, prevention from hacker and steps performed by hacker.

Ethical Hacking: Introduction to Ethical Hacking, What you can do Legally, What you cannot do Legally.

UNIT II:

Email hacking: what is cybercrime, types of cybercrimes**,** how email works, email service protocols ,email spoofing, email spamming, email fishing, prevention from phishing, email tracing

Network and computer attacks: Malicious software, Protecting against malware attacks, Intruder attacks on networks and computers, Addressing physical security, hardware Key loggers and software key logger
and behind locked doors.

UNIT III:

Footprints and Social Engineering: Using Web tools for Foot printing, Conducting Competitive Intelligence, Using Domain Name System Transfers, Introduction to Social Engineering.

Port Scanning: Introduction to Port Scanning, Types of Port Scans, Using Port Scanning tools, Conducting Ping Sweeps.

UNIT IV:

Desktop and OS Vulnerabilities: Windows OS Vulnerabilities, Tools for identifying vulnerabilities in Windows. Best practices for hardening Windows Systems, Linux OS Vulnerabilities

Hacking Web Servers: Understanding Web Applications, Understanding Web Application Vulnerabilities, Application Vulnerabilities and Countermeasures, Tools for Web attackers and Security testers, Web tools.

UNIT V:

Hacking Wireless Networks: Understanding Wireless Technologies, Components of Wireless Networks, Understanding Wireless Network standards, Understanding Authentication, Understanding Wireless Hacking.

Network Protection Systems: Understanding Routers, Understanding Firewalls, Understanding Intrusion Detection and Prevention Systems, Understanding Honey pots.

Text Book(s):

[1]. Michael T. Simpson, Kent Backman, James E. Corley, “Hands -On Ethical Hacking and Network Defense”, Second Edition, Cengage Learning, 2012.

[2]. hacking for beginners by Manthan desai

Reference Books:

[1]. Steven DeFino, Barry Kaufman, Nick Valenteen, “Official Certified Ethical Hacker Review Guide”, Cengage Learning, 2009.

[2]. Patrick Engebretson, “The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy”, Syngress Basics Series – Elsevier, 2011.

[3]. Whitaker & Newman, “Penetration Testing and Network Defense”, Cisco Press, Indianapolis, 2006.

[4].https://www.youtube.com/watch?v=7nF2BAfWUEg Complete Free Hacking Course: Go from Beginner to Expert Hacker Today!

[5].https://www.youtube.com/watch?v=t2mRNxfHTjw&list=PL7134FC0815ADB8EB TRAINSIGNAL

[6].https://www.youtube.com/watch?v=O1eNQqgEevQ Ethical Hacking - Password Cracking Demo

43002C ELECTIVE III: BIG DATA ANALYTICS

YOGI VEMANA UNIVERSITY

UNIT 1:

Introduction to Big Data: Big Data-definition, Characteristics of Big Data (Volume, Variety, Velocity),Data in the Warehouse and Data in Hadoop, why is Big Data Important? Patterns for Big Data Development

UNIT 2:

Introduction to Hadoop: Hadoop- definition, understanding distributed systems and Hadoop, Comparing SQL databases and Hadoop, Understanding MapReduce, counting words with Hadoop- running your first program, History of Hadoop, Starting Hadoop - The building blocks of Hadoop, NameNode, DataNode, Secondary NameNode, JobTracker and Task Tracker, MapReduce -A Weather Dataset, Analyzing the Data with Unix Tools, Analyzing the Data with Hadoop, Scaling Out, Hadoop Streaming, Hadoop Pipes.

UNIT 3:

HDFS: Components of Hadoop -Working with files in HDFS, Anatomy of a MapReduce program, Reading and writing
The Hadoop Distributed Filesystem -The Design of HDFS, HDFS Concepts, The Command-Line Interface, HadoopFilesystem, The Java Interface, Data Flow, Parallel Copying with distcp, Hadoop Archives

UNIT 4:

MapReduce Advanced Programming: Writing basic MapReduce programs - Getting the patent data set, constructing the basic template of a MapReduce program, Counting things, Adapting for Hadoop‘s API changes, Streaming in Hadoop, Improving performance with combiners, Advanced MapReduce – Chaining MapReduce jobs, joining data from different sources, creating a Bloom filter

TEXT BOOKS:

1. Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch ,—Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data‖, 1st Edition, TMH,2012.
2. Hadoop: The Definitive Guide by Tom White, 3rd Edition, O‘reilly
3. Hadoop in Action by Chuck Lam, MANNING Publ.
4. Hadoop in Practice by Alex Holmes, MANNING Publ.

REFERENCE BOOKS:

1. Data Divination: Big Data Strategies, 1st Edition, Pam Baker, Bob Gourley, Cengage

43002D ELECTIVE III: COMPLIER CONSTRUCTION

YOGI VEMANA UNIVERSITY

Unit I:

Introduction to Compilers -Introduction to compilers, Phases of compiler, Lexical Analyzer, The role of the lexical analyzer, input buffering, specification of tokens, Recognition of tokens.

Unit II: Syntax Analysis -I - Role of the parser, writing grammars and context free grammars, Top down parsing, Brute-force approach, Recursive descent parsing, Predictive parsing, FIRST and FOLLOW constructs.
Syntax Analysis -II - Bottom-up parsing, shift-reduce parsing, operator precedence parsing, LR parsers, SLR parser, canonical LR parser, LALR parser.

Unit III:

Semantic Analysis - Syntax directed translations, applications of syntax directed translations, Syntax directed definitions, construction of syntax tree, Bottom-up evaluation of S-attributed definitions, L- attributed definitions.

Unit IV

Intermediate Code Generation and Code Optimization -Intermediate languages, Declarations, Assignment statements, Boolean Expressions, case statements, back patching, Procedure calls, Principal sources of optimization, optimization of basic blocks, DAG representation of basic blocks, flow graphs.

Text book:

1. Alfred V Aho, Monica S Lam, Ravi Sethi, Jeffrey D Ullman, *"Compilers: Principles Techniques & Tools"*, Pearson Education,2nd Edition 2013.

Reference Books:

1. Kenneth C Louden, *"Compiler Construction: Principles and Practice*", Cengage Learning. Lex&Yacc, John R Levine, Oreilly Publishers.
2. Keith D Cooper & Linda Tarezon, *"Engineering a Compiler*", Morgan Kafman, Second edition. Lex&Yacc, John R Levine, Tony Mason, Doug Brown, Shroff Publishers.
3. Muchnik, "*Advanced Compiler Design and Implementation*", Kauffman(1998)

43003A ELECTIVE IV: HUMAN COMPUTER INTERACTION

UNIT1:

Introduction: Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design, The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics-Principles of user interface.

UNIT 2:

Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions.

UNIT 3:

Screen Designing: - Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.

UNIT 4:

Windows – New and Navigation schemes selection of window, selection of devices based and screen- based controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.

TEXT BOOKS:

1. The essential guide to user interface design, Wilbert O Galitz, Wiley DreamTech.
2. Designing the user interface. 3rd Edition Ben Shneidermann , Pearson Education Asia

REFERENCE BOOKS:

1. Human – Computer Interaction. Alan Dix, Janet Fincay, GreGoryd, Abowd, Russell Bealg, Pearson Education
2. User Interface Design, SorenLauesen , Pearson Education.

YOGI VEMANA UNIVERSITY

Unit 1

Artificial Neural network: Introduction and Fundamentals of Artificial Neural Networks, Characteristics of Artificial Neural Networks, History and development in Neural Networks, Biological prototype, Single layer neural networks, Multi layer neural networks, Recurrent Network, Feed Forward Network, Distinguish b/w Feed Forward and Recurrent Network. Training of ANN, Hebb's law, Hopfield law, Generalised Delta rule.

Unit 2

Perceprons: Introduction, representation, perceptions training algoroithm, disadvantages of PLA, XOR problem, **Back propagation:** Training algorithm, stabilization, Counter Propagation networks: FullCPN and applications.

Unit-3

Kohonen Self organizing networks: introduction ,Kohonen algorithm, neighborhood, LVM, Weight training, Grossberg layer and its traning.

Unit-4

Hopfield Network: introduction, Hopfield model, network algorithm, applications of Hopfield networks, Associative memory, bidirectional Associative memory. **Adaptive resonance theory (ART):** Introduction, ART Architecture, algorithm. Applications of pattern and Image processing.and applications

Books:

1. B. Yegnanarayana - Artificial neural network PHI Publication.

2. S. Raj sekaran, VijayalakshmiPari - Neural networks, Fuzzy logic and Genetic Algorithms

3. Kevin L. Priddy, Paul E. Keller – Artificial neural networks: An Introduction - SPIE Press, 2005

4. Mohammad H. Hassoun – Fundamentals of artificial neural networks - MIT Press ,1995

5. Nelson Morgan – Artificial neural network: Electronic Implementations – IEEE Press, 1990 6. Journal of Artificial neural networks, Volume 1 – Ablex Publishing corporation , 1994

43003C ELECTIVE IV: BLOCKCHAIN TECHNOLOGY

YOGI VEMANA UNIVERSITY

UnitI:Basics:

Distributed Database, Two General Problem, Byzantine General problem and Fault Tolerance,Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete.

•Cryptography:Hashfunction,DigitalSignature-ECDSA,MemoryHardAlgorithm,ZeroKnowledge Proof.

UnitII:Blockchain:

Introduction, Advantage over conventional distributed database, Blockchain Network,MiningMechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee,Anonymity,Reward,ChainPolicy,LifeofBlockchainapplication,Soft&HardFork,PrivateandPublicblockchain.

UnitIII:DistributedConsensus:

Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level,SybilAttack,Energyutilizationandalternate.

UnitIV:CryptocurrencyRegulation

History,DistributedLedger,Bitcoinprotocols-Miningstrategyandrewards,Ethereum-Construction,DAO, SmartContract, GHOST,Vulnerability,Attacks, Sidechain, Namecoin.
Stakeholders,RootsofBitcoin,LegalAspects-CryptocurrencyExchange,BlackMarketandGlobalEconomy.Applications:InternetofThings,MedicalRecordManagementSystem,DomainNameServiceandfutureofBlockchain.

TextBook

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder,BitcoinandCryptocurrencyTechnologies:AComprehensiveIntroduction,PrincetonUniversityPress (July19,2016).

ReferenceBooks

1. Antonopoulos,MasteringBitcoin:UnlockingDigitalCryptocurrencies
2. SatoshiNakamoto,Bitcoin:APeer-to-PeerElectronicCashSystem
3. DR.GavinWood,"ETHEREUM:ASecureDecentralizedTransactionLedger,"Yellowpaper.2014.
4. **NicolaAtzei,MassimoBartoletti,andTizianaCimoli,Asurvey of attacksonEthereumsmartcontracts**

516005

(A State University Established by the Govt. of A.P)

YOGI VEMANA UNIVERSITY

Accredited with 'B' Grade by NAAC

DEPARTMENT OF COMPUTER SCIENCE AND TECHNOLOGY

TWO YEAR (4-SEMESTER) Master of Computer Science

To come into effect from the academic Year 2021-22

COURSE STRUCTURE AND DETAILED SYLLABI

CourseCode	TitleoftheCourse	No. of Credits	Credit Hours/Week		MaximumMarks		
			Theory	Practical/Project	Internal Marks	Semester end exams Marks	Total
FIRSTSEMESTER							
CS15091	Unix and NetworkProgramming	04	04		25	75	100
CS15092	Database Management System	04	04		25	75	100
CS15093	Operating System	04	04		25	75	100
Internal Elective							
CS15094A	Web Design using PHP	04	04		25	75	100
CS15094B	E-Commerce	04	04		25	75	100
CS15094C	Theory of computation	04	04		25	75	100
CS15095	Unix and Network Programming Practical	04	--	16(8x2=16)	--	100	100
CS15096	Database Management System and PHP Practical	04	--	16(8x2=16)	--	100	100
	Tutorials and Seminars	--	04	--	--	--	--
Total		**24**	**28**	**32**	**100**	**500**	**600**
SECONDSEMESTER							
CS25091	Object Oriented Programming through JAVA	04	04		25	75	100
CS25092	Software Engineering	04	04		25	75	100
CS25093	Computer Networks	04	04		25	75	100
Open Elective							
CS25094A	Green IT	04	04		25	75	100
CS25094B	Professional Ethics	04	04		25	75	100
CS25094C	Open Elective (SWAYAM /MOOCs/NPTEL)	04	--		25	75	100
CS25095	Object Oriented Programming through JAVA Practical	04	--	16(8x2=16)	--	100	100
CS25096	Software Engineeringand Computer Networks Practical	04	--	16 (8x2=16)	--	100	100
	Tutorials and Seminars	--	04	--	--	--	--
Total		**24**	**24**	**32**	**100**	**500**	**600**

THIRDSEMESTER							
CS35091	Python Programming	04	04		25	75	100
CS35092	Big Data Analytics	04	04		25	75	100
CS35093	Cryptography and Network Security	04	04		25	75	100
Open Elective							
CS35094A	Computer Ethics	04	04		25	75	100
CS35094B	Ethical Hacking	04	04		25	75	100
CS35094C	Management Information System	04	04		25	75	100
CS35095	Python Programming Practical	04	--	16(8x2=16)	--	100	100
Skill Oriented Course							
CS35096	Data Visualization Tools	04	04		10	40	50
				8 (4x2=8)		50	50
	Tutorial s and Seminars	--	04	--	--	--	--
Total		**24**	**32**	**24**	**110**	**490**	**600**
FOURTHSEMESTER							
CS45091	Cloud Computing	04	04		25	75	100
CS45092	Machine Learning	04	04		25	75	100
CS45093	Internet of Things	04	04		25	75	100
Internal Elective							
CS45094A	Design and Analysis of Algorithms	04	04		25	75	100
CS45094B	Software Project Management	04	04		25	75	100
CS45094C	Compiler Construction	04	04		25	75	100
CS45095	Cloud Computing Practical	04	--	16 (8x2=16)			
CS45096	Project Work	04	--	-	--	100	100
	Multi Disciplinary	04	--	16(8x2=16)	--	100	100
	Tutorials and Seminars	--	04	--	--	--	--
Total		**24**	**28**	**32**	**100**	**500**	**600**
GrandTotal		***96***	***116***	***120***	***400***	***2000***	***2400***

- All core papers are mandatory.
- Internal Elective (IE) – Choose one paper each. Open Elective (OE) are for the students of other departments in the varsity.
- Skill oriented course is mandatory. Relevant society along with practical (10 marks internal, 40 final theory and 50 for practical's).
- Interested students may register for Swayam /MOOCs/NPTEL with approval of the concerned DDC for the award of the grade as 'Open elective'
- Project Work or Choose one from Multi Disciplinary (circle formation with other subjects / dept. of Arts / Commerce) course.

CS15091 UNIX PROGRAMMING

YOGI VEMANA UNIVERSITY

COURSE OBJECTIVES:

- To Identify practice different Unix utilities and commands and working with Bourne shell and commands, shell script.
- To Identify and practice utilities to create and manage simple file processing operations, organize directories.
- To understand concepts of Unix process, threads and signals.
- To study about the Interprocess communication and other concepts related to it.

COURSE OUTCOME:

- Ability to learn and implement Unix commands and shell script.
- Ability to learn and implement Unix file structure commands.
- Understand concepts like Unix process, threads and signals
- Understand the importance of Interprocess communication with respect to Unix operating system and its role.

UNIT-I

Unix Utilities-Introduction to Unix file system, vi editor, file handling utilities, security by file permissions, process utilities, disk utilities, networking commands, cp, mv, ln, rm, unlink, mkdir, rmdir, du, df, mount, umount, find, unmask, ulimit, ps, who, w, finger, arp, ftp, telnet, rlogin, text processing utilities and backup utilities, detailed commands to be covered are cat, tail, head, sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, pg, comm, cmp, diff, tr, awk, tar, cpio.

Problem solving approaches in Unix: Using single commands, using compound Commands, shell scripts, C programs, building own command library of programs. Working with the Bourne shell: what is a shell, shell responsibilities, pipes and input Redirection, output redirection, here documents, the shell as a programming language, shell meta characters, shell variables, shell commands, the environment, control structures, shell script examples.

UNIT-II

Unix Files: Unix file structure, directories, files and devices, System calls, library functions, low level file access, usage of open, creat, read, write, close, lseek, stat, fstat, octl, umask, dup, dup2. the standard i/o (fopen, fclose, fflush, fseek, fgetc, getc, getchar, fputc, putc, putchar,fgets, gets), formatted I/O, stream errors, streams and file descriptors, file and directory maintenance (chmod, chown, unlink, link, symlink, mkdir, rmdir, chdir, getcwd), Directory handling system calls (opendir, readdir, closedir,rewinddir, seekdir, telldir)

UNIT-III

Unix Process, Threads and Signals: What is process, process structure, starting new process, waiting for a process, zombie process, process control, process identifiers, system call interface for process management-fork, vfork, exit, wait, waitpid, exec, system,

Threads-Thread creation, waiting for a thread to terminate, thread synchronization, condition variables, canceling a thread, threads vs. processes, Signals- Signal functions, unreliable signals, interrupted system calls, kill and raise functions, alarm, pause functions, abort, sleep functions.

UNIT-1V

Interprocess Communication Overview: Introduction to IPC, IPC between processes on a single computer system, IPC between processes on different systems, file and record locking, other Unix locking techniques, pipes, FIFOs, streams and messages, namespaces, introduction to three types of IPC (system-V)-message queues, semaphores and shared memory.

Message Queues-Unix system-V messages, Unix kernel support for messages, Unix APIs for messages, client/server example.

Semaphores-Unix system-V semaphores, Unix kernel support for semaphores, Unix APIs for semaphores, file locking with semaphores.

Text Books:

1. Unix Network Programming, W.R.Stevens Pearson/PHI.
2. Unix Concepts and Applications, 3rd Edition, Sumitabha Das, TMH.
3. Advanced Unix Programming, 2nd Edition, M.J.Rochkind, Pearson Education.

Reference Books:

1. Unix system programming using C++, T.Chan, PHI.
2. Unix programming environment, Kernighan and Pike, PHI. / Pearson Education
3. Unix for programmers and users, 3rd Edition, Graham Glass, King Ables, Pearson Education
4. Unix and Shell programming, B.A.Forouzan and R.F.Gilberg, Thomson

CS15092 DATA BASE MANAGEMENT SYSTEM

YOGI VEMANA UNIVERSITY

COURSE OBJECTIVES:

- To understand the fundamentals of data models and conceptualize and depict a database system using ER diagram.
- To make a study of SQL and relational database design.
- To know about data storage techniques an query processing.
- To impart knowledge in transaction processing, concurrency control techniques and recovery procedures.

COURSE OUTCOME:

- Understand basic concepts of database and data models
- Learn to design database using ER diagrams and map ER into relations and normalize relations.
- Acquire knowledge on query writing and evaluation.
- Acquire knowledge about different kinds of database.

UNIT I

Database System Concepts and Architecture: Database Systems vs. File Systems- -Data Models, Schemas, and Instances; Three-Schema Architecture and Data Independence;Database Languages and Interfaces; Centralized and Client/Server Architectures for DBMS.

Data Modeling: Entity-Relationship Diagram, Relational Model - Constraints, Languages, Design, and Programming, Relational Database Schemas, Update Operations and Dealingwith Constraint Violations;

UNIT II

SQL: Data Definition and Data Types; Constraints, Queries, Insert, Delete, and Update Statements; Clauses, Views, Stored Procedures and Functions; Database Triggers, SQL Injection.
Normalization for Relational Databases: Relational Algebra and Relational Calculus; Codd Rules: Functional Dependencies and Normalization; Algorithms for Query Processing and Optimization;

UNIT III

Transaction Management: Transaction Processing, Concurrency Control Techniques, Database Recovery Techniques, Object and Object-Relational Databases; Database Security and Authorization.

UNIT IV

Enhanced Data Models: Temporal Database Concepts, Multimedia Databases, Deductive Databases, XML and Internet Databases; Mobile Databases, Geographic Information Systems, Genome Data Management, Distributed Databases and Client-Server Architectures.

TEXT BOOKS

1. Abraham Silberschatz, HentryF.Korth and S.Sudharssan,"Database System Concepts", 4th Edition, Tata McGraw Hill, 2002.
2. Raghu Ramakrishnan&Johannesgerhrke, "Data Base Management Systems", Mc Graw Hill International Edition, 2000.

CS15093 OPERATING SYSTEMS

YOGI VEMANA UNIVERSITY

COURSE OBJECTIVES:

- To knowthe evolution and fundamental principles of operating system, processes and their communication
- To understand the various operating system components like process management, memory management
- To know about file management and the distributed file system concepts in operating systems

COURSE OUTCOME:

- Understand the operating system components and its services
- Implement the algorithms in process management and solving the issues of IPC
- Understand the concepts of physical memory and virtual memory
- Understand file handling concepts in OS perspective

UNIT I

Operating System: Basic elements of computers, instruction execution, operating system objectives and functions. Evaluation of operating systems, System components, Operating- System services, System Calls, Virtual Machines.

Process and Threads: Process concepts and scheduling, Operation on processes, Cooperating Processes, Threads, and Interposes Communication

UNIT II

Concurrency: principles of concurrency mutual exclusion, The Critical Section Problem, Critical Regions, semaphores, monitors, message passing, Readers/Writers Problems

Deadlocks: System Model, Dead locks Characterization, Methods for Handling Dead locks Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock.

UNIT III

Memory Management: Requirements of main memory, Partitioning, Placement Algorithms, Page replacement algorithms, Logical versus Physical Address Space.

Virtual Memory: Real address & Virtual address, Thrashing, Paging, Virtual address, Page table entry, Address translation in paging Swapping, Translation lookaside buffer, Segmentation, Virtual address, Segment table entry, Address translation in segmentation, Combined paging and segmentation. Contiguous Allocation, Paging, Segmentation, Segmentation with Paging. Demand Paging and prepaging.

UNIT IV

I/O management and Disk Scheduling: I/O Devices, Organization of I/O Functions, I/O Buffering, Disk Scheduling, Disk Cache

File System Interface and Implementation: Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management, Directory Management, Directory Implementation, Efficiency and Performance.

TEXT BOOKS:

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.
2. Operating Systems – Internals and Design Principles Stallings, Fifth Edition–2005, Pearson Education/PHI.

Reference books:

1. Operating System A Design Approach-Crowley,TMH.

2. Modern Operating Systems, Andrew S Tanenbaum 2nd edition Pearson/PHI
3. Operating Systems, Dhamdhere, TMH

CS15094A **Web Design using PHP**

YOGI VEMANA UNIVERSITY

COURSE OBJECTIVES:

• To understand the concepts and architecture of the World Wide Web. •
•To understand and practice markup languages

• To understand concepts of JavaScript and DHTML
• To understand and practice web development using PHP.
•To understand different functions in PHP and forms

COURSE OUTCOME:

• Create a basic website using HTML and Cascading Style Sheets.
• Design and implement dynamic web page with validation using JavaScript objects and by applying different event handling mechanisms.
• Design and implement simple web page in PHP, and to present data in XML format.
• Design and implement forms using PHP

UNIT I

Introduction to web: Introduction, WWW architecture, Fundamentals of HTML, Text formatting tags, marquee, inserting images, Basic tags

HTML: Basic HTML, Document body, Text, Hyper links, adding more formatting, Lists, Tables using images. More HTML: Multimedia objects, Frames, Forms towards interactive, HTML document heading detail.

Cascading Style Sheets: Introduction, using Styles, simple examples, your own styles, properties and values in styles, style sheet, formatting blocks of information, layers.

UNIT II

Introduction to JavaScript: What is DHTML, JavaScript, basics, variables, string manipulations, mathematical functions, statements, operators, arrays, functions. Objects in JavaScript: Data and objectsin JavaScript, regular expressions, exception handling.

DHTML with JavaScript: Data validation, opening a new window, messages and confirmations, the status bar, different frames, rollover buttons, moving images.

UNIT III

Building blocks of PHP: Variables, Data Types, Operators and Expressions, Constants.Flow Control Functions in PHP: Switching Flow, Loops, Code Blocks and Browser Output. Working with Functions: Defining Functions, Calling functions, returning the values from User- Defined Functions, Variable Scope, Saving State between Function calls with the Static statement, more about arguments.

Working with Arrays: Arrays, Creating Arrays, Some Array-Related Functions. Working with Objects: Creating Objects, Object Instance.

UNIT IV

YOGI VEMANA UNIVERSITY

PHP functions:PHP functions, PHP form, passing information between pages, Working with Strings, Dates and Time: Formatting Strings with PHP, Investigating Strings with PHP, Manipulating Strings with PHP, Using Date and Time Functions in PHP.

Working with Forms: Creating Forms, Accessing Form - Input with User defined Arrays, Combining HTML and PHP code on a single Page, Using Hidden Fields to save state, Redirecting the user, Sending Mail on Form Submission, Working with File Uploads

Text Book

Learning PHP, MySQL & JavaScript: with jQuery, CSS & HTML5 by Robin Nixon

The Joy of PHP: A Beginner's Guide to Programming Interactive web applications with PHP and MySQL by Alan Forbes

CS15094B E-COMMERCE

YOGI VEMANA UNIVERSITY

COURSE OBJECTIVES:

- To learn about information systems for business and management.
- To understand organizational and managerial foundations of systems.
- To identity different internet resources for commerce.

COURSE OUTCOME:

- Understand the basic concepts and technologies used in the field of management information systems;
- Understand different types of management information systems;
- Understand the processes of developing and implementing information systems;
- Be aware of the ethical, social, and security issues of information systems

UNIT I

Electronic Commerce Environment and Opportunities: Background, The Electronic Commerce Environment, Electronic Marketplace Technologies. Modes of Electronic Commerce: Electronic Data Interchange, Migration to Open EDI, Electronic Commerce with www/Internet, Commerce Net Advocacy, web Commerce Going Forward. Approaches to Safe Electronic Commerce: Secure Transport Protocols, Secure Transactions, Secure Electronic Payment Protocol (SEPP), Secure Electronic Transaction (SET), Certificates for authentication Security on web Servers andEnterprise Networks.

UNIT II

Electronic Cash and Electronic Payment Schemes: Internet Monetary Payment & Security Requirements. Payment and Purchase Order Process, On-line Electronic cash. Internet/Intranet Security Issues and Solutions: The need for Computer Security, Specific Intruder Approaches, Security Strategies, Security Tools, Encryption, Enterprise Networking and Access to the Internet, Antivirus Programs, Security Teams.

UNIT III

Master Card/Visa Secure Electronic Transaction: Introduction, Business Requirements, Concepts, payment Processing. E-Mail and Secure E-mail Technologies for Electronic Commerce: Introduction, The Means of Distribution, A model for Message Handling, E-mail working, Multipurpose Internet Mail Extensions, Message Object Security Services, Comparisons of Security Methods, MIME and Related Facilities for EDI over the Internet.

UNIT IV

Internet Resources for Commerce: Introduction, Technologies for web Servers, Internet Tools Relevant to Commerce, Internet Applications for Commerce, Internet Charges, Internet Access and Architecture, Searching the Internet. Advertising on Internet: Issues and Technologies. Introduction, Advertising on the Web, Marketing creating web site, Electronic Publishing Issues, Approaches and Technologies: EP and web based EP.

Text Book

Web Commerce Technology Handbook, by Daniel Minoli, Emma Minoli, McGraw-Hill

Reference Books:

E-Commerce – Strategy, Technology and Applications By David Whiteley (McGraw Hill)

CS15094C THEORY OF COMPUTATION

YOGI VEMANA UNIVERSITY

COURSE OBJECTIVES:

- To understand formal definitions of machine models.
- To classify machines by their power to recognize languages.
- To understanding of formal grammars, analysis.
- To understanding of hierarchical organization of problems depending on their complexity.
- To understanding of the logical limits to computational capacity.

COURSE OUTCOME:

- Learn basic methods and conclusions of the Theory of Computation.
- Learn how to apply these methods to problems from different fields
- Guided by the results in searching for computational solutions to the problems.

UNIT I:

Introduction to Automata-Strings, Alphabet, Language, Operations, Finite state machine, definitions, finite automaton model, acceptance of strings, and languages, deterministic finite automaton and non-deterministic finite automaton, transition diagrams and Language recognizers.

UNIT II:

Finite Automata- NFA with Ɛ-transitions - Significance, acceptance of languages. Conversions and Equivalence: Equivalence between NFA with and without Ɛ transitions, NFA to DFA conversion, minimization of FSM, equivalence between two FSM's, Finite Automata with output- Moore and Mealy machines, Equivalence between Moore and Mealy.

UNIT III:

Regular Languages-Regular sets, regular expressions, identity rules, Constructing finite Automata for a given regular expressions, Conversion of Finite Automata to Regular expressions. Pumping lemma of regular sets, Closure properties of regular sets (Proofs not required).

Grammars-Regular grammars: Right linear and left linear grammars, Equivalence between regular linear grammar and FA, Inter conversion, Context free grammar, derivation trees, and sentential forms. Right most and leftmost derivation of strings

UNIT IV:

Context Free Grammars: Ambiguity in context free grammars. Minimization of Context Free Grammars. Chomsky Normal Form, Greibach Normal Form, Pumping Lemma for Context Free Languages. Enumeration of properties of CFL (Proofs omitted). **Push down automata**, definition, model, acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. Equivalence of CFL and PDA, Inter conversion. (Proofs not required).

Text Books:

Hopcroft, J D Ullman "Introduction to Automata and Language Theory", 3rd Edition, 2006
C. Papadimitrou and C. L. Lewis. Elements of Theory of Computation, Prentice-Hall, 1981.

Reference Books:

John.C.Martin, "Introduction to Languages and the Theory of Computation" McGraw-HillEducation, 01- May-2010.
Kamala Krithivasan, Rama.R, "Introduction to Formal Languages, Automata Theory andComputation", Pearson Education India, 01-Sep-2009

CS25091 OBJECT ORIENTED PROGRAMMING

YOGI VEMANA UNIVERSITY

COURSE OBJECTIVES:

• To understand Object Oriented Programming concepts, class hierarchy, characteristics of Java, inheritance and polymorphism and become familiar with the relationship between classes and objects in a Java program
• To understand OOPs concepts like Inheritance and become familiar with interaces and pakages
• To understand OOPs concepts for programming like Exception handling and multithreading
• To write efficient applications in Java, Java's event handling model, graphical user interface (GUI), swing component set, understand the relationship between the AWT and Swing.

COURSE OUTCOME:

•Learn and implement programming skills in Java. Java language elements and characteristics, including data types, operators, and control structures.
• Make use of hierarchy of Java classes to provide a solution to a given set of requirements found in the Java API.
•Learn to develop internet-based applications, graphical user interface (GUI),

UNIT1

Introduction: What is Java, History of Java, Features of Java, C++ vs Java, Hello Java Program,Java Virtual Machine, Java Variables, Java Data Types, Unicode System, Operators, Keywords Control Statements: Java Control Statements: If-else, Switch, For Loop, While Loop, Do WhileLoop, Break, continue, Java Object Class:Naming Convention, Object and Class, Method,Constructor, static keyword, this keyword, garbage collection, Method Overloading, MethodOverriding, super keyword, Instance Initializer block, final keyword, Runtime Polymorphism,Dynamic Binding, instanceof operator.

UNIT 2:

Inheritance –Inheritance concept, benefits of inheritance, Super classes and Sub classes,Member access rules, Inheritance hierarchies, super uses, preventing inheritance: final classes and methods, casting, polymorphism- dynamic binding, method overriding, abstract classes and methods, the Object class and its methods.
Interfaces –Interfaces vs. Abstract classes, defining an interface, implementing interfaces,accessing implementations through interface references, extending interface.
Packages-Defining, Creating and Accessing a Package, Understanding CLASSPATH, importingpackages.

UNIT 3:

Exception handling –Dealing with errors, benefits of exception handling, the classification ofexceptions-exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, rethrowing exceptions, exception specification, built in exceptions, creating own exception sub classes, Guide lines for proper use of exceptions.
Multithreading - Differences between multiple processes and multiple threads, thread states,creating threads, interrupting threads, thread priorities, synchronizing threads, interthread communication, thread groups, daemon threads.

UNIT 4:

GUI Programming with Java - The AWT class hierarchy, Introduction to Swing, Swing vs.AWT,MVC architecture, Hierarchy for Swing components, Containers – Top-level containers
– JFrame, JApplet, JWindow, JDialog, Light weight containers – JPanel, A simple swing

application, Overview of several swing components- Jbutton, JToggleButton, JCheckBox, JRadioButton, JLabel, JTextField, JTextArea, JList, JComboBox, JMenu, Java's Graphics capabilities – Introduction, Graphics contexts and Graphics objects, color control, Font control, Drawing lines, rectangles and ovals, Drawing arcs, Layout management - Layout manager types
– border, grid, flow, box.

Event Handling - Events, Event sources, Event classes, Event Listeners, Relationship betweenEvent sources and Listeners, Delegation event model, Semantic and Low-level events, Examples: handling a button click, handling mouse and keyboard events, Adapter classes.

Collection Framework – ArrayList, LinkedListArrayListvsLinkedList, List Interface, HashSet, TreeSet, Queue & Priority Queue, Deque.

JDBC: JDBC Driver, DB Connectivity, StepsConnectivity with Oracle, Connectivity with MySQLDriverManager, Connection, Statement, ResultSet, PreparedStatement, ResultSetMetaData, DatabaseMetaData.

TEXT BOOKS:

1. Java: the complete reference, 7th editon, Herbert Schildt, TMH.
2. Java for Programmers, P.J.Deitel and H.M.Deitel, Pearson education / Java: How to Program P.J.Deitel and H.M.Deitel, 8th edition, PHI.

REFERENCE BOOKS:

1. Core Java, Volume 1-Fundamentals, eighth edition, Cay S.Horstmann and Gary Cornell, Pearson education.
2. Java Programming, D.S.Malik, Cengage Learning.
3. Object Oriented Programming with Java, B.Eswara Reddy, T.V.Suresh Kumar, P.Raghavan, Pearson-Sanguine.
4. An introduction to Java programming and object oriented application development, R.A. Johnson- Cengage Learning.
5. Advanced Programming in Java2, K.Somasundaram, Jaico Publishing House.
6. Starting out with Java, T.Gaddis, dreamtech India Pvt. Ltd.
7. Object Oriented Programming with Java, R.Buyya, S.T.Selvi, X.Chu, TMH. 8.Object Oriented Programming through Java, P.Radha Krishna, Universities Press.
9. An introduction to programming and OO design using Java, J.Nino, F.A.Hosch, John Wiley & Sons.
10. Java and Object Orientation, an introduction, John Hunt, second edition, Springer.
11. Maurach's Beginning Java2,D.Lowe, J.Murach, A. Steelman, SPD.

CS25092 SOFTWARE ENGINEERING

YOGI VEMANA UNIVERSITY

COURSE OBJECTIVES:

- To provide an insight into software life cycle and various software process models
- To estimate the resources for developing the application and to prepare the schedule
- To understand various designing concepts and notations for modeling the software.
- To prepare the test cases for the project, apply various testing techniques, strategies and metrics to evaluate the software.
- To construct software with high quality and reliability.

COURSE OUTCOME:

- Understand the problem domain to choose process models and to develop SRS
- Learn to model software projects using appropriate design notations
- Measure the product and process performance using various metrics
- Evaluate the system with various testing techniques and strategies
- Able to analyze, design, verify, validate, implement, and maintain software systems

UNIT 1

Introduction to Software Engineering: The evolving role of software, Changing Nature of Software,Software myths.

A Generic view of process: A layered technology, A process framework, TheCapability Maturity Model Integration (CMMI), Process patterns, process assessment, personal and team process models.
Process models: The waterfall model, Incremental model, Rad model, Spiral model, Evolutionary process models, TheUnified process.
An Agile View of process: Agility, Agile process models- Scrum process model, Extreme programming (XP).

UNIT2

Software Requirements: Functional and non-functional requirements, User requirements,Systemrequirements, Interface specification, the software requirements document.
Requirements engineering process: Feasibility studies, Requirements elicitation andanalysis,Requirements validation, Requirements management.

System models: Context Models, Behavioral models, Data models, Object models, structured methods.

UNIT 3

Product metrics: Software Quality, Metrics for Analysis Model, Metrics for Design Model, Metrics forsource code, Metrics for testing, Metrics for maintenance.
Testing Strategies: A strategic approach to software testing, test strategies for conventional software,Black-Box and White-Box testing, Validation testing, System testing, the art of Debugging.
Metrics for Process and Products : Software Measurement, Metrics for software quality.

UNIT 4

Risk Management: Reactive vs Proactive risks strategies, software risks, risk identification, risk projection, risk refinement, RMMM, RMMM plan.
Quality Management: Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability.

TEXT BOOKS:

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition. McGrawHill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson education.
3. Designing Flexible Object Oriented systems with UML-Charles Ritcher
4. Object Oriented Analysis & Design, Sat/.inger. Jackson, Burd Thomson

REFERENCE BOOKS:

1. Software Engineering- K.K. Agarwal & Yogesh Singh, New Age International Publishers
2. Software Engineering, an Engineering approach- James F. Peters, WitoldPedrycz, John Wiely.
3. Systems Analysis and Design- ShelyCashmanRosenblatt,Thomson Publications.
4. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill Companies.

CS25093 COMPUTER NETWORKS

YOGI VEMANA UNIVERSITY

COURSE OBJECTIVES:

- To understand networking concepts and basic communication model
- To understand network architectures and components required for data communication.
- To analyze the function and design strategy of physical, data link, network layer and transport layer
- To acquire basic knowledge of various application protocol for internet security issues and services

COURSE OUTCOME:

- Trace the flow of information from one node to another node in the network
- Identify the components required to build different types of networks
- Understand the functionalities needed for data communication into layers
- Able to choose the required functionality at each layer for given application
- Understand the working principles of various application protocols and fundamentals of security issues and services available.

UNIT-I

Introduction, Uses of Computer Networks, Network Hardware-Transmission technology, Network topology, Transmission mode, scale, Network software-protocol hierarchies, Design issues for layers, interface and services, connection oriented and connection less services service primitives, Reference Models- OSI reference model, TCP/IP reference Model, Example of data communication services- X.25 networks, Frame relay,Physical Layer: Transmission media, Guided media and unguided media, Wireless transmission,

UNIT-II

Data Link Layer: Data Link Layer Design Issues- services provided to the network layer, framing, error control, flow control, Error Detection and Correction – types of errors, Error detection, error correction, , Elementary data link protocols- An unrestricted simplex protocol, A simplex stop and wait protocol, simplex protocol for noisy channel, Sliding Window Protocol- one bit sliding window protocol, A protocol using Go back N ARQ, Selective repeat protocol, HDLC, multiple access protocol- Aloha, carrier Sense multiple access protocol, IEEE Standard 802 for LANs and MANs- 802.4 token bus, 802.5 token ring.

UNIT-III

Network Layer: Network layer design issues, Routing algorithms- classification, routig table, Shortest path routing, Flooding, Distance Vector routing, Link state routing, Hierarchical routing, Broadcast routing, Multicast routing.

Congestion control algorithms- general principles to congestion control Open loop control, Closed loop control, Network layer in the Internet- IP protocol, IPV4, IPV6 addressing, subnet addressing.

UNIT-IV

Transport layer: The Transport Service, Elements of Transport Protocols, Internet Transport Protocols(TCP and UDP).

Application Layer: Network Security, Traditional cryptography- substitution ciphers, Transposition ciphers, DNS, Electronic Mail, World Wide Web, Multimedia.

TEXT BOOKS:

Computer Networks -- Andrew S Tanenbaum, 4th Edition. Pearson Education/PHI

Reference Books:

1. Computer Communications and Networking Technologies –Michael A.Gallo, William M .Hancock - Thomson Publication

YOGI VEMANA UNIVERSITY

CS25094A Green IT

YOGI VEMANA UNIVERSITY

COURSE OBJECTIVES:

- To explain Green Computing and Green IT infrastructure for making computing and information system environment sustainable
- To encouraging optimized software and hardware designs for development of Green IT Storage, Communication and Services
- To explores the use of approaches to embrace green IT initiatives
- To explain the principles of Energy efficient technologies

COURSE OUTCOME:

- Classify and understand the principles of Energy efficient technologies
- Estimate the carbon credits of various activities
- Recognize the benefits of green fuels with respect to sustainable development
- Initiating how green IT can be achieved in by hardware, software, network communication and data center operations
- Enlist different concepts of green technologies in a project

UNIT-I

The Importance of Green Information Technologies, Governance and Regulatory Issues,minimizing power usage, Cooling, Business process reengineering for sustainability.

UNIT-II

Going Paperless, Recycling, Sustainable hardware

UNIT-III

Technology company case studies, University and other case studies, Data center design andredesign

UNIT-IV

Virtualization, managing your Green Information Technology Transformation, The future:Staying Green

TEXT BOOKS:

1. Green IT- Toby J. Velete, Anthony T. Velete, Robert Elsenpeter-McGraw-Hill
2. The Greening IT - John Lamb-IBM Press
3. Foundation of Green IT - Marty Poniatowsk- Prentice Hal

Reference Books:

1. Green Project Management - Richard Maltzman and David Shirley-CRC Press a Taylorand Francis Company

CS25092B Professional Ethics

YOGI VEMANA UNIVERSITY

COURSE OBJECTIVES:

- To Understand the concepts of computer ethics in work environment.
- To understand the threats in computing environment
- To Understand the intricacies of accessibility issues
- To ensure safe exits when designing the software projects

COURSE OUTCOME:

- Helps to examine situations and to internalize the need for applying ethical principles, values to tackle with various situations.
- Develop a responsible attitude towards the use of computer as well as the technology.
- Able to envision the societal impact on the products/ projects they develop in their career
- Understanding the code of ethics and standards of computer professionals.
- Analyze the professional responsibility and empowering access to information in the work place.

UNIT-I

Human Values: Morals, values and Ethics – Integrity- Academic integrity-Work Ethics- Service Learning- Civic Virtue- Respect for others- Living peacefully- Caring and Sharing- Honestly- courage-Cooperation commitment- Empathy-Self Confidence -Social Expectations.

UNIT-II

Engineering Ethics & Professionalism: Senses of Engineering Ethics - Variety of moral issues- Types of inquiry- Moral dilemmas –Moral Autonomy – Kohlberg's theory- Gilligan's theory- Consensus and Controversy-Profession and Professionalism- Models of professional roles- Theories about right action – Self interest-Customs and Religion- Uses of Ethical Theories.

UNIT-III

Engineering as social Experimentation: Engineering as Experimentation – Engineers as responsible Experimenters- Codes of Ethics- Plagiarism
Responsibilities and Rights: Collegiality and loyalty – Managing conflict- Respect for authority-Collective bargaining- Confidentiality-Role of confidentiality in moral integrity-Conflicts of interest-Occupational crime- Professional rights-Employee right- IPR Discrimination.

UNIT-IV

Global Ethical Issues: Multinational Corporations- Environmental Ethics- Business Ethics- Computer Ethics -Role in Technological Development-Engineers as Managers- Consulting Engineers- Engineers as Expert witnesses and advisors-Moral leadership.

TEXT BOOKS:

1. M Govindarajan, S Natarajan and V S Senthil Kumar, Engineering Ethics, PHI Learning Private Ltd, New Delhi,2012.
2. R S Naagarazan, A text book on professional ethics and human values, New age international (P) limited ,New Delhi,2006.

Reference Books:

CS35091 **PYTHON PROGRAMMING**

YOGI VEMANA UNIVERSITY

COURSE OBJECTIVES:

- To understand programming concepts and key feature of Python including Files I/O
- To study OOPs concepts of Python and to understand relationship between class and object in Python
- To write efficient programming using Python and graphical user interface (GUI) programming by Python.
- To study database concepts and database connection in Python and also different operations on database

COURSE OUTCOME:

- Learn and implement programming skills in Python and learn language elements and characteristics, including data types, operators, and control structures.
- Implementing Python OOPs concepts in writing programs.
- Learn to develop applications, graphical user interface (GUI).
- Learn to design and connect database using Python.

UNIT1:

Python Features, Python History, Python Applications, Python Example, Variables, Data Types, Keywords, Literals, Operators, Comments, If else, Loops, For Loop, While Loop, Break, Continue, Pass, Strings, Lists, Tuples, List Vs Tuple, Sets, Dictionary, Functions, Built-in Functions, Lambda Functions,
Files I/O, Modules, Exceptions, Date, Regex, Sending Email, Read CSV File, Write CSV File, Read Excel File, Write Excel File, Assert, List Comprehension, Collection Module, Math Module, OS Module, Random Module, Statistics Module, Sys Module, IDEs, Arrays, Command Line Arguments

UNIT 2:

Python OOPsConcepts: Python OOPsConcepts, Creating classes in Python, Creating an instanceof the class, Delete the Object, Constructors,Creating the constructor in python, Python Non-Parameterized Constructor, Parameterized Constructor, default Constructor, Python built-in classfunctions, Built-in class attributes, Inheritance, Types of inheritances, The issubclass(sub,sup)method, The isinstance (obj, class) method,method overloading, Data abstraction in python, **UNIT 3:**
GUI Programming : Python Tkinter (GUI), Button, Canvas, Checkbutton, Entry, Frame, Label, Listbox, Menubutton, Menu, Message, Radiobutton, Scale, Scrollbar, Text open link, Label, Frame, MessageBox.

UNIT 4:

Python Database connection: Environment Setup, Database Connection, Creating New Database, Creating Tables, Insert Operations, Read Operations, Update Operations, Join Operations, Performing Transactions

TEXT BOOKS:

1. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning.
2. Think Python First Edition, by Allen B. Downey, Orielly publishing

REFERENCE BOOKS:

1. Introduction to Computation and Programming Using Python. John V. Guttag, The MIT Press.
2. James Payne, Beginning Python using Python 2.6 and Python 3, Wrox publishing
3. Paul Gries, Practical Programming: An Introduction to Computer Science using Python 3,The Pragmatic Bookshelf, 2nd edition (4 Oct. 2013)
4. Charles Dierach, Introduction to Computer Science using Python

CS35092 BIG DATA ANALYTICS

YOGI VEMANA UNIVERSITY

COURSE OBJECTIVES:

- To explore the fundamental concepts of big data analytics
- To understand the concept of Hadoop and learn to build blocks using Hadoop with different nodes.
- To learn different components of Hadoop and to understand Hadoop file system.
- To understand the applications using Map Reduce Concept

COURSE OUTCOME:

- Work with big data platform and understand the fundamentals of various big data analysis techniques
- Analyze Hadoop concepts for building blocks with different nodes.
- Understand different components of Hadoop and file system of Hadoop.
- Analyze the HADOOP and Map Reduce technologies associated with big data analytics
- Explore the applications of Big Data

UNIT 1:

Introduction to Big Data: Big Data-definition, Characteristics of Big Data (Volume, Variety, Velocity),Data in the Warehouse and Data in Hadoop, why is Big Data Important? Patterns for Big Data Development

UNIT 2:

Introduction to Hadoop: Hadoop- definition, understanding distributed systems and Hadoop, Comparing SQL databases and Hadoop, Understanding MapReduce, counting words with Hadoop-running your first program, History of Hadoop, Starting Hadoop - The building blocks of Hadoop, NameNode, DataNode, Secondary NameNode, JobTracker and Task Tracker, MapReduce -A Weather Dataset, Analyzing the Data with Unix Tools, Analyzing the Data with Hadoop, Scaling Out, Hadoop Streaming, Hadoop Pipes.

UNIT 3:

HDFS: Components of Hadoop -Working with files in HDFS, Anatomy of a MapReduce program, Reading and writing

The Hadoop Distributed Filesystem -The Design of HDFS, HDFS Concepts, The Command- Line Interface, HadoopFilesystem, The Java Interface, Data Flow, Parallel Copying with distcp, Hadoop Archives

UNIT 4:

MapReduce Advanced Programming: Writing basic MapReduce programs - Getting the patent data set, constructing the basic template of a MapReduce program, Counting things, Adapting for Hadoop‘s API changes, Streaming in Hadoop, Improving performance with combiners, Advanced MapReduce – Chaining MapReduce jobs, joining data from different sources, creating a Bloom filter

TEXT BOOKS:

1. Dirk deRoos, Chris Eaton, George Lapis, Paul Zikopoulos, Tom Deutsch ,—Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data‖, 1st Edition, TMH,2012.
2. Hadoop: The Definitive Guide by Tom White, 3rd Edition, O‘reilly
3. Hadoop in Action by Chuck Lam, MANNING Publ.
4. Hadoop in Practice by Alex Holmes, MANNING Publ.

REFERENCE BOOKS:

1. Data Divination: Big Data Strategies, 1st Edition, Pam Baker, Bob Gourley, Cengage

CS35093 CRYPTOGRAPHY AND NETWORK SECURITY
YOGI VEMANA UNIVERSITY

COURSE OBJECTIVES:

- To understand basics of Cryptography and Network Security.
- To be able to secure a message over insecure channel by various means
- To learn about how to maintain the Confidentiality, Integrity and Availability of a data.
- To understand various protocols for network security to protect against the threats in the networks.

COURSE OUTCOME:

- Understand the most common type of cryptographic algorithm
- Provide security of the data over the network.
- Understand the Public-Key Infrastructure
- Understand security protocols for protecting data on networks
- Understand vulnerability assessments and the weakness of using passwords for authentication
- Be able to configure simple firewall architectures
- Do research in the emerging areas of cryptography and network security.

UNIT 1:

Introduction: Security trends, OSI Security Architecture, Security Attacks, services and mechanisms, Model for Network Security.
Classical techniques: Symmetric Cipher model, Substitution Techniques, Transposition Techniques, Steganography.
Modern techniques: Simplified DES, block cipher principles, data encryption standard, strength of DES, differential and linear crypt analysis, block cipher design principles and modes of operations. Algorithms: Triple DES, international data encryption algorithm, characteristics of advanced symmetric block ciphers.

UNIT 2:

Conventional encryption: Placement of encryption function, traffic confidentially, keydistribution.
Public key cryptography: Principles of public key cryptosystems, RSA algorithm, keymanagement, Diffie-Hellmen key exchange.
Message authentication and hash functions: Authentication requirements and functions, Message Authentication, Hash functions, security of hash functions and Macs

UNIT 3:

Authentication applications: Kerbores, X.509 directory authentication service. Electronic mailsecurity: Pretty good privacy, S/MIME.

UNIT 4:

System Security: Intruders, Intrusion detection, Password management. Malicious Software: Virus and related threats, Virus counter measures. Firewall: Firewall design principles, Trusted systems.

TEXT BOOKS:

1. Cryptography and Network Security: Principles and Practice – William Stallings, Pearson Education.
2. Network Security Essentials (Applications and Standards) by William Stallings, Pearson Education.

REFERENCE BOOKS:

1. Fundamentals of Network Security by Eric Maiwald (Dreamtech Press)
2. Network Security – Private Communication in a Public World by Charlie kaufman, Radia Perlman and Mike Speciner, Pearson/PHI.
3. Introduction to Cryptography, Buchmann, Springer.

CS35094A COMPUTER ETHICS

YOGI VEMANA UNIVERSITY

COURSE OBJECTIVES:

- To provide knowledge about the ethical issues that arise as a result of increasing use of computers
- To discuss the responsibilities of those who work with computers,
- To discuss technical issues in using computer science and focus on a particular area such as software design, privacy, intellectual property rights , freedom of speech and liability hacking, viruses, computer crime, and employee surveillance.

COURSE OUTCOME:

- Understand the basic concepts of ethics.
- Describe the different methods of applying laws and regulations.
- Analyze IT related ethical problems and to arrive at appropriate decisions
- Apply concepts of computer ethics in organizational settings.
- Deal with practical problems as related to ethical, political and social issues.
- Integrate elements of problem and its solution in different settings.
- Discuss failures of proposed solutions to different problem situations.
- Discuss designing and developing code of ethics.

UNIT 1:

Understand the basic concepts of ethics. Contribution of ethics in security and privacy of IS. Technology used in the security of IS and regulations related to its implementation. Different methods of applying laws and regulations.

UNIT 2:

Ideas appropriate for analysis and problem solving. Theoretical build up of parts of ethics needed for an organizational IS. Analyse IT related ethical problems and to arrive at appropriate decisions. Concepts of computer ethics in organizational settings.

UNIT 3:

Practical problems as related to ethical, political and social issues. Integrate elements of problem and its solution in different settings. Failures of proposed solutions to different problem situations.

UNIT 4:

Competencies of technical and operations management related to ethical, Political and social issues. Designing and developing code of ethics. Ways of arriving at solutions related to IT ethical problems. Discussions and evaluate success and failure of solutions and cases

TEXT BOOKS:

Baase, Sara ,A Gift of Fire: Social, Legal, and Ethical Issues for Computing and the Internet, 4th ed, Prentice-Hall, ISBN: 0130082155

CS35094B ETHICAL HACKING

YOGI VEMANA UNIVERSITY

COURSE OBJECTIVES:

- To Understand the Ethical Hacking Process.
- To understand different Tools and Techniques of Ethical Hacking.

COURSE OUTCOME:

- Ability to understand the processes involved in ethical hacking.
- Acquiring skills to analyze malware threats and developing solutions.

UNITI:

Introduction to hacking: what is hacking, pros and cons of hacking, types of hacking, types of hackers, hacker vs. cracker, why hackers hack, prevention from hacker and steps performed by hacker.

Ethical Hacking: Introduction to Ethical Hacking, What you can do Legally, What you cannot do Legally.

UNIT II:

Email hacking: what is cybercrime, types of cybercrimes**,** how email works, email service protocols,email spoofing, email spamming, email fishing, prevention from phishing, email tracing

Network and computer attacks: Malicious software, Protecting against malware attacks, Intruder attacks on networks and computers, Addressing physical security, hardware Key loggers and software key logger
and behind locked doors.

UNIT III:

Footprints and Social Engineering: Using Web tools for Foot printing, Conducting Competitive Intelligence, Using Domain Name System Transfers, Introduction to SocialEngineering.
Port Scanning: Introduction to Port Scanning, Types of Port Scans, Using Port Scanning tools, Conducting Ping Sweeps.

UNIT IV:

Desktop and OS Vulnerabilities: Windows OS Vulnerabilities, Tools for identifying vulnerabilities in Windows. Best practices for hardening Windows Systems, Linux OS Vulnerabilities
Hacking Web Servers: Understanding Web Applications, Understanding Web Application Vulnerabilities, Application Vulnerabilities and Countermeasures, Tools for Web attackers and Security testers, Web tools.
Hacking Wireless Networks: Understanding Wireless Technologies, Components of Wireless Networks, Understanding Wireless Network standards, Understanding Authentication, Understanding WirelessHacking.

Text Book(s):

[1]. Michael T. Simpson, Kent Backman, James E. Corley, "Hands -On Ethical Hackingand Network Defense", Second Edition, Cengage Learning, 2012.
[2]. hacking for beginners by Manthandesai

Reference Books:

[1]. Steven DeFino, Barry Kaufman, Nick Valenteen, "Official Certified Ethical Hacker Review Guide", Cengage Learning, 2009.
[2]. Patrick Engebretson, "The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy", Syngress Basics Series – Elsevier, 2011.
[3]. Whitaker & Newman, "Penetration Testing and Network Defense", Cisco Press,Indianapolis, 2006.
[4].https://www.youtube.com/watch?v=7nF2BAfWUEg Complete Free Hacking Course:Go from Beginner to Expert Hacker Today!
[5].https://www.youtube.com/watch?v=t2mRNxfHTjw&list=PL7134FC0815ADB8EB TRAINSIGNAL
[6].https://www.youtube.com/watch?v=O1eNQqgEevQ Ethical Hacking - Password Cracking Demo

CS35094C Management Information System

YOGI VEMANA UNIVERSITY

COURSE OBJECTIVES:

- To describe the role of information technology and decision support systems in business and record the current issues with those of the firm to solve business problems.
- To introduce fundamental principles of computer-based information systems analysis and design and develop understanding principles and techniques used.
- To understand various knowledge representation methods and different expert system structures as strategic weapons to counter the threats to business and make business more competitive.
- To use information to assess the impact of Internet and Internet technology on electronic commerce and electronic business and understand the specific threats and vulnerabilities of computer systems.

COURSE OUTCOME:

- Relate the basic concepts and technologies used in the field of management information systems
- Compare the processes of developing and implementing information systems.
- Plan the role of ethical, social, and security issues of information systems.
- Translate the role of information systems in organizations, the strategic management processes, with the implications for the management.

UNIT I

The meaning and role of MIS: What is MIS? Decision support systems, systems approach, the systems view of business, MIS organization within the company, Managers view of Information systems. Management organizational theory and the systems approach - Development of organizational theory, organizational behavior, management - information and the systems approach – Data processing and the computer – components of computer system – computer based information system -Applications Information systems for decision making: Evolution of an information system - Basic information systems - decision making and MIS - MIS as a technique for making programmed decisions - decision assisting information systems –DSS

UNIT II

Strategic and project planning for MIS: General business planning - appropriate MIS response - MIS planning general - MIS planning details Conceptual system design: Define the problems - set system objectives - establish system constraints - determine information needs - determine information sources - develop alternative conceptual designs and select one - prepare the conceptual design report. Detailed system design: Inform and involve the organization - aim of detailed design - project management of MIS detailed design - identify dominant and trade off criteria - sketch the detailed operating subsystems and information flows – automation - inputs, outputs, and processing - software, hardware and tools - propose an organization to operate the system - document the detailed design - revisit the manager-user.

UNIT III

Implementation, evaluation and maintenance of the MIS: Plan the implementation - acquire floor space and plan space layouts - organize for implementation - develop procedures for implementation train the operating personnel - computer related acquisitions - develop forms for data collection and information dissemination - develop the files - test the system - evaluate the MIS - control and maintain the system. Pitfalls in MIS development: Fundamental weaknesses - soft spots in planning - design problems - implementation

UNIT IV

Systems concepts and control: Systems classifications – concepts – control: Key system concept – business organization as a system – control and system design Management science and systems modeling for MIS: What is Management science? – What are models? – Kinds and use

of models for analysis of systems characteristics – simulation – construction of models Casestudies

TEXT BOOK:

1. Information systems for modern management, 3rd Edition by R.G Murdick, J.E Ross and J. Rclagget, PHI-2004.

REFERENCE BOOKS:

1. Management Information Systems, 9/e, Laudon&Laudon, V.M.Prasad, Pearson, 2005
2. Management Information Systems ,C.S.V.Murthy, Himalaya Publications, 2004

CS35096 Data Visualization Tools

YOGI VEMANA UNIVERSITY

COURSE OBJECTIVES:

- To introduce visual perception and core skills for visual analysis
- To understand visualization for time-series analysis and ranking analysis
- To understand visualization for deviation analysis
- To understand visualization for distribution analysis and correlation analysis
- To understand visualization for multivariate analysis
- To understand issues and best practices in information dashboard design

COURSE OUTCOME:

- Understand different analysis with visualization.
- Ability to use the tools for data visualization.

UNIT I

CORE SKILLS FOR VISUAL ANALYSIS: Information visualization - effective data analysis- traits of meaningful data - visual perception - making abstract data visible - building blocks of information visualization - analytical interaction - analytical navigation - optimal quantitative scales - reference lines and regions - trellises and crosstabs - multiple concurrent views - focus and context - details on demand - over-plotting reduction - analytical patterns – patternexamples

UNIT II

TIME-SERIES, RANKING, AND DEVIATION ANALYSIS: Time-series analysis - time-series patterns - time-series displays - time-series best practices- part-to-whole and ranking patterns - part-to-whole and ranking displays - best practices - deviation analysis - deviation analysis displays - deviation analysis best practices

UNIT III

DISTRIBUTION, CORRELATION: Distribution analysis - describing distributions - distribution patterns - distribution displays - distribution analysis best practices - correlation analysis - describing correlations – correlation patterns - correlation displays - correlation analysis techniques and best practices

UNIT IV

MULTIVARIATE ANALYSIS: Multivariate analysis - multivariate patterns - multivariate displays - multivariate analysis techniques and best practices

TEXT BOOK:

1. Stephen Few, Now you see it: Simple Visualization techniques for quantitative analysis, Analytics Press, 2009.
2. Stephen Few, Information Dashboard Design: The effective visual communication of data, O'Reilly,2006.
3. Edward R. Tufte, The visual display of quantitative information, Second Edition, Graphics Press, 2001.

REFERENCE BOOKS:

1. Nathan Yau, Data Points: Visualization that means something, Wiley, 2013.
2. Ben Fry, Visualizing data: Exploring and explaining data with theprocessing environment, O'Reilly, 2008.
3. Gert H. N. Laursen and JesperThorlund, Business Analytics for Managers: Taking business intelligence beyond reporting, Wiley, 2010.

4. Evan Stubbs, The value of business analytics: Identifying the path to profitability, Wiley,2011.

CS45091 CLOUD COMPUTING

YOGI VEMANA UNIVERSITY

COURSE OBJECTIVES:

- To introduce the broad perceptive of cloud architecture and model
- To understand the concept of Virtualization and design of cloud Services
- To understand the infrastructure of cloud
- To apply different cloud programming model as per need.
- To understand the concepts of high-performance computing in cloud

COURSE OUTCOME:

- Compare the strengths and limitations of cloud computing
- Identify the architecture, infrastructure and delivery models of cloud computing
- Apply suitable virtualization concept.
- Understand the infrastructure of cloud.
- Address the core issues of cloud computing such as security, privacy and interoperability.

UNIT-I:

Introduction: Cloud models-Evolution of Cloud Computing –System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture – On-demand Provisioning – Elasticity in Cloud – deployment models – service models-cloud service providers **Virtualization:** Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization -Virtualization Structures - Tools and Mechanisms – resource sharing and resource pooling - Desktop Virtualization – Server Virtualization.

UNIT-II:

Cloud Infrastructure: Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development– Design Challenges - Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources.

UNIT-III:

Programming Model: Parallel and Distributed Programming Paradigms – Map Reduce, Twister and Iterative Map Reduce – Hadoop Library from Apache – Mapping Applications - Programming Support.
Security in the Cloud: Security Overview – Cloud Security Challenges
– Access control mechanisms – Security Governance – Risk Management – Security Monitoring
– Security Architecture Design – Virtual Machine Security.

UNIT-IV:

Enterprise Cloud-Based High-Performance Computing (HPC):

Overview of High Performance Computing (HPC) on Cloud-Enterprises HPC applications (High-performance grid computing, high-performance big data computing/analytics, high performance reasoning)-HPC Cloud vendor solutions: compute grids (Windows HPC, Hadoop, Platform Symphony ,Gridgain), data grids (Oracle coherence, IBM Object grid, Cassendra, HBase, Memcached, HPChardware (GPGPU, SSD, Infiniband, Non-blocking switches)

Text Book

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, Distributed and Cloud Computing, FromParallelProcessing to the Internet of Things, 2012, 1st Edition, Morgan Kaufmann Publishers.

Reference Books

1. Katarina Stanoevska-Slabeva, Thomas Wozniak, SantiRistol, Grid and Cloud Computing – A Business

Perspective on Technology and Applications, 2010, Springer.
2. John W.Rittinghouse and James F.Ransome, Cloud Computing: Implementation,

Management, and Security", 2010, CRC Press.

3. Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing, A Practical Approach, 2009, TMH.
4. George Reese, Cloud Application Architectures: Building Applications and Infrastructure in the Cloud O'Reilly, 2009.

CS45092 MACHINE LEARNING

YOGI VEMANA UNIVERSITY

COURSE OBJECTIVES:

- To understand the concepts of machine learning.
- To appreciate supervised and unsupervised learning and their applications.
- To appreciate the concepts and algorithms of learning.
- To understand the basic theory underlying machine learning.
- To be able to formulate machine learning problems corresponding to different applications.
- To understand a range of machine learning algorithms along with their strengths and weaknesses.
- To be able to apply machine learning algorithms to solve problems of moderate complexity.

COURSE OUTCOME:

- Understand different learning processes and their applications.
- Ability to explore logic for solving various AI problems
- Ability to understand what is learning and why it is essential to the design of intelligent machines.
- Ability to design and implement various machine learning algorithms in a wide range of real-world applications.

UNIT I:

INTRODUCTION: Learning Problems –Perspectives and Issues -A brief introduction to Machine Learnin`g, Supervised Learning, Unsupervised Learning, Reinforcement Learning– ConceptLearning – Version Spaces and Candidate Eliminations –Inductive bias –Decision Tree learning

NEURAL NETWORKS AND GENETIC ALGORITHMS **:**Neural Network Representation – Problems – Perceptrons –Multilayer Networks and Back Propagation Algorithms –Advanced Topics –Genetic Algorithms –Hypothesis Space Search –Genetic Programming –Models ofEvalution and Learning.

UNIT II:

BAYESIAN LEARNING **:**Bayes Theorem –Concept Learning –Maximum Likelihood – Minimum Description Length Principle –Bayes Optimal Classifier –Gibbs Algorithm –Naïve Bayes Classifier – Bayesian Belief Network –EM Algorithm –Probability Learning –Sample Complexity –Finite and Infinite Hypothesis Spaces –Mistake Bound Model.

UNIT III :

COMPUTATIONAL LEARNING **:**Probability Learning –Sample Complexity –Finite and Infinite Hypothesis Spaces –Mistake Bound Model. Learning Sets of Rules –Sequential Covering Algorithm – Learning Rule Set –First Order Rules –Sets of First Order Rules.

INSTANCE BASED LEARNING **:**K-NearestNeighbour Learning –Locally weighted Regression – Radial Bases Functions –Case Based Learning.

UNIT IV:

YOGI VEMANA UNIVERSITY

ADVANCED LEARNING : SVM –Formulation, SVM –Interpretation & Analysis, SVMs for Linearly Non-Separable Data, SVM Kernels.Reinforcement Learning –Task –Q-Learning – Temporal Difference Learning

TEXT BOOKS:

1. Machine Learning –Tom M. Mitchell, -MGH

2. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Francis

REFERENCE BOOKS

1. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, Trevor Hastie," *An Introduction to Statistical Learning: with Applications in R",*Springer, First Edition.

2. Kevin Murphy, "*Machine learning: a probabilistic perspective"*, MIT Press, First Edition.

3. Christopher Bishop, "*pattern recognition andmachine learning",*Springer, First Edition.

CS45093 INTERNET OF THINGS

YOGI VEMANA UNIVERSITY

COURSE OBJECTIVES:

- To understand IoT Market perspective.
- To understand State of the Art – IoT Architecture.
- To understand Real World IoT Design Constraints, Industrial Automation and Commercial Building Automation in IoT.

COURSE OUTCOME:

- Understand the architecture of IoT
- Ability to develop small applications using IoT

UNIT-I:

Introduction to IoT:

An Overview of Internet of things, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies. M2M Communication, Examples of IoTs, Difference between IoT and M2M, SDN and NFV for IoT. Design Principles for Connected Devices Internet Connectivity Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet.

UNIT-II:

Business Models for Business Processes in the Internet of Things, IoT/M2M systems LAYERS AND designs standardizations, Modified OSI Stack for the IoT/M2M Systems, ETSI M2M domains and High-level capabilities, Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability

UNIT-III:

Design Principles for the Web Connectivity for connected-Devices, Web Communication Protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected Devices. Data Acquiring, Organizing and Analytics in IoT/M2M, Applications /Services /Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

UNIT-IV:

Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services, Data Collection, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively (Pachube/COSM), Nimbits and other platforms Sensor, Participatory Sensing, Actuator, Radio Frequency Identification, and Wireless, Sensor Network Technology, Sensors Technology, Sensing the World.

Text Books:

1. Internet of Things: Architecture, Design Principles and Applications, Rajkamal, McGraw Hill Higher Education
2.Internet of Things, A.Bahgya and V.Madisetti, Univesity Press, 2015

Reference Books:

1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley
2. Getting Started with the Internet of Things CunoPfister ,Oreilly

CS45094A DESIGN AND ANALYSIS OF ALGORITHMS
YOGI VEMANA UNIVERSITY

COURSE OBJECTIVES:

- To analyze the asymptotic performance of algorithms.
- To write difficult correctness proofs for algorithms.
- To demonstrate a familiarity with major algorithms and data structures.
- To synthesize efficient algorithms in common engineering design situations.

COURSE OUTCOME:

- Understand the correctness of algorithms using inductive proofs and invariants and analyze worst-case running times of algorithms using asymptotic analysis.
- learn to describe various paradigms of design when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm and synthesize them
- Learn compare between different data structures.

UNIT 1:

Introduction: Algorithm, Pseudo code for expressing algorithms, Performance Analysis-Space complexity, Time complexity, Asymptotic Notation- Big notation, Omega notation, theta notation and Little notation, Probabilistic analysis, Amortized analysis. Disjoint Sets- disjoint set operations, union and find algorithms, spanning trees, connected components and biconnected components.

UNIT 2:

Divide and conquer: General method , applications-Binary search, Quick sort, Merge sort, Strassen‘s matrix multiplication. Greedy method: General method, applications-Job sequencing with deadlines, 0/1 knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

UNIT 3:

Dynamic Programming: General method, applications-Matrix chain multiplication, Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Travelling sales person problem, Reliability design. Backtracking: General method, applications-n-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles.

UNIT 4:

Branch and Bound: General method, applications - Travelling sales person problem,0/1 knapsack problem- LC Branch and Bound solution, FIFO Branch and Bound solution..

TEXT BOOKS :

1. Fundamentals of Computer Algorithms, Ellis Horowitz,SatrajSahni and Rajasekharam,Galgotia publications pvt. Ltd.
2. Algorithm Design: Foundations, Analysis and Internet examples, M.T.Goodrich and R.Tomassia,Johnwiley and sons.

REFERENCES:

1. Introduction to Algorithms, second edition,T.H.Cormen,C.E.Leiserson, R.L.Rivest,andC.Stein,PHIPvt. Ltd./ Pearson Education
2. Introduction to Design and Analysis of Algorithms A strategic approach,R.C.T.Lee, S.S.Tseng, R.C.Chang and T.Tsai, McGraw Hill.
3. Data structures and Algorithm Analysis in C++, Allen Weiss, Second edition, Pearson education.
4. Design and Analysis of algorithms, Aho, Ullman and Hopcroft,Pearson education. 5. Algorithms – Richard Johnson baugh and Marcus Schaefer, Pearson Education.

CS45094B **SOFTWARE PROJECT MANAGEMENT**

YOGI VEMANA UNIVERSITY

COURSE OBJECTIVES:

- To know process of project planning for different software process.
- To learn cost estimation techniques during the analysis of the project.
- To understand quality concepts for ensuring the functionality of the software

COURSE OUTCOME:

- Understand the activities during project scheduling of software application.
- Learn risk management activities and resource allocation for the projects.
- Applying the software estimation and recent quality standards for evaluation of software projects
- Acquire knowledge and skills needed for the construction of highly reliable software project
- Able to create reliable, replicable cost estimation that links to the requirements of project planning and managing.

UNIT I

Conventional Software Management: The waterfall model, conventional software Managementperformance.

Evolution of Software Economics: Software Economics, pragmatic software cost estimation.
Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality,peer inspections.

The old way and the new: The principles of conventional software Engineering, principles ofmodern software management, transitioning to an iterative process.

UNIT II

Life cycle phases: Engineering and production stages, inception, Elaboration, construction,transition phases.
Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

Model based software architectures:A Management perspective and technical perspective.

Work Flows of the process: Software process workflows, Iteration workflows,

UNIT III

Checkpoints of the process: Major mile stones, Minor Milestones, Periodic status assessments.
Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

Project Organizations and Responsibilities: Line-of-Business Organizations, ProjectOrganizations, evolution of Organizations.

Process Automation: Automation Building blocks, The Project Environment.

UNIT –IV

Project Control and Process instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

Tailoring the Process: Process discriminants.

Future Software Project Management: Modern Project Profiles, Next generation Software economics, modern process transitions.

Text Books:

1. Software Project Management, Walker Royce: Pearson Education, 2005.

Reference Books:

1. Software Project Management, Bob Hughes and Mike Cotterell: Tata McGraw- Hill Edition.
2. Software Project Management, Joel Henry, Pearson Education.
3. Software Project Management in practice, PankajJalote, Pearson Education.2005.

CS45091 CCOMPLIER CONSTRUCTION

COURSE OBJECTIVES:

- To understand the various phases in the design of a compiler.
- To understand the design of top-down and bottom-up parsers.
- To understand syntax-directed translation schemes.
- To learn intermediate languages
- To learn how to optimize machine code

COURSE OUTCOME:

- Ability to design, develop, and implement a compiler for any language
- Able to design and implement LL and LR parsers
- Able to design algorithms to perform code optimization in order to improve the performance of aprogram in terms of space and time complexity.
- Ability to design algorithms to generate machine code

Unit I:

Introduction to Compilers -Introduction to compilers, Phases of compiler, Lexical Analyzer, The role of the lexical analyzer, input buffering, specification of tokens, Recognition of tokens.

Unit II:

Syntax Analysis -I - Role of the parser, writing grammars and context free grammars, Top down parsing, Brute-force approach, Recursive descent parsing, Predictive parsing, FIRST and FOLLOW constructs.

Syntax Analysis -II - Bottom-up parsing, shift-reduce parsing, operator precedence parsing, LR parsers, SLR parser, canonical LR parser, LALR parser.

Unit III:

Semantic Analysis - Syntax directed translations, applications of syntax directed translations, Syntax directed definitions, construction of syntax tree, Bottom-up evaluation of S-attributed definitions, L-attributed definitions.

Unit IV

Intermediate Code Generation and Code Optimization -Intermediate languages , Declarations, Assignment statements, Boolean Expressions, case statements, back patching, Procedure calls, Principal sources of optimization, optimization of basic blocks, DAG representation of basic blocks, flow graphs.

Text book:

1. Alfred V Aho, Monica S Lam, Ravi Sethi, Jeffrey D Ullman, *"Compilers: PrinciplesTechniques & Tools"*, Pearson Education,2nd Edition 2013.

Reference Books:

1. Kenneth C Louden, *"Compiler Construction: Principles and Practice*", Cengage Learning. Lex&Yacc, John R Levine, Oreilly Publishers.
2. Keith D Cooper & Linda Tarezon, *"Engineering a Compiler*", Morgan Kafman, Secondedition. Lex&Yacc, John R Levine, Tony Mason, Doug Brown, Shroff Publishers.
3. Muchnik, "*Advanced Compiler Design and Implementation*", Kauffman(1998)

Syllabus for 5 Year M.Sc.

Applied Geology (Integrated)

Vemanapuram,Kadapa-516 005, A.P.,INDIA

Based on
National Education Policy (NEP)-2020

Choice Based Credit System (CBCS)

Preamble:

Earth Sciences give the holistic knowledge of Atmosphere, Lithosphere, Hydrosphere and Biosphere with an emphasis on Earth. The basic knowledge and the applications of various phenomena involving physical, chemical and biological processes give the complete understanding on our Nature. In this connection, Department of Earth Sciences is established in Yogi Vemana University, Kadapa in the academic year 2007-08. The department offers 5- Year M.Sc., Applied Geology (Integrated) course that is designed to help the students not only gain enough knowledge but also gain adequate practical understanding on natural resources and their exploration such that they can pursue research. The students from this department are highly solicited both in the modern technology based software industry and conventional employment opportunities in the state and central governments. The duration of this course is 5 years (10 semesters) and as per the New Education Policy 2020, the course has been redesigned with multiple entry and exit options with appropriate certificates (After completing one year, a certificate, after two years, a diploma, after 3 years, a Bachelor's degree, after 4 years, a Bachelor's degree with honours / Research and finally after completion of 5 years, a Master's degree).

Program Educational Objectives (PEOs)	
PEO1	To create opportunities for multi-disciplinary education, training and research in Earth Sciences.
PEO2	To stand-in ethically strong Earth scientist/Geologists who effectively contribute towards the growth of the nation.
PEO3	The graduates will be practitioners and leaders in their chosen fields.
PEO4	Students will interact with nobles of other disciplines in their workplace and society and contribute to the economic growth of the country
PEO5	Develop confidence and competence in individuals, able to adapt to the changing fabric of society through their professional expertise and personal traits
PEO6	Students will be successful in pursuing higher studies in their chosen Applied Geological field and pursue career paths in teaching or research.
Program Specific Outcomes (PSOs)	
PSO1	Gain and apply knowledge to plan, analyse and find innovative solutions in the field of Earth Science/ Geological Science.

PSO 2	Explore problems and provide valid solutions through the industry-academia interactions.
PSO 3	Acquire interdisciplinary knowledge in the areas of Geological, chemical, environmental and technical sciences for the benefit of society
PSO 4	Acquire life skills, innovative thinking, planning and setting of small scale mines andgeolgy industry.

Program Outcomes (POs)	
PO1	Students have a clear understanding of the concept of subjects and contemporary issues, and apply them to identify, analyse and understanding of complex Earth science/ geological problems
PO2	Students can able to design and conduct experiments, as well in analysis and interpretation.
PO3	Students enable to use the skills, resources and modern tools of Geology along with mineral exploration IT tools (geoinformatics) in solving complex geological problems.
PO4	Having problem solving ability- to assess social issues (societal, health, safety, legal and cultural) and other geological problems
PO5	Students can have adaptive thinking and adaptability in relation to environmental context and sustainable development
PO6	Students have a clear understanding of professional and ethical responsibility
PO7	Students have a great working knowledge of communicating in English – communication with the geological community and society
PO8	Graduates have a good cognitive load management skill in project management and finance
PO9	Graduates have a computational thinking (Ability to translate vast data in to abstract concepts and to understand database reasoning.
PO10	Graduates having life skills, critical thinking and innovative skills

YOGI VEMANA UNIVERSITY, KADAPA
Department of Earth Sciences

5 Year M.Sc. Applied Geology (Integrated)

(For the students admitted during the academic year 2022 – 23 onwards)

Semester	Components of study	Course code	Title of the Course	No. of credits	No. of hours per week	Practical /Project	Internal Assessment	Semester End	Total
SEMESTER-I	Core	16021	Earth and Atmospheric Sciences	04	04		25	75	100
	Inter discipline	16012	Physical Sciences - I	04	04		25	75	100
	Inter discipline	16013	Fundamentals of Mathematics	04	04		25	75	100
	Inter discipline	16014	General English	04	04		25	75	100
	EVS	16015	Environmental Studies	04	04		25	75	100
	Practical	16021P	Earth and Atmospheric Sciences Lab	01		2		50	50
	Practical	16012P	Physics Lab I	01		2		50	50
	Practical	16013P	Chemistry Lab I	01		2		50	50
	Practical	16014P	English Lab	01		2		50	50
	Sub-total			24	20	8	125	575	700
SEMESTE	Core	26021	Minerology	04	04		25	75	100
	Core	26022	Physical Geology	04	04		25	75	100
	Inter discipline	26013	Physical Sciences - II	04	04		25	75	100
	Inter discipline	26014	Computer Sciences – I	04	04		25	75	100
	LSC	26015	Language Skill and Communication - I	04	04		25	75	100
	Practical	26021P	Minerology Lab	01		2		50	50
	Practical	26012P	Physics Lab – II	01		2		50	50
	Practical	26013P	Chemistry Lab – II	01		2		50	50
	Practical	26014P	Computer Science Lab -I	01		2		50	50
	Sub-total			24	20	8	125	575	700
	Exit option with Undergraduate Certificate after the first year or two semesters (LEVEL 5) with the completion of courses equivalent to 48 credits along with entry option to third semester (LEVEL 6) after exit								
SEMESTER-III	Core	36021	Crystallography and Optical Minerology	04	04		25	75	100
	Inter discipline	36022	Geostatistics	04	04		25	75	100
	Inter discipline	36013	Physical Sciences – III	04	04		25	75	100
	Inter discipline	36014	Computer Science – II	04	04		25	75	100
	LSC	36015	Language Skill and Communication - II	04	04		25	75	100
	Practical	36021P	Crystallography and Optical Minerology Lab	01		2		50	50
	Practical	36012P	Physics Lab – III	01		2		50	50
	Practical	36013P	Chemistry Lab – III	01		2		50	50
	Practical	36014P	Computer Science Lab – II	01		2		50	50
	Sub-total			24	20	8	125	575	700
SEMESTER	Core	46021	Igneous Petrology	04	04		25	75	100
	Core	46022	Metamorphic Petrology	04	04		25	75	100
	Core	46023	Sedimentology	04	04		25	75	100
	Inter discipline	46014	Principles of Management and Enterpreneurship	04	04		25	75	100
	VBC	46025	Value/Skill Based Course (Computer Applications for Geosciences)	04	04		25	75	100
	Practical	46021P	Igneous Petrology Lab	01		2		50	50
	Practical	46022P	Metamorphic Petrology Lab	01		2		50	50
	Practical	46023P	SedimentologyLab	01		2		50	50
	Practical	46024P	Skill based Lab (Computer Applications for Geosciences)	01		2		50	50
	Sub-total			24	20	8	125	575	700
	Exit option with Undergraduate Diploma after two years or four semesters (LEVEL 6) with the completion of courses equivalent to 98 credits along with entry option to fifth semester (LEVEL 7) after exit								
SEMESTER-V	Core	56021	Structural Geology	04	04		25	75	100
	Core	56022	Stratigraphy and Indian Geology	04	04		25	75	100
	Core	56023	Paleontology	04	04		25	75	100
	Inter discipline	56024	Geosoft and Origin software	04	04		25	75	100
	GCE	56015	Global Citizenship Education	04	04		25	75	100
			Seminar and Tutorials		04				

	Practical	56021P	Structural Geology Lab	01		2		50	50
	Practical	56022P	Stratigraphy Lab	01		2		50	50
	Practical	56023P	Paleontology Lab	01		2		50	50
	Practical	56024P	Unix, HTML and Origin Lab	01		2		50	50
	Sub-total			24	20	8	125	575	700
SEMESTER	Core	66021	Mining Geology and Ore Dressing	04	04		25	75	100
	Core	66022	Economic Geology	04	04		25	75	100
	Core	66023	Hydrogeology	04	04		25	75	100
	Core	66024	Remote Sensing	04	04		25	75	100
	VBC	66015	Value/Skill Based Course (R Programming)	04	04		25	75	100
			Seminar and tutorials		04				
	Practical	66021P	Economic Geology	01		2		50	50
	Practical	66022P	Hydrogeology	01		2		50	50
	Practical	66023P	Remote Sensing	01		2		50	50
	Practical	66024P	Skill Based Lab -R Programming Lab	01		2		50	50
	Sub-total			24	24	8	125	575	700
	Exit option with Bachelor's Degree (B.Sc., Bachelor of Science) after three years or six semesters (LEVEL 7) with the completion of courses equivalent to 144 credits. Entry option to the fourth year or seventh semester (B.Sc. Hons., Bachelor's degree Honours/Research (LEVEL 8) or 2 Year Master degree course (LEVEL 9)) for those students meeting a minimum CGPA of 7.5 in Bachelor's Degree examination								
	Course and Credit Distribution for B.Sc. Honours (LEVEL 8)								
SEMESTER-	Core	76021	Geochemistry and Isotope Geology	04	04		25	75	100
	Core	76022	Geospatial Technology, GNSS & Digital Cartography	04	04		25	75	100
	Core	76023	Field Geology and Surveying	04	04		25	75	100
	Internal elective	76024	(A)Marine Geology	04	04		25	75	100
			(B)Oceanography	04	04		25	75	
			(C)Geoinformatic Applications In Soil, Forestry, Environment And Agriculture	04	04		25	75	
			Seminars and tutorials		04				
	Practical	76021P	Geochemistry Lab	02		4		50	50
	Practical	76022P	Geospatial Technology, GNSS & Digital Cartography Lab	02		4		50	50
	Practical	76023P	Field Geology and Surveying Lab	02		4		50	50
	Practical	76024P	76024 A or B or C Lab	02		4		50	50
	Sub-total			24	20	16	100	500	600
SEMESTER-	Core	86021	Fuel Geology	04	4		25	75	100
	Core	86022	Mineral Exploration	04	4		25	75	100
	Core	86023	Digital Image Processing	04	4		25	75	100
	Open elective	86024	(A) Fundamentals of Earth Science	04	4		25	75	100
			(B)Watershed Management	04	4		25	75	
			(C) SWAYAM/MOOCs/NPTEL	04	4		25	75	
			Seminars and tutorials		4				
	Practical	86021P	Fuel Geology Lab	02		4		50	50
	Practical	86022P	Mineral Exploration Lab	02		4		50	50
	Practical	86023P	Digital Image Processing Lab	02		4		50	50
	Research project	86024RP	Minor Research Project	02		4		50	50
	Sub-total			24	20	16	100	500	600
	Award of Bachelor's Degree (Honours/Research) or Bachelor of Arts/Science/Commerce (Hons) in Discipline with Research after four years or eight semesters (LEVEL 8) with the completion of courses equivalent to **192 credits.** Entry into a One-Year (Two-Semester) Master's Degree Programme (Level 9) shall be for those students who obtained a Bachelor's Degree (Honours/Research) that is, Level 8).								
	Course and Credit Distribution for One-Year PG/Master's Degree Programme for B.Sc. Honours (LEVEL 9)								
SEMESTER-IX	Core	96021	Engineering Geology	04	4		25	75	100
	Core	96022	Mineral Processing Engineering	04	4		25	75	100
	Core	96023	Mineral Economics	04	4		25	75	100
	Open elective	96024	(A)Disaster Management	04	4		25	75	100
			(B)Mineral Deposits of India	04	4		25	75	
			(C)SWAYAM/MOOCs/NPTEL	04	4		25	75	
			Seminars and tutorials		4				

	Practical	96021P	Engineering Geology Lab	02		4		50	50
	Practical	96022P	Mineral Processing Engineering Lab	02		4		50	50
	Skill oriented course	96023 SOC	Geological Mapping	04	4		10	40	100
						8		50	
	Sub-total			24	20	16	100	500	600
SEMESTER-X	Core	06021	Research Methodology	04	4		25	75	100
	Internal elective	06022	Sedimentary Basins of India	04	4		25	75	100
			Environmental Geology	04	4		25	75	
			Precambrian Geology	04	4		25	75	
	Major Project/Dissertation	06021 MPD	Major Project/Dissertation	16		24	100	300	400
	Sub-total			24	8	24	150	450	600
	GRAND TOTAL			240	284	120	1200	5300	6500
	A student, on completion of 5 years (ten semesters) which is equivalent to 240 credits shall be awarded a 5 Year Integrated Master Degree or on completion of the One-Year (Two-Semester) Master's Degree Programme (level 9) equivalent to 48 credits shall be awarded a Master's Degree.								

Course and Credit Distribution for Two-Year PG/Master's Degree Programme in 5 YearM.Sc. Applied Geology (Integratedfor 3 Year B.Sc Degree holders (LEVEL 9)

d

Semester	Component sof study	Course code	Title of the Course	No. of	No. of hoursper	Practical /Project	Internal Assessment	Semester En	Total
SEMESTER-I	Core	APG2101	Geochemistry and Isotope Geology	04	4		25	75	100
		APG2102	Geospatial Technology, GNSS & Digital Cartography	04	4		25	75	100
		APG2103	Field Geology and Surveying	04	4		25	75	100
	Internal Elective	APG2104	(A)Marine Geology	04	4		25	75	100
			(B)Oceanography	04	4		25	75	100
			(C)Geoinformatic Applications In Soil, Forestry, Environment And Agriculture	04	4		25	75	100
			Seminars and tutorials		4				
	Practical	APG2105	Geochemistry Lab	02		4		50	50
	Practical	APG2106	Geospatial Technology, GNSS & Digital Cartography Lab	02		4		50	50
	Practical	APG2107	Field Geology and Surveying Lab	02		4		50	50
	Practical	APG2108	76024 A or B or C Lab	02		4		50	50
	Sub-total			24	20	16	100	500	600
SEMESTER	Core	APG2201	Fuel Geology	04	4		25	75	100
		APG2202	Mineral Exploration	04	4		25	75	100
		APG2203	Digital Image Processing	04	4		25	75	100
	Open Elective	APG2204	(A) Fundamentals of Earth Science	04	4		25	75	100
			(B)Watershed Management	04	4		25	75	100
			(C) SWAYAM/MOOCs/NPTEL	04	4		25	75	100
			Seminars and tutorials		4				
	Practical	APG2205	Fuel Geology Lab	02		4		50	50
	Practical	APG2206	Mineral Exploration Lab	02		4		50	50
	Practical	APG2207	Digital Image Processing Lab	02		4		50	50
	Minor Project	APG2208	Minor Research Project	02		4		50	50
	Sub-total			24	20	26	100	500	600
SEMESTER-III	Core	APG2301	Engineering Geology	04	4		25	75	100
		APG2302	Mineral Processing Engineering	04	4		25	75	100
		APG2303	Mineral Economics	04	4		25	75	100
	Open Elective	APG2304	(A)Disaster Management	04	4		25	75	100
			(B)Mineral Deposits of India	04	4		25	75	100
			(C)SWAYAM/MOOCs/NPTEL	04	4		25	75	100
			Seminars and tutorials		4				
	Practical	APG2305	Engineering Geology Lab	02		4		50	50

	Practical	APG2306	Mineral Processing Engineering Lab	02		4		50	50
	Skill Oriented Course Practical	APG2307 SOC	Geological Mapping Training	04	4	08	10	40 50	100
	Sub-total			24	32	24	110	490	600
SEMESTER-IV	Core	APG2401	Research Methodology	04	4		25	75	100
	Internal elective	APG2402	Sedimentary Basins of India	04	4		25	75	100
			Environmental Geology	04	4		25	75	
			Precambrian Geology	04	4		25	75	
	Dissertation/Major Project	APG2403 MPD	Major Project/Dissertation	16		24	100	300	400
	Sub-total			24	28	32	150	450	600
Grand Total				**96**			**460**	**1840**	**2400**

- All core papers are Mandatory
- Compulsory foundation choose one paper.
- Internal/Open Elective – Choose one paper each. Open Electives are for the students of other Departments in the varsity.
- Skill Oriented course is mandatory. Relevant society along with practical (10 marks internal, 40 final theory and 50 for practical's).

- Interested students may register for SWAYAM /MOOCs/ NPTEL with the approval of the concerned DDC for the award of the grade as 'open elective'.
- Choose one from Multi-Disciplinary (Circle formation with other subjects/Dept. of Arts/ Commerce) Course or Project (Collaboration with various firms/companies/societies) work.

Category wise Credits Distribution

Category	No. of Papers	Credits
Programme Major Core	24	96
Internal core elective of programme	06	08
Practical	33	66
Value/Skill added courses	03	12
Research Projects	02	18
Interdisciplinary Subjects	10	40
University core subjects on Environment, Language and Communication Skills and Global Citizenship Education	04	16
University Open Elective Subjects	06	08
Bridge Course In Applied Geology Basics	01	00
Total	**89 papers**	**264 credits**

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)
SEMESTER I
16021 - EARTH AND ATMOSPHERIC SCIENCES

Course Objectives:

- The objective of the paper is to make the students to understand about the solar system, evolution of continents and ocean basins, concepts of lat-longs, Indian standard Time, Planetary and local winds, and major Natural regions of the world.

Course Outcomes:

- To acquire knowledge about the universe, how it is formed and also earth as aplanet its shape size and density.
- To identify the earths location using latitudes and longitudes.
- To describe the locations of any place on earth like hot-wet equatorial, tropical,savannas, and steppes.
- By knowing the Geologic time scale they will understand the relationships

UNIT I

Exploring the Universe- The Solar System. Theories on the origin of the Earth. Planetary motion: Kepler's Law, Earth as a Planet – its Shape, Size and Density – Movementsand their effects, Interior and Age, Geological Time Scale (GTS)- Phenarozoic Era.

UNIT II

Introduction to Evolution of Continents and Ocean Basins and their permanence – Theories of Paleo-Magnetism - Ice Ages and their Periodicity – Rift Valleys and their characteristics and origin.

UNIT III

Concepts of Latitudes and Longitudes, Mathematical location of places on the globe, Indian Standard Time (IST)- Atmosphere – Circulation, Planetary and local winds: Jet streams, Monsoons, EL-Nino and LA Nina phenomena, Inter Tropical Convergence Zone (ITCZ) and The Air - Masses- Cyclones and Anti Cyclones

UNIT IV

Major Natural regions of the World : Hot-Wet Equatorial, Tropical Monsoon and Marine, Savannas, Hot and Mid Latitude Deserts, Mediterranean, Steppes, China Type,British Type, Siberian, Laurentian and Polar.

Text Books:

1. Physical Geology - A.N. Strahler , 1980
2. Environmental Geosciences - A.N. Strahler and A.H. Strahler, 1973
3. An Introduction to Earth and Environment - A.K. Sinha, 1990

Reference Books:

1. Elements of Meteorology - Albert Miller and Jack C. Thompson
2. Basic Physical Geology - E. S. Robinson , 1982
3. Certificate Physical and Human Geography- Goh Cheng Leong

YOGI VEMANA UNIVERSITY

5 year M.Sc. Applied Geology (Integrated)

Semester I

Paper 16012: PHYSICAL SCIENCES-I

PART-A: PHYSICS

Course Objectives:

- Develop better understanding of key concepts concerning scalar and vector fieldslearned previously in multivariable calculus courses.
- To learn the concepts of rocket engines and its applications in mission.
- To know about concepts of aerodynamic forces on rocket and missiles, staging ofrocket and also equation of motions.
- Define and identify a particle and a rigid body and be able to state and derive

Course Outcomes:

- Students are prepared for further study in the relevant technological disciplinesand more advanced mathematic courses.
- Design a preliminary chemical rocket engine.
- Compute various types of aerodynamic forces acting on the rocket and missileduring the flight.

Unit-I: Vector analysis 7 hours

Scalar and Vector fields – Gradient of a scalar field and physical significance. Divergenceand Curl of a vector field. Integration of vectors - Line, Surface and Volume integrals.

Stock's, Guas's and Green's theorems.

Unit-II: Mechanics of particles and a rigid body 18 hours

Laws of motion - Motion of variable mass system - motion of a rocket – Collisions in twoand three dimensions – Concepts of impact parameter and scattering cross-section - Rutherford's scattering. Definition of a rigid body – Rotational motion – rotational kinematics relations – equation of motion of a rigid rotating body –angular momentum andinertia tensor- Euler's equation.

Reference Books:

1. Fundamentals of Physics by David Haliday, Robert Resnick and
2. Mechanics by Hans and Puri, Tata McGraw Hill Pub.
3. Introduction to Physics for Scientists and Engineers by F.J. Ruche(Mc Graw Hill).
4. Mechanics by Upadhyaya.
5. A text book of Engineering Mechanics by R.K. Rajput (Dhanpat Rai and sons).
6. B.Sc. Physics Vol.-1 by C. Murali Mohan Sastry, K. Shankar Rao, P. Babu Rao.
7. B.Sc. Physics Vol.-1 – Unified Physics.

PART - B: INORGANIC CHEMISTRY

Course Objectives:
➢ To give a thorough introduction to the study of coordination
Course Outcomes:
➢ Recall the concepts on Metal ligand chemistry and their complexes.

Unit – I: Inorganic metals in biological system **11 hours**

Introduction, essential and trace elements, biological significance of sodium, potassium and chlorine, iron, zinc, cobalt, toxic metals and their toxicity of As, Hg, and Pb;metallophorphyrins with emphasis on hemoglobin – structure and fusion, chlorophyll –structure and fusion, functions of nitrogenase.

Unit – II: Coordination compounds **13 hours**

Introduction, nomenclature of inorganic molecules and complex compounds, Werner'stheory – postulates, experimental evidences. Sidwick's theory – calculation of EAN,limitations. Metal – ligand bonding in transition metal complexes – valence bondtheory – postulates, geometrics of coordination number 4 – tetrahedral and square planner,and coordination number 6 – octahedral complexes, and crystal field stabilization energy.(Elementary treatment – diagrams only).

Reference books:

1. Concise Inorganic Chemistry by J.D. Lee
2. Basic Inorganic Chemistry by Cotton & Wilkinson
3. Inorganic Chemistry by J.E. Huheey
4. Selected Topics in Inorganic Chemistry by Wahid U.Malik
5. Vogel's Text book of Qualitative inorganic Analysis
6. Unified course in Chemistry by O.P. Agarwal, Vol. I, II, and III

YOGI VEMANA UNIVERSITY

5 year M.Sc. Applied Geology (Integrated)

Semester I

Paper 16013: FUNDAMENTALS OF MATHEMATICS

Course Objectives:

- To make aware of various methods in matrices.
- To know about determinants and inverse of a matrix.
- Understands the idea of Differentiation and Integration
- Provides an introduction to vector calculus
- To provide basic knowledge for the non-Mathematics students to learn and

Course Outcomes:

- Applications of Matrices and determinants play a major role in solving linearequations.
- Recognize and use the appropriate tools of calculus to solve applied problems in avariety of settings ranging from physics and biology to business and economics.
- Vector Calculus plays an important role in differential geometry and in the studyof partial differential equations.
- Students have a clear understanding of the subject related concepts and problemsolving ability in Solving social and contemporary issues.

Unit-I: (20 Hours)

Matrices: Introduction – Definition- Special matrices- Matrix operations – Related matrices.
Determinants– Ad joint and inverse of matrix –Solution of a system of lean equations by inversion
method.

Sections 5.1 to 5.5 of chapter 5 of Elementary Engineering Mathematics by Dr. B. S.Grewal.

Unit- II: (25 Hours)

Differentiation: Definition - General rules of differentiation (product and quotient rule) – Derivatives of standard functions
Sections 12.1 to 12.2of chapter12 of Elementary Engineering Mathematics by Dr.B.S.Grewal.

Unit – III: (25 Hours)

Integration: Definition: Standard results – Integration by substitution – Integration by Parts.
Sections 16.1 to 16.3 and 16.8of Chapter 16ofElementary Engineering Mathematics by B.S.Grewal.

Unit – IV: (20 Hours)

Vector Calculus: Definitions and Properties of theDot or Scalar products and Cross or Vector products – Gradient – Divergence – Curl.
Chapter 4 of "Vector Analysis" by Schaum's Outline Series.

Note: No theory questions. Only direct problems from

the above said topics.Reference Books:

1. “Intermediate Mathematics” –Volume I & II by S.Chand Publications.

YOGI VEMANA UNIVERSITY

5 year M.Sc. Applied Geology (Integrated)

Semester I

Paper 16014: GENREAL ENGLISH

Course Objectives:

- To enable the learners to read appreciates different discourses like Poems, Prose pieces and Plays
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing
- Facilitate effective Listening skills for better comprehension of academic lectures
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- To improve familiarity with a variety of technical writings.
- To develop confidence in the students to use English in everyday situations
- To enable the learners to acquire structure and written expression required for their profession.

Course Outcomes:

- Understand the context, topic, and pieces of specific information.
- Applies grammatical structures to formulate sentences and correct word forms.
- Evaluates reading/listening texts and to write summaries based on global comprehension of these texts
- Creates a coherent paragraph interpreting a figure/graph/chart/table
- Listener improves Listening, Speaking, Reading and Writing skills in general.
- Develops their Oral Communication and Fluency.
- Improves awareness of English.
- Acquires a proper level of competence for employability.

SECTION	SELECTIONS	AUTHOR
Poetry- 25 Marks	1.Pied Beauty 2. Still I Rise	G.M. Hopkins Maya Angelou
Prose- 15 Marks	3.True and Rare Genius (Vemana) 4. The Power of Prayer	V Rao. Narla Abdul Kalam
One Act Play – 15 Marks	5.Thirst	M.V.Madasu

Grammar	45 marks
1. Parts of Speech 2. Tenses 3. Concord (5 Sentences out of ten)	20 Marks
4. Transformation of Sentences 5. Synonyms and Antonyms	25 Marks

Books Suggested:

1. Selections from English Prose (Common Core Syllabus), Oxford Press
2. Poetry for Pleasure (Common Core for Under Graduate)
3. True and Rare Genius – Narla's writings Vol-11.
4. Finesse, Selections from Poetry and Prose. ISBN: 9878-93-5138-119-8.
5. Non detail (Common Core for Under Graduate)
6. Murphy's English Grammar, Cambridge University Press
7. Oxford English Grammar by John Eastwood, Oxford University Press.

YOGI VEMANA UNIVERSITY

5 year M.Sc. Applied Geology (Integrated)

Semester I

Paper 16015: ENVIRONMENTAL SCIENCES

Course Objectives:
➢ To make students understand and appreciate the unity of life in all its forms and theimplications of lifestyle on the environment. ➢ To broaden the understanding of global climate changes and the importance of renewablesources of energy. ➢ To inspire students to find ways in which they can contribute personally
Course Outcomes: At the end of the course, the student should be able to ➢ Know the importance of environment and awareness on natural resources to find thecauses, effects, and consequences if not protected. ➢ Identify the numerous causes for environmental pollutions, hazards, their management,and control methods ➢ Enriching the understanding of the need for eco-balance and the importance ofbiodiversity conservation. ➢ Find ways to protect the environment on global climatic changes and their mitigation. ➢ Recognise some of the social issues and gaining knowledge on the protection of

Unit – I: Environment and Natural Resources

Definition, scope, importance, the need for public awareness on natural resources.
Forest resources – use, exploitation, causes, and consequences of deforestation.
Water resources – use of surface and subsurface water; dams - effect of drought, water conflicts. Land resources – Land degradation, soil erosion, and desertification. Indian Case studies. Food resources – Definition, world food problems, Traditional and modern agriculture, and its impacts and remedies.

Unit – II: Energy sources

renewable and non-renewable energy resourc Definition of

Non-renewable energy resources - oil, Natural gas, Coal, Nuclear energy. Renewable energy - Solar energy,hydroelectric power, Ocean thermal energy, wind, and geothermal energy. Biomass energy and Bio Gas.

Unit –III: Environmental changes and Remediation

Air, water, soil, Thermal Pollution: Causes, effects and control measures; Nuclear hazard. Solid waste Management - Causes, Effects and control measures. Floods, earthquakes, cyclones, tsunami and landslides, Case studies.

Unit-IV: Global Climatic Change and Mitigation, and Social Issues

Global climate change and the greenhouse effect – Kyoto Protocol, Carbon sequestration, Acid rain, Ozone depletion problem – Montreal Protocol. Urban problems related to energy and sustainable development, Water conservation, Rainwater harvesting, Wasteland Reclamation. Environment Protection Act - Prevention and control of Pollution of Air and Water. Wildlife protection and Forest Conservation Acts.

References

1.Prithipal Sigh (2006) Perspectives in Plant Ecology and environmental biology. Scientific Publishers Jodhpur

2. Subramanian V (2002) Text book of environmental science. Narosa Pub House, Delhi
3.Sharma PD. (2006) Ecology and environment Rastogi Publications, Meerut.
4.BiswarropMukharjee (1997) Environmental biology. Tata Mc Graw hill publishing Company Limited.
5.Kumar H.D. (1994) Environmental ecology, Vikas Publishing House Pvt. Ltd. New Delhi
6.A.B. Choudary and sarkar D.D (2006) Biodiversity Endangered. Scientific Pub.Jodhpur.
text book of environmental studies (2014). Asthana and Meera Asthana.

YOGI VEMANA UNIVERSITY

5 year M.Sc. Applied Geology (Integrated)

Semester I

16021P: Earth and Atmospheric Sciences Lab

Course Objectives: ➢ The objective of the practical is to understand the solar system by showing the models, tectonic movements, isostacy models, Maps etc. it will be easy
Course Outcomes: At the end of course, the students should able to ➢ Acquire knowledge about the universe, how it is formed and also earth as a planetits shape size and density.

List of Practical's:

1. Solar system -- Models (Size wise)
2. Ellipsoid, Geoid – Models
3. Geotectonics Models
4. Concepts of Lat-longs
5. Isostacy Models (Pratt^{s} , Airy^{s})6.
7. World, India, State, District (Relief, Rivers, Political 2D and 3D Maps)
8. Idenfication of Various features onWorld Atlas
9. Calculation of Map Scales
10. Identification of Location on Toposheets and other Maps

16012P: PHYSICS LAB

Course Objectives: ➢ To measure the viscosity of a sample liquid. ➢ To study the relation between length of a given wire and tension for a
Course Outcomes: ➢ Students develop the idea about standing waves.

List of practicals

i. Determine the acceleration due to gravity using compound pendulum.
ii. Determine the frequency of given tuning fork using Volume resonator.
iii. Determine the viscosity of water.
iv. Verify the laws of transverse vibrations of a given stretched string.
v. Study the oscillations of mass under series and parallel combinations of two springs.

16013P: CHEMISTRY LAB

Course Objectives:
➢ To give a thorough introduction to the study of coordination
Course Outcomes:
➢ Recall the concepts on Metal ligand chemistry and their complexes.

List of practicals

Inorganic chemistry

i. Acid base titrations

Determination weight of carbonate in given Sodium Carbonate solution – by using acid base titration method.

ii. EDTA titrations

Determination of weight of Zinc in given ZnSO4 solution by using standard EDTA solution. Determination of weight of copper in given CuSO4 solution by using standard EDTA solu tion.

16014P: ENGLISH LAB

Course Objectives:
➢ To enhance LSRW Skills. ➢ To improve the fluency in Spoken English ➢ To familiarize students with the use of English in everyday situations. ➢ To maintain good linguistic competency and accuracy in grammar,
Course Outcomes:
➢ Develops communication skills through various language learning activities ➢ Enriches Vocabulary knowledge ➢ Builds the LSRW skills of the students in English ➢ Enhances the ability to converse.

List of practicals

1. Enhancement of the Vocabulary
2. English structured grammar rules and regulations
3. Listening and Speaking Skills
4. Pronunciation of Phonetic Drill
5. Rhyme, Rhythm and Intonation
6. Reading and Writing Skills
7. Mock Interviews
8. Developing Presentation Skills
9. Conducting Group Discussions
10. Debates.

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

SEMESTER II

26021 - Mineralogy

Course Objectives:
➢ To understand the fundamentals of mineralogy.
Course Outcomes:
➢ Student will be able to identify the minerals in hand specimens in the museum

Unit I

Definition of mineral, chemical mineralogy, Element, Molecules Atomic structure. Bonding- types, Ionic bond and covalent bond, Ionic packing-types, Coordination number, Classification of minerals, Rock forming minerals. Silicate minerals,[Sio4] tetrahedron, linking of silicon – Oxygen tetrahedrans, Silicate Structures.

Unit II

Crystal chemistry –Isomorphism Solid solution and Exsolution, Polymorthism, Allotropy, Polytypiom, Pseudomorphism. Radio activity. Physical properties – Habit, Properties depending on light; cleavage, Fracture,Parting, Specific gravity, tenacity and Hardness.

Unit III

Physical properties depending on heat, Electricity and Magnetism. Additional properties like Odour, Taste, Touchfeel, Reaction with HCl etc., Modes of mineral formations and occurrence and association of minerals. Mineralloids. Study of Physical and Chemical Properties and mode of occurrences of tectosilicates – Silica, Felspar and Felspathoid groups, Sorosilicates – Hemimorphite, Lawsonite; Neso silicates – Olivine group; Garnet group; Epidote, Zircon, Topaz and Kayanite.

Unit IV

Study of Physical Properties , Chemical Properties and mode of Occurrence of Cyclositicates – Tourmaline Beryl ; Inosilicates -Pyroxene group; Amphibole group phyllosilicsted – Mica group; Chlorite group; Talc.

Text Books:

A Text Book of Mineralogy - E.S.Dana
Elements of Crystallography - F.A.Wade and R.B.Mattrox
Elements of Mineralogy - Rutleys
Rock forming silicates - Deer,Jushman, Housis

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

SEMESTER II

26022–Physical Geology

Course Objectives:

- The earth's surface is the only part of the planet we can directly observe. Thus "Geomorphology" is essential in that it allows students to translate what they see

Course Outcomes:

- To know about the landforms and their processes
- To explore their knowledge about internal and external movements.
- To understand geomorphic agents like wind, river, glaciers, ground water a.nd thefeatures developed by them.

UNIT I

Nature, definition, scope, fundamental concepts and Principles in Geomorphology- Geomorphic classification of Land forms – Evolution of various Land Forms- Drainage Pattern- Geomorphic Cycle and their Rocks- Origin – Classification – Distribution

UNIT II

Earth Movements – Epeirogenic and Orogenic Earth movements- Theories ofand Continental Drift – Isostasy Plate tectonics – Earthquakes - Volcanoes and their distribution.

UNIT III

Geomorphic agents and processes – Weathering – Erosion –Mass wasting –Cycles of erosion Concept – Land forms of Sea – Marine deposits – Coral reefs- Lacaustrine deposits-Earth's Heat Budget and Global Climate Change.

UNIT IV

Geomorphic processes – Erosional and Depositional Land forms made by Fluvial, Glaciers, Aeolian, Karst topography and Seas and Oceans.

Text Books:

1. Text Book of Geomorphology - A.L.Bloom
2. Principles of Geomorphology -W.S. Thornbury
3. A text Book of Geomorphology - P.Dayal

4. Indian Geomorphology - H.S. Sharma

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester II

Paper 26013: PHYSICAL SCIENCES-II

Part A: Physics of Thermodynamics and Optics

Course Objectives: ➢ State the first law of thermodynamics and understand its implications. Explaincyclic processes and apply this to heat engines. ➢ State the second law of thermodynamics and understand its implications. Developan appreciation of the concepts of order, disorder and entropy. ➢ Define diffraction and gain an understanding of its occurrences.
Course Outcomes: ➢ Students will be able to determine the reversibility or irreversibility of athermodynamic process. ➢ Student should understand importance gas refrigeration cycle. ➢ Analyse the intensity variation of light due to Polarization, interference,

Unit-I: Thermodynamics (15 hours)

The zeroth law and first law of thermodynamics – Internal energy – work done in isothermaland adiabatic processes – reversible and irreversible processes – Carnot's theorem – Carnot's engine – efficiency – Clausius – Clapeyron equation. Second law of thermodynamics – entropy – concept – entropy and disorder measurement of entropy changes in reversible and irreversible processes – entropy of universe. Joule – Kelvin effect – expression for Joule - Kelvin coefficient – Liquefaction of gases – Principle of Refrigeration.

Unit-II: Interference Diffraction & Polarization (13 hours)

Interference of light – the principle of superposition – Young's double slit theory and experimen - Diffraction – Fraunhofer diffraction – Fraunhofer diffraction at a single slit and double slit. Diffraction grating – Grating spectrum – Fresnel half period zones – zone plate. Polarization – Nicol prism – theory of circular and elliptical polarized light – Quarter and Half wave plates – Polarimeter experiment.

Reference Books:

1. B.Sc. Phyics Vol.-II by Sastry and Babu Rao (S. Chand and Co.)
2. Optics by Brijlal and Subrahmanyam (S. Chand and Co.)
3. Heat and Thermodynamics by Brijlal and Subrahmanyam (S. Chand and Co.)
4. B.Sc. Physics Unified Physics- II by Gupta and Gupta (Jai Prakashnath& Co.)

Part-B: Physical Chemistry

Course Objectives:
Course Outcomes: ➢ Recall the concepts on adsorption isotherms, kinetics of surface reactions andthermodynamics of surfaces.

Unit–I: Chemical kinetics

Rate of a reaction, factors of influencing the rate of a reaction-concentration, temperature, pressure, solvent, catalyst and light. Concentration dependence of rates, mathematical characteristics of simple chemical reaction-zero order, first order second order, pseudo first order, Half-life. Determination of order of a reaction-deferential method, method of integration, half-life method and isolation method. Methods of determining order of a reaction.

Unit–II: Phase Equilibria

Homogeneous and heterogeneous system, statement and meaning of the terms-Phase, Component and degrees of freedom, Gibb's Phase rule, phase equlibria of one component system-water system. Phase equlibria of two-component system-solid-liquid equlibria, simple eutectic. Pb-Ag system, desilverization of lead. Solid solutions-definition of compound with congruent melting point system and incongruent melting point system. NaC1-H2O system.

Reference books

1. Thermodynamics for Chemists by S. Glasstone
2. Chemical Thermodynamics by R.P. Rastogi & S.S. Misra
3. Advanced Physical Chemistry by Gurdeep Raj
4. Principles of Physical chemistry by Puri, Sharma and Pathania

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester II

Paper 26014: COMPUTER SCIENCE - I

Course Objectives:

- To familiarize students with Microsoft Word, Excel and PowerPoint.
- To learn the fundamental programming concepts and methodologies which are essential to building good C/C++ programs.
- To practice the fundamental programming methodologies in the C/C++

Course Outcomes:

- Students will be able to open, edit and save the document in formats that arecompatible with other word processing applications.
- Student can create documents with MS word which can easily be accompanied intoMS PowerPoint, Excel or any other MS office applications.
- It helps them to prepare presentation for their academic purpose as well as officialpurpose.

Unit-I:

Creating new document; opening existing document; file, edit, insert format, tools, table, and window menu commands. Working with excel; spread sheet features; file, edit, insert format and tools, using different types of charts. MS power point: auto content wizard; master slides; fines with other presentations

Unit-II:

Introduction to C-programming language: History of C-program, structure of C-program, identifiers' and keywords, data types, constants, variables, arrays and pointers. Operators and Expressions: Arithmetic operators, unary operators, relational and logical operators, assignment operators, conditional operators and library functions

Unit-III:

Control statement: Branching: if-else statement; Looping: while-loop, do-while and For-loop statement; Jumping: break, continue, go to; switch statement and comma statement, I/O statements Function: defining a function, accessing a function, function prototype, passing arguments to a function, recursion; Arrays-one dimensional, Two-dimensional, pointers, structures and unions.

Unit-IV:

Algorithm and its characteristics, pseudo code / flow chart, program. Object Oriented Programming: Introduction, Generation of programming Languages, Programming Paradigms, Features of Object Oriented Programming, Merits and Demerits of Object Oriented Programming Language. Basics of C++ Programming: Introduction, History, Structure, Writing the First C++ Program, Files used in a C++ Program, Compiling and Executing,

References

1. MS office book 2007
2. Let us C by Yashavant Kanethkar
3. ANSI-C by Balaguruswamy
4. Reema Thareja "Object Oriented Programming with C++" Oxford university Press, 2015

Recommended Books :

1. E. Balagurusamy "Object Oriented Programming with C++" TMH, 6th edition, 2013.

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester II

Paper 26015: LANGUAGE SKILLS AND COMMUNICATION - I

Course Objectives:

- To enable the learners to read appreciates different discourses like Poems, Prose pieces and Plays
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing
- Facilitate effective Listening skills for better comprehension of academic lectures
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- To improve familiarity with a variety of technical writings.
- To develop confidence in the students to use English in everyday situations
- To enable the learners to acquire structure and written expression required for their profession.

Course Outcomes:

- Understand the context, topic, and pieces of specific information.
- Applies grammatical structures to formulate sentences and correct word forms.
- Evaluates reading/listening texts and to write summaries based on global comprehension of these texts
- Creates a coherent paragraph interpreting a figure/graph/chart/table
- Listener improves Listening, Speaking, Reading and Writing skills in general.
- Develops their Oral Communication and Fluency.
- Improves awareness of English.
- Acquires a proper level of competence for employability.

*****75 Marks

I. Communication 20 Marks

1. Objectives of Communication
2. Types of Communication
3. Verbal and Non-verbal Communication
4. Characteristics of Successful Communication
5 Principles and Barriers of Communication

II. Listening 15 Marks

1. The Listening Process 2. Types of Listening
3. Principles of Good Listening 4. Listening with a purpose
5. Barriers to Listening

III. Speaking 20 Marks

1. Phonetics 2. The Syllable 3. Word Stress
4. Accent and Rhythm in Connected Speech 5. Intonation
6. American and British Accents

IV. Writing 20 Marks

1. Principles of Effective writing 2. Formal and Informal Letter Writing
3. E-mail 4. Resume 5. Job application

Reference books suggested:

1. Essentials of Business Communication by Rajendra Rao
2. A Course in Listening and Speaking II
3. Business Correspondence and Report Writing R.C. Sharma Krishna Mohan
4. The Oxford Guide to Writing and Speaking by John Seely, (Oxford)
5. Developing Communication Skills by Krishna Mohan & Meera Benerji, Macmillan.
6. Effective Technical Communication – M. Ashraf Rizvi (Tata Mc Grew Hill)
7. Communication – C.S. Rayudu, Himalaya Publishing House
8. Business Communication – D.D. Chaturvedi, Mukesh Chaturvedi (Pearson Edu.)
9. Communication Skills – Dr. Nageshwara Rao, Dr. Rajendra P. Das (Himalaya Publication House)

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

SEMESTER II

26021P–Minerology Lab

Course Objectives:

- To prepare the students ready to identify the minerals by observing their physicalproperties in the museum and in the field.
- To boost the confidence of the students to identify the economically

Course Outcomes: Students will have practical knowledge on following at end of course

- Students will appreciate in identifying the minerals in and around the museum andin the field.
- Students will get the knowledge of various silicate minerals and their

Practical's List

1. Identification of minerals specimens with their physical properties.
   a) Quartz varieties – Rock crystal, Green quartz, Yellow quartz, Pink quartz, Milky quartz, Amethyst, Opal, Chalcedony, Flint, Jasper, Agate,
   b) Feldspars- Plagioclase orthoclase, Microcline, Diopside
   c) Garnet
   d) Talc
   e) Gypsum
   f) Calcite
   g) Fluorite
   h) Apatite
   i) Beryl
   j) Phlagopite
   k) Tourmaline
   l) Topaz
   m) Corundum
   n) Trermolite
   o) Hornblende
   p) Augite
   q) Enstatite
   r) Hypersthene
   s) Alumino silicates – Kyanite, Sillimanite, Andalusite
   t) Mica – Muscovite, Biotite, Chlorite Mica
   u) Epidote
   v) Zircon
   w) Serpentine
   x) Steatite
2. Determination of specific gravity of minerals.

26012P: PHYSICS LAB-II

Course Objectives:

- Recognize that the shorter the wavelength of light, the grater its deviation by aprism.
- The students are made to determine the width of a single slit by observing

Course Outcomes: Students will have practical knowledge on following at end of course

- They would also learn optical phenomena such as interference, diffraction and dispersion and do experiments related to optical devices: Prism, grating, spectrometers.
- Understand how to use a spectrometer.
- Obtain a practical understanding of the refraction of light by a prism.

List of practicals

1. To form a wedge shaped air film between two glass plates with a given wire anddetermine the thickness of the given wire.
2. To determine the Radius of curvature of the given plano-convex lens by forming Newton's Rings?
3. To determine the dispersive power of the material of a given quartz prism using a spectrometer?
4. To determine the wavelengths of a given white light using a plane transition grating placed in normal incidence position.
5. To determine the refractive index (M) of a given liquid and glass using boy's method

26013P: CHEMISTRY LAB-II

Course Objectives:

Course Outcomes:

- Recall the concepts on adsorption isotherms, kinetics of surface reactions andthermodynamics of surfaces.

List of practicals

Physical chemistry

1. Chemical kinetics: Determination of specific rate of the hydrolysis of methyl/ethyl acetate catalyzed by hydrogen ion at room temperature.
2. Electrochemistry: Determination of HCl strength conductometrically using standard NaOH
3. Critical solution temperature (CST): Determination of CST of phenol-water system.
4. Determination of adsorption isotherm of acetic acid on activated

26014P: COMPUTER SCIENCE LAB – I

Course Objectives:
➢ To familiarize students with Microsoft Word, Excel and PowerPoint ➢ To learn problem solving techniques
Course Outcomes: After the completion of this course the student would be able to
➢ Student can create documents with MS word which can easily be accompanied intoMS PowerPoint, Excel or any other MS office applications.

List of programmes

1. To create a resume using MS Word
2. Procedures to create a worksheet with 4 columns enter 10 records and find the sum of all columns
3. Procedures to create a simple bar chart to high light the sales of a company for 3 different periods
4. Write a C program to find the largest two numbers using if and conditional operator.
5. Write a C program to calculate arithmetic operations of two numbers using switch.
6. Write a C program to print the reverse of a given number.
7. Write a C program to print whether the given number is a prime or not.
8. Write a C program to find the sum of two matrices
9. Write a OPP program that will ask for a temperature in Fahrenheit and display in Celsius.
10. Write a OPP program which accepts marks of three subjects. Calculate total & average marks and also check student is pass or fail. (If average above or equal to 50 the „Pass").

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester III

Paper: 36021: Crystallography and Optical Mineralogy

Course Objectives:

- To understand the Concepts in crystallography and mineralogy.
- To make the students skilful to find out the symmetry elements of crystals.
- To make the students ready to identify minerals and rocks by the study of

Course Outcomes: After the completion of this course the student would be able to

- Students will gain skill in doing three symmetry operations.
- To identify the system, class, and symmetry elements and forms.
- By the study of optical properties, students will be able thorough identify

UNIT I

Definition of Crystal –Amorphous and Crystalline states, Concept of Crystal field theory and Mineralogical spectroscopy, Lattice Defects (point, line and planar) -Morphology of Crystals- Face, Edge, Solid angle, Interfacial angle – Forms of crystals- Symmetry- Parameters – Crystallographic notation – Miller Index.

UNIT II

Classification of Crystals into 7 systems- Morphological characters of 7 crystalsystems- Twin Laws - Twinning in Crystals.

Unit III

Principles of optics –Theories of light – refringence, birefringence, Index of refraction, Dispersion, reflection, Critical angle – Total Reflection. Snell's law of refraction, Double refraction – Polarisation, Polarising Microscope – Optical accessories. Uniaxial & Biaxial minerals Interference colours, Retardation, Formation of Interference figures. Axial angles 2V & 2E, Dispersion in Biaxial Interference Figures.

Unit –IV

Uniaxial & Biaxial minerals, Fletchers Indicatrix, Optical ellipsoids Interference colours – Retardation – Determination with Bereck Compensator. Extinction – Types, elongation sign of elongation – Optical properties of Uni & Biaxial minerals Quartz, Calcite Beryl, Zircon, Apatite, Corundum & Olivine, Hournblende, Hypersthene, Augite, Albite, Kayanite, Gypsum, Orthoclase, Biotitie.

References and Text Books:

1. Elements of Crystallography - F.A.Wade and R.B.Mattrox
2. Rock forming sillicates - Dear,Jushman, Housis.
3. Rutley's Elements of Mineralogy -H.H.Reed
4. Manual of Optical Mineralogy -Shelly
5. Optical Mineralogy - Paul F. Kerr
6. Mineral Opticics -Phillips W.R
7. Elements of Optical Mineralogy -Winchell A. N

YOGI VEMANA UNIVERSITY

5 year M.Sc. Applied Geology(Integrated)

Semester III

Paper 36022: GEOSTATISTICS

Course Objectives:
To educate the learners on statistical tools that could support data analysis pertaining togeological studies.
Course Outcomes: After the successful completion of this course, the students are able to:
Ability to analyse and interpret gathered data in a research process

Unit I

Basic Statistics : Frequency Distributions, Cumulative Frequency Distributions and Frequency Curves, Measures of Central Tendencies – (Mean, Median and Mode) - Measures of Dispersion – (Range, Variance and Standard Deviation).

Unit II

Regression Analysis: Linear Correlation Coefficient - Linear Regression - Non- Linear Regression - Multiple Correlation and Multiple Regression, Factor and Factor Varimax analysis.

Unit III

Sampling: Theory of Sampling - Population and Sample - Sampling Survey Methods - Estimation of Mean and Proportion in Simple Random Sampling.

Unit IV

Statistical inference: Testing of Hypothesis and Tests of Significance for Mean, Proportion and Variance.

References Books

1. Urray R. Spiegel, Theory And Problems Of Statistics, Schaum's Outline Series - Mcgraw Hill Book Company, 1972.
2. Sizeh, B, Use And Abuse Of Statistical Methods In The Earth Science, Oxford
3. University Press, Oxford, 1987.
4. Margaret Armstrong: Basic Linear Geostatistics, Springer, 1998.
5. Taxali, PC Software Made Simple, Tata Mc Graw hill Publications, 1987.

YOGI VEMANA UNIVERSITY

5 year M.Sc. Applied Geology(Integrated)

Semester III

Paper 36013: PHYSICAL SCIENCES-III

Part A: Physics of Semiconductor devices and Lasers

Course Objectives: ➢ To introduce the operation of semiconductor devices. ➢ Characteristics and biasing of diodes and transistors, design and analysis of circuits. ➢ Understand basic laser physics. Describe the concept of stimulated emission
Course Outcomes: ➢ Classify solids on the basis of band theory and to calculate conductivity of semiconductors. ➢ Explain the working of p-n junction and zener diode. ➢ Apply concepts of semiconductor devices to design and analyze circuits.

Unit-I: Semiconductor devices (15 hours)

Intrinsic and extrinsic semiconductors –p-n junction diodes –energy band diagram - Zenerdiode – applications of Zener diode – tunnel diode – transistors - Bipolar junction transistor- p-n-p transistors - CB,CE,CC configurations - hybrid transistor hybrid parameters - determination of parameters from transistor characteristics.

Unit-III: Lasers (10 hours)

Characteristics of Laser Introduction –

– Spontaneous and Stimulated emission of radiation – Einstein's coefficients – Population inversion – Ruby Laser – Helium- Neon Laser –Applications of Lasers In Industry, Scientific and Medical Fields.

Reference Books

1. B.Sc. Physics: Unified Physics Vol.III
2. Engineering Physics by M. R. Srinivasan, New Age Publications

Part B - Organic Chemistry

Course Objectives:

- To give a thorough introduction to the study of Structural theory in

Course Outcomes:

- Recall the concepts on organic chemistry of carbon compounds.

Unit–I: Structural theory in Organic Chemistry (12 hours)

Bond polarization: Factors influencing the polarization of covalent bonds, electro negativity – electromeric effect, inductive effect, mesomeric effect or resonance and hyperconjugation, and their applications. Concept of aromaticity-definition, Huckel's rule-application to Benzenoid and Non-benzenoid compounds. Reactions-General mechanism of electrophilic substitution, mechanism of nitration and sulfonation. Mechanism of halogination, FriedelCraft's alkylation and acylation. Orientation of aromatic substitution-definition of

ortho, *para* and *meta* directing groups

Unit–II: Stereochemistry of carbon compounds (12 hours)

Molecular representations: Wedge, Fischer, Newman and Saw-horse formulae, stereoisomers: enantiomers and diastereomers, conformational and configurational isomerism. Enantiomers: Optical activity: wave nature of light, plane polarized light, interaction with molecules, optical rotation and specific rotation. Chiral centers: definition- molecules with similar chiral carbons-definition of mesomers. Molecules with dissimilar chiral carbons. Number of enantiomers and mesomers-alculation. D, L & R, S configuration for symmetric and dissymmetric molecules. Cahn-Ingold-Prelog rules. Racemic mixture, racemization and resolution techniques.

Reference Books*Organic Chemistry*

1) Advanced Organic chemistry- Reactions, Mechanism and Structure, Jerry March, Wiley.
2) Organic Chemistry, R.T. Morrison & R.N. Boyd, Prentice-Hall.
3) Text book of Organic Chemistry, T.W. Solomon.
4) Stereo Chemistry, P.S. Kalsi
5) Reaction mechanisms by P.S. Kalsi
6) A guide book to Mechanisms in Organic Chemistry by Mukherji & S.P. Singh

YOGI VEMANA UNIVERSITY

5 year M.Sc. Applied Geology(Integrated)

Semester III

Paper 36014: COMPUTER SCIENCE - II

Course Objectives:

- Comparison between procedural languages and object oriented languages.
- The concepts of operator overloading and function overloading, files,

Course Outcomes: An understanding of the principles behind the object oriented development process.

- Competence in use of object oriented programming language in the development

Unit-I

INTRODUCTION TO PROGRAMMING LANGUAGES: The Evolution of Java, Object-Oriented Programming Concepts and Java, The Primary Characteristics of Java, The Architecture, Simple Java Program, More of Java, An Application with Two Classes Java Program structure, Java Tokens, Java Statements, Implementing a Java Program, Java Virtual Machine, Programming Style. Branching: Constants, Variables, and Using Data Types, Operators and Expressions, Type conversion and Associativity, Mathematical Functions.

Unit-II

DECISION MAKING AND INTRODUCTION: Decision Making with if Statement, Simple if Statement, The if …… else Statement, Nesting of if …… else Statements, The else if Ladder, The Switch Statement, The?: Operator. Decision Making and Looping: Introduction. The while Statement, The do Statement, the for Statement, Jumps in Loops Labeled Loops

Unit-III

INTRODUCTION TO PYTHON: Getting Started with Python, Essentials of Python Programming, Integers, Floating point Numbers, Strings, Variables and its Scope: Variables, Modifying values, Type Conversion, Selection Control Statements, Collections: Lists, Tuples, Sets, Ranges, Dictionaries, Two Dimensional Sequences, Loop Control Statements.

Unit-IV

INTRODUCTION TO OBJECT ORIENTED PROGRAMMING IN PYTHON: Programming Paradigms, Objects, Classes, Python Classes, Specifying Attributes and Behaviours, Abstraction, Encapsulation, Polymorphism, Inheritance, Composition.

Text books:

1. “Introduction to Java Programming” by Daniel Liang.
2. E. Balaguruswamy, Programming with JAVA, A Primer, TMH (1999) Chun, J Wesley, Core Python Programming, Second Edition, Pearson, 2007 Reprint 2010
3. Barry, Paul, Head First Python, 2nd Edition, O Rielly, 2010
4. Lutz, Mark, Learning Python, 4th Edition, O Rielly, 2009

References

1. Darrel Ince & Adam Freeman, Programming the Internet with Java, Addison – Wesley, (1997).
2. KenArnold & James Gosling, The Java Programming Language, Addison – Wesley, (1998)
3. Patrick Naughton & Herbert Schildt, JAVA 2: The Complete Reference, 3rd Edition, TMH, (1999).
4. Dusky Phillips, Python 3 Object-oriented Programming - Second Edition

YOGI VEMANA UNIVERSITY

5 year M.Sc. Applied Geology(Integrated)

Semester III

Paper 36015: LANGUAGE SKILLS AND COMMUNICATION - II

Course Objectives:

- To enable the learners to read appreciates different discourses like Poems, Prose pieces and Plays
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use inspeech and writing
- Facilitate effective Listening skills for better comprehension of academic lectures
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Focus on appropriate reading strategies for comprehension of various academic texts and authenticmaterials
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing wellorganized essays, record and report useful information
- To improve familiarity with a variety of technical writings.

Course Outcomes:

- Understand the context, topic, and pieces of specific information.
- Applies grammatical structures to formulate sentences and correct word forms.
- Evaluates reading/listening texts and to write summaries based on global comprehension of thesetexts
- Creates a coherent paragraph interpreting a figure/graph/chart/table
- Listener improves Listening, Speaking, Reading and Writing skills in general.
- Develops their Oral Communication and Fluency.
- Improves awareness of English

75 MARKS

I. Listening (20 Marks)

1. Listening Comprehension 2. Effective Listening Strategies
3. Listening to Structured Talks 4. Intensive Listening
5. Team Listening (Listening & Note Taking)

II. Speaking (20 Marks)

1. Oral Communication 2. Presentation Skills
3. Use of Visual Aids 4. Group Discussion 5. Facing Interviews

III. Reading (15 Marks)

1. Types of Reading 2. Understanding the gist of an argument
3. Identifying the topic sentence

IV. Writing (20 Marks)

1. Paragraph Writing **d:**
3. Minutes Drafting

B o o k s

s u g g e s t e

Report Writing

2. 4. Information Transfer 5. Interpreting Data Editing a Passage

1. Essentials of Business Communication by Rajendra Rao
2. A Course in Listening and Speaking II
3. The Oxford Guide to Writing and Speaking by John Seely, Oxford
4. Developing Communication Skills by Krishna Mohan and Meera Benerji (Macmilan)
5. Speaking English Effectively by Krishna Mohan and N.P. Singh (Macmilan)
6. Effective Technical Communication – M. Ashraf Rizvi (Tata Mc Grew Hill)
7. Communication – C.S. Rayudu, Himalaya Publishing House
8. Business Communication – D.D. Chaturvedi, Mukesh Chaturvedi (Pearson Edu.)
9. Communication Skills – Dr. Nageshwara Rao, Dr. Rajendra P. Das (Himalaya PubHouse)

YOGI VEMANA UNIVERSITY

5 year M.Sc. Applied Geology(Integrated)

Semester III

Paper 36021P: Crystallography and Optical Mineralogy Lab

Course Objectives:

- To train the students to identify and describe the symmetry elements and forms ofcrystals.
- To make the students to identify the minerals in the lab & field by their

Course Outcomes:

- Students will be able to describe the symmetry and forms of crystal.
- By the observation of optical properties students will be able to identify

List of Practical's:

1. Study of symmetry and form of the all classes of seven crystal systems.
2. Study of optical properties of selected minerals.
3. Extinction, Pleochroism, Birefringence and optical sign.

36012P: PHYSICS LAB

Course Objectives:

- To provide practical knowledge about the DC & AC circuits, different wiring

Course Outcomes:

List of practical's

1. Draw the junction characteristic curve of the given P-N junction diode.2.

3. Study the characteristics of P-N-P Transistor in the Common Emitter Configuration and to determine the Transistor parameters.

36013P: CHEMISTRY LAB III

Course Objectives:

- To give a thorough introduction to the study of Structural theory in

Course Outcomes:

- Recall the concepts on organic chemistry of carbon compounds.

List of practical

Organic chemistry:

1. Qualitative analysis: identification of an organic compound through the functional groupanalysis and preparation of suitable derivatives

2. Preparations

a) Preparation of *p*-bromo acetanilide

b) Preparation of *p*-nitro acetanilide

36014P: COMPUTER SCIENCE LAB - II

Course Objectives:

- To understand the basic concepts and fundamentals of platform independent objectoriented language.
- To introduce the fundamentals of Python Programming language.

Course Outcomes: After successful completion of course, the students are able to

- Use the syntax and semantics of java programming language and basic concepts ofOOP.
- Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages.
- Discuss the fundamentals of Python programming language.
- Explain Object Oriented programming features of Python and process tuples andsets.

Programs List:

1. Write a java program that swaps two numbers
2. Write a java program to find the given number is palindrome or not
3. Write a java program to perform quadratic equation
4. Write a java program to perform the factorial value
5. Write a java program to print the below pattern
   a) ******
      ******
      ******
   b) ******
      *****
      ***
      **
6. Write a python program to print prim numbers less than 20:
7. Write Python program to Take **N** float numbers as an input from the user, the find the average.
8. Write a python program to create, append and remove lists in python.
9. Write a program to demonstrate working with dictionaries in python
10. Write a python program to find largest of three numbers

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester IV

Paper 46021: Igneous Petrology

Course Objectives:

- To provide knowledge on classifications, structures and functions of various Todevelop skill and abilities in the identification of rocks with their texture.
- To determine the genesis of various rocks in hand specimen and their significance inevolution of crustal units.

Course Outcomes:

- To gain knowledge on the igneous rocks and the conditions under which they form.
- To understand the structures and textures, properties and classification of differenttypes of Igneous rocks.

Unit – I

Introduction to igneous petrology – Earth zones – Formation of igneous rocks – Crystallization of unicomponent magma – Grain of igneous rocks – Formation of glass.
Crystallisation of Binary magmas – Eutectics – Mixed crystals – Crystallisation of ternary magmas – the reaction relation. Forms of intrusive igneous rocks; concordant forms and discordant forms. Composite intrusions, multiple intrusions.

Unit – II

Structures: Vesicular and amygdaloidal, block lava, ropy lava, pillow, flow, jointing, sheet & platy structures, columnar and prismatic structures. Textures – Definition of Texture, crystallinity, granularity, shapes of textures, micro-structures, devitrification, allotriomorphic, hypidiomorphic, panidiomorphic, porphyritic, poikilitic, ophitic, trachytic, graphic and micro-graphic textuires. Reaction structures corona, myrmekitic, orbicular, spherulitic.

Unit – III

Classification of igneous rocks- CIPW, IUGS and tabular classification, nomenclature of Igneous rocks, composition and constitution of magma. Magmatism and tectonics, interrelationship between tectonic settings and igneous rock suite. Bowen's reaction principle. Origin of primary basic magmas.
Differentiation, assimilation, role of volatiles in evolution of magmatic rocks, role of trace elements in igneous petrogenesis. Geothermo metry, geobaro metry.

Unit – IV

Study of from structure, texture, model mineralogy, petrogenesis and distribution of the following rock types: granite, granodiorite, syenite, nepheline syenite, diorite, porphyry, pegmatite, aplite, gabbro, anorthosites, peridotite, pyroxenite, dunite, dolerite, rhyolite, obsidian, trachyte, andesite ,basalt.Kimberlite , lamprophyres, Carbonatite, komatite. Introduction to IG PET software.

Reference Books:

1. Philpotts, A., 1992. Igneous and metamorphic petrology
2. Best, M.G., 1986. Igneous and metamorphic petrology
3. Raymond, L.A., 1995. Petrology
4. Tyrrell, G.W. The principles of petrology
5. Turner & Verhaugen. Igneous and Metamorphic Petrology

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester IV

Paper 46022: Metamorphic Petrology

Course Objectives:

- The objective of the paper is to make the student to understand about metamorphic processes and evolution of various metamorphic rocks and their significance in evolution of crustal units.

Course Outcomes:

- To gain knowledge on the metamorphic rocks and the conditions under which theyform.
- To understand the properties and classification of different types of metamorphicrocks.
- To understand the process of formation of metamorphic rocks.

Unit – I

Definition of metamorphism, agents of metamorphism, types of metamorphism, zones of metamorphism – metamorphic minerals – stress and anti-stress minerals. Structures of metamorphic rocks – cataclastic, maculose, schistose, granulose and gneissose. Textures of metamorphic rocks – crystalloblastic, palimpsest, xenoblastic, idioblastic.

Unit – II

Classification of metamorphic rocks, concept of metamorphic facies. Cataclastic metamorphism of argillaceous and arenaceous rocks. Thermal metamorphism of argillaceous, arenaceous and calcareous rocks, dynamothermal metamorphism of argillaceous, arenaceousand igneous rocks. Plutonic metamorphism.

Unit – III

Mineral assemblages and pressure, temperture conditions, characteristics of different grades and facies of metamorphism. Metasomatism and additive processes. Metamorphism and granitization, Metamorphic differentiation: anatexis and origin of migmatites. Regional metamorphism and paired metamorphic belts in reference to plate tectonics.

Unit – IV

Descriptive study of the following metamorphic rocks, gneiss, schist, slate, phyllite, quartzite, marble, granulite, eclogite, amphibolite, migmatite, gondite, charnockite and khondalite.

Reference Books:

1. Philpotts, A., 1992. Igneous and metamorphic petrology
2. Best, M.G., 1986. Igneous and metamorphic petrology
3. Raymond, L.A., 1995. Petrology
4. Tyrrell, G.W. The principles of petrology
5. Yardley, B.W., 1989. An introduction to metamorphic petrology
6. Turner & Verhaugen. Igneous and Metamorphic Petrology

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester IV

Paper 46023: Sedimentology

Course Objectives:
➢ The objective of the course is to make the student to understand about sedimentary processes and sedimentary environments and facies and find out the variance of the sedimentary rocks.
Course Outcomes:
➢ Gets the knowledge of different type of weathering processes, classification of sedimentary rocks, sedimentary environments and facies, palaeo environment and pale climate analyses. ➢ They gain knowledge on the impact of different agents on sedimentary deposition. ➢ They get understand about all type of Sedimentary rocks and rock properties.

UnitI

EarthSurfaceSystem:Liberationandfluxofsediments,Physical,ChemicalandBiological processes. Sedimentary structures and textures. Classification of Sedimentary Rocks;Sedimentationand tectonics.

Unit II

Sedimentary environments and facies. Continental alluvial-fluvial, lacustrine, desert-aeolianandglacialsedimentarysystems.Shallowcoastalclastics.Marineandcontinentalevaporit es. Shallow water carbonates. Deep sea basins. Volcanoclastic: on-land and marine.Palaeocurrentsandbasinanalysis.Conceptofsedimentaryfacies;basicprinciplesofpalae oenvironment and palaeoclimate analysis. Facies modeling for marine, non marine andmixed sediments.

UnitIII

Application of trace element, rare-earth element and stable isotope geochemistry sedimentlogicalproblems

Unit IV

Provenance and Diagenesis of terrigeneous and chemical sediments. Diagenesis ofmudstones,sandstones,andcarbonaterocks:changesinmineralogy,fabricandchemistry.Descriptive study of Common Sedimentary Rocks – Conglomerate, Breccia, Sandstone,Shale,Limestone, Laterite

ReferenceBooks:

1. Pettijohn,F.J.,Potter,P.E. andSiever,R.C., 1990:sandandsandstone. Springer-Verlag
2. BoggsSamJr.,1995:PrinciplesofsedimentologyandStratigraphy,PrenticeHall.
3. Sengupta,S.,1997:IntroductiontoSedimentology, Oxford-IBH
4. Davis,R.A.Jr.,1992:DepositionalSystemsPrenticeHall.
5. Nichols,G.,1999:SedimentologyandStratigraphy.Blackwell.
6. Sloss.SedimentaryTectonics

5 Year M.Sc. Applied Geology
(Integrated)Semester IV

PAPER 46014: PRINCIPLES OF MANAGEMENT AND ENTREPRENEURSHIP

Course Objectives: To understand the

- Concept and functions of management
- role and importance of entrepreneurship in economic development
- financial and institutional assistance to entrepreneurs
- various Government schemes for Entrepreneurs

Course Outcomes: After successful completion of this paper, the students are able to

- gain knowledge on smooth functioning of enterprise management
- aware the opportunities and problems in Entrepreneurship
- understand and utilise the finance and institutional support for startingEntrepreneurship
- get awareness on the Govt. schemes and its utilization

Unit-I: Introduction to Management: Definition - Concept – Significance - Principles - Functions of Management: Planning – organizing - staffing – directing – Coordination - Leadership – Controlling

Unit-II: Entrepreneurship: Entrepreneur – Entrepreneurship - Entrepreneurship development - Factors Affecting Entrepreneurial Growth – Opportunities and Problems in Entrepreneurship Development - Role of Entrepreneurship in Economic Development - Entrepreneurship Development Programmes (EDPs)

Unit-III: Financial and Institutional Support for Entrepreneurship – Need – Financial institutions: Commercial banks - IDBI, IFCI, ICICI – SFCs – IRBI – SIDC – SIDBI - Exim Bank; Institutional support : NSIC – SIDO – SSIB – SSID – SISIs – DICs – TCOs – Industrial estates – Specialized institutions

Unit-IV: Government schemes for Entrepreneurs: Importance - Entrepreneurship Development Schemes: Gram Udyog Vikas Yojna - National SC-ST Hub - Ambedkar Social Innovation & Incubation Mission - Work-Shed Scheme for Khadi Artisans - Honey Mission Programme / Beekeeping - Pottery Activity under Gramodyog Vikas Yojana Scheme - Pradhan Mantri Mudra Yojana (PMMY) - PM SVANidhi

Reference Books:

1. Subba Rao P., Management & Organisational Behaviour, Himalaya Public, New Delhi.
2. Koontz and Weichrich; Essential of management, Text and cases, Tata Mcgraw.
3. S.S. Khanka, Entrepreneurship Development, S. Chand Publications, New Delhi
4. Vasanth Desai, Dynamics of Entrepreneurship Development and Management, Himalaya
5. Publications, New Delhi.
6. BEVL Naidu, Entrepreneurship, Himalaya Publications, New Delhi

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester IV

Paper 46025: Value/Skill Based Course (Computer Application for Geosciences)

Course Objectives:

- Geoscience is a practical subject with applied problem-solving laboratory classes and field courses so computer applications are necessary for students to do their

Course Outcomes: After successful completion of this paper, the students are able to

- To learn how to interpret map and geologic features
- To identify geological resources by using spatial technology on the computers
- To make maps manually now using Geographical Information System, AutoCAD, made

Unit I

Introduction: History, Scope, Reference Systems, Data formats, Toposheets. Open Source Software. Plotting locations on the map and Open Series Maps of India.

Unit II

AutoCADD :Introduction - Configuring the system - Template - AutoCAD window - Function Keys - Pull down Menu Bar - Dialog Box - Tool Bars - Palettes - Drawing, Selecting and Editing Commands. Drafting Settings - Layers - Object Snap - Units and Precision - Break - Trim - Extend - Move - Explode - Copy - Mirror - Fillet - Chamfer - Hatch - Gradient Fill. Text and Text Editing - Coordinate Input - UCS & Polar Coordinates, Tracking and Snap - Scale - Stretch - Rotate. Page Setup - Scale - Paper Space - Basic Plotting.

Unit III

Installation, Introduction, Menu Bar Tool Bar, Grid files, menu surface plot andInterpolation. Introduction to Grid, Gridding Methods, Contour Mapping and 3Dviews, Overlays and individual maps

Unit IV

Open source Geospatial Data, Web Geoportals, Exploration and Data download

Reference Books:

1. CSE Practice Skills in Maps &Toposheets --K S Randhawa
2. Institute of Science and Technology Course material –Integrated GIS and CAD

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester IV

Paper 46021P: Igneous Petrology Lab

Course Objectives:

- To develop skill and abilities in the identification of rocks with their texture.
- To determine the genesis of various rocks in hand specimen and thin sections.
- To calculate the CIPW norm form calculations.

Course Outcomes:

- Students will acquire practical experiences on the identification of the rock specimen inhand specimenand thin sections
- Students will able to calculate the CIPW norm form calculations and identify category ofrock types.

Practical's List

1. Megascopic and Microscopic Identification of granite
2. Megascopic and Microscopic Identification of granodiorite
3. Megascopic and Microscopic Identification of syenite
4. Megascopic and Microscopic Identification of nepheline
5. Megascopic and Microscopic Identification of diorite
6. Megascopic and Microscopic Identification of porphyry
7. Megascopic and Microscopic Identification of pegmatite
8. Megascopic and Microscopic Identification of aplite
9. Megascopic and Microscopic Identification of gabbro
10. Megascopic and Microscopic Identification of anorthosites
11. Megascopic and Microscopic Identification of peridotite
12. Megascopic and Microscopic Identification of pyroxenite
13. Megascopic and Microscopic Identification of dunite
14. Megascopic and Microscopic Identification of dolerite
15. Megascopic and Microscopic Identification of rhyolite
16. Megascopic and Microscopic Identification of obsidian
17. Megascopic and Microscopic Identification of trachyte
18. Megascopic and Microscopic Identification of andesite
19. Megascopic and Microscopic Identification of basalt
20. Megascopic and Microscopic Identification of Kimberlite
21. Megascopic and Microscopic Identification of lamprophyres
22. Megascopic and Microscopic Identification of Carbonatite
23. Megascopic and Microscopic Identification of komatite.
24. CIPW Norm Calculations

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester IV

Paper 46022P: Metamorphic Petrology Lab

Course Objectives:

- To develop skill and abilities in the identification of Metamorphic rocks based ontextures
- To determine the minerology of various metamorphic rocks under petrologicalmicroscope by using thin sections

Course Outcomes:

- Students will acquire practical experiences on the identification of the rockspecimen in hand specimen and thin sections

List of practicals:

1. Megascopic and Microscopic Identification of gneiss
2. Megascopic and Microscopic Identification of schist
3. Megascopic and Microscopic Identification of slate
4. Megascopic and Microscopic Identification of phyllite
5. Megascopic and Microscopic Identification of quartzite
6. Megascopic and Microscopic Identification of marble
7. Megascopic and Microscopic Identification of granulite
8. Megascopic and Microscopic Identification of eclogite
9. Megascopic and Microscopic Identification of amphibolite
10. Megascopic and Microscopic Identification of migmatite
11. Megascopic and Microscopic Identification of gondite
12. Megascopic and Microscopic Identification of charnockite
13. Megascopic and Microscopic Identification of khondalite.

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester IV

Paper 46023P: SedimentologyLab

Course Objectives:

- To develop skill and abilities in the identification of sedimentary rocks based onstructures and textures
- To determine the minerology of various sedimentary rocks
- To Identify the heavy minerals under petrological microscope etc.,

Course Outcomes:

- Students will get knowledge about identification of mega scope and micro scopesedimentary rocks properties.
- Study of sieve analysis helps to determine the particle size which further helps

List of Practicals

1. Study of primary, secondary and biogenic sedimentary structures in hand specimens, in photographic atlases, field photographs and wherever possible on the outcrops.
2. Microscopic study of sedimentary structures, textures and digenetic features sedimentary
3. Microscopic study of heavy minerals.4. Granulometric analysis (Sieving).

Paper 46024P: Skill based Lab (Computer Applications for GeosciencesLab)

Course Objectives:

- Geosciences is a practical subject with applied problem-solving laboratory classesand field courses so computer applications are necessary for students to do their work fast and accurately

Course Outcomes:

At the end of course, the students should able to

- Use all learned skills to draw Mine layouts, contour maps etc.,
- Use all soft skills in Geoscience with trained talent.

List of Practical's:

(YVU)

1. Redraw the given sketches
2. Redraw the given sketch3.
4. Drawing the Solar System in 3D orientation
5. Data Export in different formats
6. Creating grid file using XYZ data
7. Creating Contour Maps using Grid File
8. Creating WireFrame and Surface Maps using grid file
9. Creating a Mine Layout by using the Given data

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester V

Paper 526021: Structural Geology

Course Objectives:

- To enhance the students' knowledge on mechanical principles and behaviour of various rocks that are under great stresses and eventually forming structural features (deformations)they attain.
- To study various secondary structures, their description, to recognise in the field provides knowledge and application skills.
- To measure the three dimensional orientation of planar feature of rocks using clinometer compass and Brunton compass that requires skill and application activity.
- Structural data collected in the field to be converted in to various diagrammatic forms using various office techniques

Course Outcomes: At the end of course, the student able to

- Study of secondary structural features enables the students to understand the tectonichistory and geological history of the earth.
- To equip the students to suggest a suitable place for the construction of huge civil engineering constructions.
- Study of solving of structural problem develops skill activity and interpretation of

Unit-I

Definition, aim and objectives of structural geology. Types of structures primary and secondary; their distinctions and importance in determination of top of beds, Outcrop, attitude of beds - strike, dip and apparent dip, use of clinometer and Brunton compass.
Mechanical principles and properties of rocks and their controlling factors – theory of rock failure; concept of stress and strain. Types of strain ellipses and ellipsoids and their properties and geological significance. 2D, 3D stress, strain analysis.

Unit-II

Classification of folds. Mechanics of folding and buckling. Superposed folding and formation of domes and basins. Micro, meso and macroscopic folding and their importance.
Fractures and joints; their nomenclature, classification, origin and significance. Foliation, cleavage and schistosity. Lineation-types and their significance in recognition of fold generation.

Unit-III

Definition, classification and mechanics of faults. Criteria for recognition of faults. Effects of faulting on topography – anticlinal valleys, synclinal ridges, fault scrap, fault line scrap, nappe, window and klippe. Shear zone and its characteristics.
Unconformity, definition, types of unconformities- overlap, offlap, outlier and inlier. Criteria for distinguishing the unconformity from fault.

Unit-IV

Structure on discordant forms. Forms of extrusive igneous rocks- volcanic hill, cinder cone, composite volcano, caldera, crater and volcanic neck. Concept of petrofabric methods, field techniques, laboratory and microscopic studies, Classification of tectonites, fabric, petrofabric diagram.

Reference Books:

1. Structural Geology by M.P.Billings
2. Structural Geology and Tectonic Principles by P.C.Badgley
3. Principles of physical geology by A.Holmes and D.L.Holmes
4. An outline of structural Geology by Bruce E. Hobbs
5. Introduction to modern structural Geology by S.K. Ghos

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester V

Paper 526022: Stratigraphy and Indian Geology

Course Objectives:

- To learn about the geological time scale, principles and concepts of stratigraphy.
- To know the various physiographic divisions of India.

Course Outcomes: At the end of course, the student able to

- Students gain knowledge on the rock successions and the interpretation in terms oftime scale.
- They will have the knowledge of the physiographic division and rock successions in India.

Unit I

Principles of Stratigraphy, History and development, Stratigraphic terminology, nomenclature and classification – Biostratigraphy, Chronostratigraphy Lithostratigraphy, Magnetostratigraphy and seismic Stratigraphy. Concept of lithofacies and biofacies.

Historical Evolution of Geological Time Scale.

Unit II

Principles and concepts of Sequence Stratigraphy: Scope, stratigraphic terminology. Principles of palaeogeography and paleoclimate. Completeness and incompleteness of Stratigraphic records. Presservation and Net rates of accumulation in various basinal settings.

Unit III

Major stratigraphical divisions and their equivalents in India. Brief account of classification, lithology, structures and fossil content with economic importance of Archaean, Cuddapah and Vindhyan Super Groups. Gondawana super group, Triassic, Jurassic, Cretaceous formations of India. Geological history and evolution of Dharwars and their equivalents Short account of Siwaliks and Deccan Traps. Origin, composition and distribution. Intra and Inter trapeans, Tertiary and Quaternary rocks of India.

Unit –IV

Age problems pertaining to Indian stratigraphy. a) Saline Series b) Deccan trap. Study of the following boundary problems with reference to India a) Precambrian - Cambrian, b) Permian Triassic, and c) Cretaceous – Tertiary d) Pleistocene – Holocene.

Reference Books:

1. Fundamentals of historical Geology and Stratigraphy of India – Ravindra Kumar
2. Principles of Stratigraphy - Lemon,R.R
3. Principles of Sedimentology and Stratigraphy - Boggs, S.
4. Principles of Stratigraphy - Danbar, C.O. and Rodgers, J.
5. Geology of India and Burma by M.S.Krishnan
6. Geology of India by D.N.Waldiya
7. Geology of India by M. Ramakrishna & R. Vidyanadhan

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester V

Paper 526023: Paleontology

Course Objectives:

- Students will get the knowledge on Morphology, classification and evolutionary trends of fossil and their types of preservation and uses.
- To throw a light what happened in the geological past, thus projects the future can be assed. Micro paleontology study will help the students to get theknow the mechanism of oil and natural gas exploration formations.

Course Outcomes: At the end of course, the student able to

- Identify the fossil and their types of preservation and uses.
- Correlation of fossils with Geological Time Scale
- Able to know the modus of operandi for the formation of hydrocarbons etc..

Unit – I

Concept of species – Nomenclature – Life through Geological Time Scale – Taphonomy – Definition of fossil – Modes of preservation of fossils – Index fossil – Zone fossil.

Unit – II

Morphology, classification and evolutionary trends of Graptolites, Corals, Trilobites and Brachiopods.

Unit – III

Morphological and evolutionary trends of Mollusks (Lamellibranches, Gastropods and Cephalopods), Palaeobotany. Origin of vertebrates and general characteristics of their skeletons, classification of vertebrate fossils. General account of Gondwana vertebtates, Silwalik mammals and possible causes of their extinction

Unit – IV

Scope of Micropaleontology – Detailed morphology of Foraminifera, Ostracoda – Utility of microfossils in hydrocarbon exploration, oxygen and carbon isotope studies of microfossils and their uses in palaeoocenographic, palaeoclimatic interpretation Palaeoecology, Palaeobiogeography.

Reference Books:

1. Invertebrate Paleontology – Henry woods
2. Principles of Invertebrate Paleontology – Shorock &Twenhofel
3. Elements of Micropaleontology – Bignot. G
4. Principles of Micropaleontology – F. H. Glessener.

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester V

Paper 526024: Geosoft and Origin software

Course Objectives:

- Geosoft provides integrated mapping and analysis workflows for geology, geophysics, geochemistry and GIS, supporting effective and collaborative earth exploration
- To introduce key features of Origin related to importing data, performing basic

Course Outcomes: At the end of course, the students able to

- Learn the process of integrated mapping and analysis workflows and effective and

Unit-I

Basic Mapping and Gridding: Creating a New Map, Creating a Map Template using Interactive Tools, Creating a Base Map, Plotting Survey Lines, Plotting Profiles, Gridding Data- Grid and Image Menu, Multiple Channel Gridding, Plotting Contours.

Map Editing and CAD Tools: Displaying an Interpretation Map, Understanding the Parts ofa Map, Hiding, Moving and Masking Map Groups, Drawing Lines, Polylines and Polygons **Unit-II**

Advanced Mapping and Gridding: Processing Data in the Spreadsheet , Plotting Symbols,

Colour Bars and Legends, Gridding Random Data, Gridding Geochemical Data

Coordinate Systems: Map Coordinate System, Defining the map coordinate system of a mapview, Displaying data with different Coordinate Systems on a map, Applying a warp to a grid

Understanding Spheroids and Datums: Understanding local datums, Choosing a local datum transform, Projection name tables.

Unit III

Introduction to Origin software

Introduction, Components of the Origin Project File, Opening, Closing and Backing Up the Origin Project File.

Graphing: Creating Graphs from Graph Templates, Plotting, Graph Axes, Creating Multi- Layered Graphs, Managing Data Plots in Layers, Linking Layers, Graph Legends and Color Scales. Adding Data Labels and Error Bars, Inserting Graphs and Data Tables into Graphs, Customizing Graphs with the Plot Details Dialog Box,

Unit IV

Working with Microsoft Excel: Importing vs. Opening of Microsoft Excel Workbooks, Running Microsoft Excel inside of Origin, Plotting Excel Workbook Data

Graphical Exploration of Data: Data Selection, Data Exploration Regression and CurveFitting, Statistics: Descriptive Statistics, Hypothesis Testing, ANOVA

Graphic Export and Publishing: Creating a Master Page Layout for Your Graph Windows,Using the Layout Page Window, Printing, Exporting Graphs and Layout Pages

Reference Books:

1. Geosoft Lab Manual – Geosoft Incorporated quick start tutorials www.geosoft.com
2. Origin Lab Manual – 1st edition by Origin Lab Corporation.www.Originlab.com

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester V

Paper 56015: GLOBAL CITIZENSHIP EDUCATION

Course Objectives:

- To build global leadership skills by reframing the way they interact with the world.
- Toempower learners of all ages to assume active roles, both locally and globally, inbuilding more peaceful, tolerant, inclusive and secure societies.
- To enhance competencies of Empathy, Mindfulness, Compassion, and Critical

Course Outcomes: After completion of course, the students will

- Able to solve problems, make decisions, think critically, communicate ideas effectively and work well with others.
- The attributes of the global citizens and their roles in the sustainable

Unit-I: Introduction on Global Citizenship Education (GCED)

What is Global Citizenship, and Global Citizenship Education? Key principles of GCED, the significance and relevance of GCED, supporting teachers in GCED. Template of GCED. The guidance – learning contents of global citizenship education

Unit-II Implementing global citizenship education

A conceptual framework for global citizenship; Transformative education: past and present; GCED curriculum and pedagogy; GCED: alternative paradigms. How to integrate GCED to education system; How to deliver in classroom; Key issues and challenges of GCED.

Unit-III Understanding SDG-4.7

Introduction to the UN (United Nations),
Brief history of SDG-4;SDG 4 – 10 target for education.
Citizenship: What does it entail and can it be global?

Unit-IV GCE and Role of Teacher

GCE assessment and evaluation; Teacher as Global Teacher
School and Society
Curriculum Analysis with Global Citizenship Education

References:

1. UNENSCO – Global Citizenship Education, topics and learning objectives.
2. Global Citizenship Education, Goals and Challenges in the New Millennium By Soon-Yong Pak, APCEIU Research Reports 2013-02

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

S

emester VPaper 56021P:

Structural Geology Lab

Course Objectives: ➢ Students will be trained for the field measurement techniques like measurement
Course Outcomes: After completion of course, the students will ➢ Students gain practical experience on measurement of geometry of

List of Practical's

1. Solving Dip and Strike Problems (Total 16 problems)
2. Solving borehole (3 point)problems (Total 3 problems)
3. Thickness problem solutions (Total 9 problems)
4. Geological Map interpretation and section drawing (Total 8 problems)
5. Completion of outcrops of strata in geological maps (Total 2 problems)

Paper 56022P: Stratigraphy Lab

Course Objectives: ➢ To learn about the geological time scale, principles and concepts of stratigraphy. ➢ To know the various physiographic divisions of India.
Course Outcomes: After completion of course, the students will ➢ Able to solve stratigraphic problems ➢ Correlation of stratigraphic sequences with respect to GTS ➢ Students will acquire practical experiences on geological events, rock

List of Practical's

1. Stratigraphy of geologic sections
2. Drawing the characteristic of fold and fault from geologic map
3. Interpretation of geologic map
4. Preparation of geologic time scale with respect to lithology and life evolution
5. Rock formation of India in the geologic time scale, history of life through the geologic age and evolution of man.

Paper 56023P: Paleontology Lab

Course Objectives:

- Students after thorough observation of fossil specimens in the laboratory, they learndescription, identification and classifications of Fossils.

Course Outcomes: After completion of course, the students will

- Students will acquire practical experiences on the identification of the fossil andshells.
- Student will able to identify the parts of various fossils.

List of Practical's:

Megascopic identification and description of the following fossils and shells specimen1.

1. Morphology, classification and evolutionary trends of Graptolites,
2. Morphology, classification and evolutionary trends of Corals,
3. Morphology, classification and evolutionary trends of Trilobites.
4. Morphology, classification and evolutionary trends of Brachiopods.
5. Morphology, classification and evolutionary trends of Mollusks (Lamellibranches, Gastropods and Cephalopods),
6. Morphology, classification and evolutionary trends of Foraminifera
7. Morphology, classification and evolutionary trends of Ostracoda.

Paper 56023P:Geosoft and Origin Lab

Course Objectives:

- Geosoft provides integrated mapping and analysis workflows for geology, geophysics, geochemistry and GIS, supporting effective and collaborative earth exploration.
- This course introduces you to key features of Origin related to importing data, performing basic data processing and analysis, and creating and publishing graphs.

Course Outcomes:

- Learn the process of integrated mapping and analysis workflows and effective and collaborative for earth exploration.
- This practical course helps you study your data which plays a vital role in discovering useful information and draw necessary conclusions. Advance your skills by learning all that's needed about Origin from this course.

List of programmes

1. Creating a Project
2. Basic Mapping and Gridding.
3. Drawing Lines
4. Polylines and Polygons
5. Creating Custom Base Maps
6. Advanced Mapping and Gridding
7. Displaying data with different Coordinate Systems on a map
8. Drawing Scatter plots and line plots
9. To plot column, bar and stacked plots
10. To plot floating column and vertical drop line plot
11. Creating and Customizing Graphs.

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester VI

Paper 66021: Mining Geology and Ore Dressing

Course Objectives:

- To study the Ores and their genesis and to understand the various techniques inmining, mine environment.
- To know the various methods of beneficiation of ore minerals.
- To gain knowledge about the methods of grinding, crushing, and separation

Course Outcomes:

- They will have the knowledge on the methods & techniques in mining.
- The students will gain the knowledge in the mineral and ore formation processes.
- They will gain knowledge on the different ore processing techniques and

Unit-I

Introduction to mining terminology. Preliminary and detailed mining. Tracing and outlining of mineral deposits. Mining methods- surface mining- alluvial, open pit and open cast mining. Sub-surface mining- classification of stoping methods, underground development different types of stoping.

Unit-II

Mining supports; support types with their merits and demerits. Stowing methods; subsidence –causes and prevention. Methods of breaking and blasting the rocks, types of explosives used, arrangements of drill holes for blasting in surface and underground mines. Mining atmosphere; ventilation in underground mines, types and arrangements of directing ventilations in underground mining.

Unit-III

Mine drainage, mine pumping, haulage and winding. Mining hazards and safety measures Properties of minerals and rocks and their considerations in ore techniques. Primary crushers- jaw crushers, dodge crusher, gyratory crusher. Secondary crusher- cone crusher, impact crusher. Bore hole problems. Preparation of mine plans.

Unit-IV

Movable and vibrational classifiers- sizing classifiers, mechanical classifiers, pneumatic classifiers. Methods of drilling- diamond, core, rotary, percussion and auger drilling. Sampling methods- Chip channel, trench, cutting and underground mine samples.

Reference Books:

1. Mineral Beneficiation and agglomeration plant in India- Indian bureau of Mines, Nagpur
2. Oreprocessing- S.K.Jain
3. Principles of mineral dressing- A.M.Gaudin
4. Mineral Processing- E.J.Pryor
5. Courses in Mining Geology- R.N.P.Arogyaswamy
6. Mining Geology- H.C.Mckinstry
7. EElements of ore dressing-A.F.Taggart
8. Mineral Economics-R.K.Sinha and N.L.Sharma
9. Ore deposits of India- Their distribution and processing- K.V.G.K.Gokhale

.

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester VI

Paper 66022: Economic Geology

Course Objectives:

- Primarily focus on the types and processes of mineral or ore deposits andidentification of ores by studying the physical properties.

Course Outcome:

- Students will get knowledge about the formation, occurrence and geological distribution ofvarious Economic mineral
- Student will gain expertise in identification of various ore minerals that are used

Unit 1

Definition of Economic Geology, Ore, Gangue, Tenor. Spatial and temporal distribution of ore deposits –global perspective. Application of ore microscope. Types of Deposits – Syngenetic, Epigenetic, Endogenetic deposits. Processes of formation of mineral deposits- magmatic concentration, sublimation, contact metasomatism, hydrothermal process, cavity filling, replacement, evaporation, sedimentation, residual and mechanical concentration, oxidation, and supergene sulphide enrichment.

Unit 2

Noble Metals – Mineralogy, genesis, uses the distribution of Gold, Silver, and Platinum inIndia.
Base Metals - Mineralogy, genesis, uses distribution of Cu, Pb, Zn in India.
Iron and Ferro Alloy Metals - Mineralogy, genesis, uses, distribution of Fe, Ni, Cr, and Mo inIndia.
Mineralogy, genesis, uses, distribution of Atomic minerals and coal.

Unit 3

Minerals used for chemical Industry- mineralogy, genesis, uses, distribution of Sulphur and Pyrite, Baryte, Fluorspar in India. Minerals used for Ceramic Industry: mineralogy, genesis, uses, distribution of Gypsum, Talc, Steatite, and Soapstone and Clay in India.

Unit 4

Minerals used for Fertilizer industries: mineralogy, genesis, use and distribution of Rock phosphates and phosphorites, Gypsum, Apatite.
Minerals used for Refractory Industry: mineralogy, genesis, use and distribution of Graphite, Dolomite, Magnesite, Kyanite, Sillimanite and Andalusite, Fire clay and Ball clay in India.

Minerals for insulation and Electrical industry: mineralogy, genesis, use, and distribution ofMica, Asbestos in India.

Reference Books

1. Economic Mineral Deposit – Bateman, A.M.
2. Introduction of India's Economic Minerals – N.L.Sharma and K.S.V Ram
3. Ore Deposits – Lindgren, W.
4. India Mineral resources – S.Krishna Swamy.

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester VI

Paper 66023: Hydrogeology

Course Objectives:

- To learn about fundamental concepts and terminology of hydrogeology
- To learn the applications of geological and geophysical method to explore groundwater and applications of remote sensing techniques to for hydrological

Course Outcome:

- Study of the ground water occurrence, movement, hydrologic properties of rocksthe students will understand suitable place of ground water occurrence.
- Students will get the knowledge about ground water quality and parameters, standard parameters of W.H.O to identification of which place of ground water is suitable drinking purpose.
- Knowledge about artificial recharge of ground water, ground water exploration method and using the ground water exploration in remote sensing techniques.

Unit – I

Groundwater: Origin, types, importance and occurrence, Hydrologic cycle. Hydrologic properties of rocks – Porosity, Permeability, Specific Yield, Specific Retention, Hydraulic Conductivity, Transmissivity, Storage Coeffient; Safe Yield, Aquifer types; Subsurface distribution of groundwater; Groundwater occurrence in the different geological formations.

Unit – II

Groundwater movement, Darcy's law and its applications, Determination of Permeability in laboratory and in field: Well hydraulics: Confined, Unconfined, Steady, Unsteady and radial flow, water level fluctuations, Types of wells, drilling methods.

Unit – III

Groundwater Quality: Physical, Chemical and bacteriological parameters; Quality criteria for groundwater use, graphical presentation of water quality data, Saline Water intrusion in coastal aquifers. Problem of arsenic and fluoride, case studies.

Unit – IV

Groundwater Exploration: Geophysical and geological methods of groundwater exploration, Remote Sensing techniques and Radio isotopes in hydrogeological studies. Artificial recharge of groundwater, consumptive and conjunctive use of surface and groundwater; Groundwater budgeting and basin management. Ground water provinces of India.

Reference Books:

1. Todd, D.K.., (1987), Ground water hydrology, John Wiley&Sons, New York.
2. Davies, S.N. and De Wiest, R.J.M., (1966) Hydrogeology, John Wiley & Sons, New York
3. Karanth, K.R.,Hydrogeology. Tata McGrawHill Publ., New Delhi.
   Karanth, K.A. (1997) Ground water assessment, development and management, Tata McGrawHill Publ., New Delhi

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester VI

Paper 66024: Remote Sensing

Course Objectives:

- This paper aims to deals with the basics of Satellite Remote Sensing and its applied aspectsin Geosciences.
- The knowledge acquired in this paper is certainly edge over the conventional and traditional Geoscientists

Course Outcome:

- This paper covers the history and basic concepts and advantages over conventional ground surveys. Types of satellites and sensors, physics of remote sensing, and interaction of electromagnetic radiation with atmosphere and Earth surface on one hand.Data acquisition with terrestrial, aerial and space borne sensors on the other hand including RADAR and LiDAR.
- Remote sensing methodologies like multispectral, microwave, thermal scanning on one hand and geological interpretation of the same on the other hand

UNIT-I

Introduction to remote sensing: History and basic concepts. Advantages of Remote sensing, aerial conventional ground surveys. History of space energy. Geostationary and Sun synchronous satellites. Sensors and its resolutions of Land sat, Spot and IRS series. Development of remote sensing in India.

UNIT-II

Physics of remote sensing: Electromagnetic energy, Electromagnetic radiation, interaction of Electromagnetic radiation with atmosphere and Electromagnetic radiation with the earth surface. Atmospheric windows and spectral regions useful for Remote sensing.

Data Acquisition: Platforms- Terrestrial, aerial and space borne. Sensors- passive sensors, photographic cameras, Videocon television camera, multispectral scanners and microwave radiometer Radar altometer and scatarometer. Active sensors- Radar and Lidar

UNIT-III

Multispectral remote sensing: Multispectral photography and multispectral scanning. Remote sensing in solar optical region- basic characteristics and its interpretation.

Remote sensing in thermal infrared region: Basic concepts and its characteristics. Geological interpretation of thermal imagery. Advantages of thermal imagery.

UNIT-IV

Microwave remote sensing: Basic concepts, characteristics of radar imagery. Radar geometry and resolutions and data acquisition. Advantages and disadvantages of Radar imagery. Interpretation of lithology, structure, landforms, land use and land patterns using satellite imagery.

Reference Books:

1. Remote Sensing principles and interpretation, by Sanfrancisco. Sabins, F.F.jr 1978.
2. Remote Sensing and Image Interpretration Lillis and,T.M. and P.W. Kiefer, 1986.
3. Remote Sensing Geology by R.P. Gupta, 1991.
4. Principles of Remote Sensing Curran, Longman.
5. Applied Remote Sensing, Lo.C.P. 1986 Longman.
6. Introduction to Remote Sensing of the Environment,B.F.jr.(Ed), 1978. Kendall/Hunt, Dubuque, lowa.
7. A Guide to Remote Sensing-interpreting images of Earth Drury S.A.1990. Oxford Science Publications, Oxford.

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester VI

Paper 66015: VALUE/SKILL BASED COURSE (R-PROGRAMMING)

Course Objectives:

- To impart knowledge on the R-programming to help graduates to be competent inData Manipulation with R programming, Data visualization, advance analytics

Course Outcomes: At the end of course, the students have an ability to

- Understand the fundamental syntax of R through readings, practice exercises, demonstrations, and writing R code.
- Apply critical programming language concepts such as data types, iteration, control structures, functions, and Boolean operators by writing R programs and through examples
- Import a variety of data formats into R using R Studio.
- Prepare or tidy data for in preparation for analysis
- Query data using SQL and R
- Analyse a data set in R and present findings using the appropriate R packages

Unit-1: Introduction: R environment; Why R? R for Computational Biology and Bioinformatics; Installing R; R- GUI and IDE; Running R. Programming with R: R as a deluxe calculator, Objects: creating objects and assigning values, Types of objects: vector, matrix, array, factor, list, data frames and functions; Data structures.

Unit-II: Control Statements in R: if, for, repeat, while; Functions- user defined function and built –in functions. Working with data sets: Reading and writing data from files: read. Table, Write. Table, read.csv, write.csv, readFasta, writeFasta. File manipulation in R: Opening afile, creating a file, editing a file, renaming a file, removing a file.

Unit-III: Graphics in R: Introduction to graphics package: scatterplot, boxplot, bar plot, plotting time series, plotting categorical data, basic graphics functions-high level functions and low-level functions, saving graphical output. R packages for Microarray/NGS Data analysis, Protein Structure visualization, etc.

Unit-IV: Statistics using R: Basic statistical operations: mean, median, range, minima and maxima, variance, standard deviation, correlation coefficient, covariance, R for statistical applications (Flexi module- Only for Internal Assessment. Lecturers may expand and/ or interpret the syllabus to update it or suit the particular cohort in any way.): Packages in R: CRAN, designing packages, installing packages, loading packages, unloading packages, listing packages (popular packages for bioinformatics applications, Bioconductor – overview, features, overview of packages in Bioconductor.

References:

1. Sandip Rakshit: R Programming for Beginners. McGraw Hill Education Lander: R for Everyone: Advanced Analytics and Graphics. Pearson Education India
2. Adler, J. (2010). R in a nutshell: A desktop quick reference.
3. R programming for bioinformatics. CRC Press.
4. R, Notes on R: A Programming Environment for Data Analysis and Graphics Version 2.10.1. • Venables, W. N., & Smith, D. M. (2009).
5. The art of R Programming – Norman Matloss (A Tour of Statistical software designing).

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester VI

Paper 66021P: Economic Geology Lab

Course Objectives:

- To identify the different kinds of ores by using hand specimens and thin section

Course Outcomes: At the end of course, the students have an ability to

- Recognize different kinds of ores, origin and their distribution
- Students will gain expertise in identification of various minerals that are used indifferent industries
- Students will get expertise in different procedures of ore reserve estimation andtheir distribution
- Student will able to estimate the grade tonnage and profit of the reserve

List of practical's

1. Megascopic identification of ores (Total 20 specimens)
2. Ore reserve Estimation Problems.
3. Problems on the estimation of average assay values, grade, and tonnage of ore deposits.
4. Grade and lithofacies maps and their interpretation.

Paper 66022P: Hydrogeology Lab

Course Objectives:

- To enable the students to determine the various parameters of ground waterdetermination.

Course Outcomes: At the end of course, the students have an ability to

- Get the knowledge parameters of ground water like determination of calcium,chloride, concentration of sodium, carbonates and bicarbonates.
- Students understand about calculation to the percentage of sodium,

List of Practical's

1. Determination of pH
2. Determination of Electrical Conductivity by using instrument
3. Determination of Calcium by using titration method
4. Determination of Total Alkalinity by using titration method
5. Determination of Calcium by using titration method
6. Determination of Chloride by using titration method
7. Determination of Calcium by using titration method
8. Determination of Hardness
9. Determination of concentration of sodium
10. Total dissolved solids calculation method
11. Checking the analytical results
12. Classification of irrigation water
13. Percentage of sodium calculation

14. SAR (Sodium Absorption Ratio) calculation

Paper 66023P: Remote Sensing Lab

Course Objectives:
➢ Aims at building a skill to identify the features from satellite imageries
Course Outcomes: After completing course, the student will able
➢ Description of False Colour Composite and Panchromatic Imageries ➢ Lithological and Structural interpretation of 4 Satellite Imageries and

Practical's list:

1. Recognition of elements in the satellite imageries
2. Interpretation of lithology and structures by using satellite image (57NO3)
3. Interpretation of lithology and structures by using satellite image (57MO2)
4. Interpretation of lithology and structures by using satellite image (57J16)
5. Interpretation of lithology and structures by using satellite image (57J05)
6. Interpretation of lithology and structures by using satellite image (57JO1)
7. Interpretation of lithology and structures by using satellite image (57J15)
8. Interpretation of lithology and structures by using satellite image (57J16&17)

66014P: VALUE ADDED COURSE - R-PROGRAMMING LAB

Course Objectives:
➢ Aims at building a skill-set to tackle real-world data analysis challenges as a dataengineer. It is a guide to understand how to program in R and how to use R
Course Outcomes: After completing course, the student will able
➢ Explain critical R programming concepts ➢ Demonstrate how to install and configure RStudio ➢ Apply OOP concepts in R programming ➢ Explain the use of data structure and loop functions ➢ Analyse data and generate reports based on the data

List of practical's

1) R program to make a simple calculator that can add, subtract, multiply and divide using switch cases and functions
2) R program to create a list containing strings, numbers, vectors and logical values and do the following manipulations over the list.to. access the first element, names position and remove the elements in the list.
3) R program to find the sum of natural numbers without formula using the if–else statement and the while loop.
4) R program a list and data frame to find out the total marks, average, maximum marks and minimum marks of every subject of student.
5) R programming.to create Matrices,
6) R programming packages

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester VII

76021: Geochemistry and Isotope Geology

Course Objectives:

- The course gives an introduction to fundamental geochemical tools and directions like aqueous geochemistry, trace element geochemistry and isotope geochemistry, and how these can be used to understand the formation of the elements and the solar system, the Earth´s geochemical composition and differentiation into different reservoirs, the age of rocks, global geochemical cycles, the surface environment, andchemical traces of early life.

Course Outcomes: After completing course, the student will able

- Understand the important chemical approaches used to study the Earth. The the formation of earth and the elements in it.
- Geochemistry cover the introduction to geochemistry, basic knowledge about crystal chemistry, ion exchange, cosmic abundance of elements, composition of planets and meteorite and along with geochemical cycle, the distribution of major, minor and trace elements in three types of rocks and elements of geochemical thermodynamics, isotope geochemistry, fundamental concepts of sampling and groundwater quality techniques using AQUACHEM software.

Unit – I

Introduction to geochemistry – its scope. The earth in relation to the solar system and the Universe. Cosmic abundance of elements, composition of planets and meteorites. Structure composition and distribution of elements in the earth. Geochemical classification of elements. Geochemistry of hydrosphere, biosphere and atmosphere.

Unit –II

Elementary crystal chemistry and thermodynamics. Lattice energy of crystals, principles of ionic substitution in minerals. Ionization potential, electro negativity, Pauling's rule, Periodic table with special reference to rare earth elements. Geochemistry of Uranium & Lithium.

Unit – III

Introduction to isotope geochemistry, stable isotopes, geochemistry of carbon, oxygen, sulfur Isotopes, Radiogenic Isotopes, Decay scheme of K-Ar, U-Pb and Rb-Sr, carbon dating and its applications in geology.

Unit – IV

Geochemical prospecting; fundamental concepts, pathfinder elements. Threshold values, geochemical anomaly. Primary and secondary dispersion Halos sampling. Geochemical cycles and Geochemical methods for prospecting of metallic minerals, petroleum and natural gas. Techniques in geobotanical survey. Introduction to geochemistry software - AQUACHEM.

Reference Books:

1. Mason, B and Mooro, C.B., 1991: Introduction to Geochemistry, Wiley Eastern
2. Kranskopf, K.B.,1967 : Introduction to Geochemistry McGraw Hill
3. Faure, G., 1986: Principles or Isotope Geology, John Wiley
4. Evans, R.C, 1986: Introduction to Crystal Chemistry, Cambridge Univ.Press.

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester VII

76022: Geospatial Technology, GNSS & Digital Cartography

Course Objectives:

Course Outcomes:

- Students get the knowledge about raster and vector, types of data (point, Line, Polygon), data conversions. Learning three dimensional models, Methods of DEM, products of DSM, DTM and uses of Digital elevation models , that are useful Urban planning, Telecom and Network Services., Accident Analysis and Hot Spot Analysis. Transportation Planning. Environmental Impact Analysis. Agricultural Applications. Disaster Management and Mitigation.

Unit I

Introduction to GIS: Definition and Meaning and usefulness of GIS - Components of GIS - Computer Hardware and Software Modules. Data structures: Data structures in GIS – Raster and Vector Data Structures. Type of data (Points, Lines and Polygons) – Data Conversion, (Vector to Raster and Raster to Vector).

Unit II

Data Input, Verification, Storage and Output: Data Input Processes and Devices – Differenttypes of entering Spatial and Non – Spatial data – Data Verification (Data Quality and Errors)
– Storage – Topology - Data output processes. Digital Elevation Modeling: Need for three dimensional models – Methods of DEM – Products of DSM-DTM and usefulness of DEM.

Unit III

GNSS: Introduction – Concepts and segments: Satellite, Control and User segments – Signal components, Errors – Types of errors and errors in observations and accuracy. Navigation and Data collection – waypoints, routes and tracks using GPS. DGPS. Merits and demerits of DGPS. IRNSS-GAGAN.

Unit IV

Digital Cartography: History of Cartography and types of Maps. Principles of Map Design and symbolization - Colors and Patterns. Generalisation in Cartography. Digital Input : Data types & data sources and Thematic Maps. Cartographic processes – Making of various maps
- Special merits of digital cartography.

Reference Books:

1. Borough, P.A 1986 PRINCIPLES OF GEOGRAPHICAL INFORMATION SYSTEMS FOR LAND RESOURCES Assessment, vkarabdibe press, oxford.
2. Gauche, N.C 1970: urban land use study through aerial photo interpretations techniques, pink publishing house, mature.
3. Kang Tsung Chang, Geographical Information Systems
4. Campbell, J 1984: introductory cartography, printer's hall Englewood cliffs, Ann.
5. Dent B.D 1985: principles of thematic map design, addition- Wesley, reading, mass.
6. Freeman, H and GG. Pierson 1980: map data processing, academic press, New York.
7. Monomer, M.A 1982: computer assisted cartography- principles and prospects, prentice hall, Englewood cliffs, NJ
8. Tomlinson, R.F catkins, H.S and doff marble 1976: computer handling of geographic data, UNESCO, Geneva.
9. Graeme F. & Bonham- caster, geographic information systems for geoscientists, modeling with GIS, paragon.

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester VII

76023: Field Geology and Surveying

Course Objectives:

- The objective of the paper is to make the student to understand about Field geology andClassification, planning, execution and interpretation of surveying methods.

Course Outcomes:

- They will get the knowledge about study of topographical maps like hills, rivers, town's areas etc.
- Get the knowledge of different classification and methods of surveying like chain surveying, prismatic compass surveying, plane table surveying, dumpy levelling and

UNIT–1

Field Geology**:** Toposheet, map reading. Various methods of locating a point on toposheet or map. Basic field procedures: Determination of slopes and gradient, measuring differences in elevation. Basic field observations data point or outcrop.
Geological mapping: general considerations, reconnaissance, study of surface features and rocks. Transfer of field data collected on to a base map, finalization of map, preparation of geological cross section.
Contouring: Definitions of contour-Contour internal-characteristics of contours. Direct and in direct methods of contouring. Uses of contours. Grade contours.

UNIT-II

Surveying& Measurements: Surveying–History; Definition; Classification; Principles of surveying; Plan and map; Measurements–Basic Measurements and methods; Scale–Scales used for Maps and plans

Chain And Plane Table Survey: Principles of chain survey, use and adjustment of various instruments employed in chain survey. Offsets and error in offsets. Obstructions in chaining

.Errors and sources of errors. Determination of areas by chain survey. Plane table survey-preparation of detailed maps.

Compass Survey: Use and adjustment of prismatic and surveyor's compass. Methods of surveying with a compass. Magnetic Declination, Local attraction .Errors in Prismatic Survey

.Drawing up field books. Plotting of compass surveying.

UNIT-III

Dumpy Levelling: Definitions and Principles of construction of a levelling instrument and its various parts with special reference to the spirit bubble and the telescope. Use and adjustment of Dumpy and tilting levels. Establishment of Bench Marks by Levelling. Methods of booking and reduction of levels. Errors in levelling.

UNIT-IV

Theodolite: Transit Vernier Theodolites, Setting, use and temporary adjustments. Use of micro- optic thedolite. Measurements of horizontal angles and bearings by repetition and reiteration methods. Permanent adjustments of a transittheodolite. **TotalStation:** Features, concepts, types and applications

ReferenceBooks:

1. SurveyingVolI&IIbyK R Arora,Standard Book house.

2. FundamentalsofSurveyingbySKRoy,Prentice-Hallof IndiaPrivateLtd.
3. SurveyingVolI,II&IIIbyB.C.Punmia, Ashok KumarJain &Arun KumarJain-LaxmiPublications.
4. PlaneSurveyingbyA.M.Chandra,Newageinternational .
5. SurveyingVolI&IIbyS.K.DuggalTataMc.graw HillPublications.
6. ElementsofplaneSurveyingbyArthurRBentonandPhilipJTacty. TataMc.grawHillPublication.

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester VII

INTERNAL ELECTIVE Paper 76024 (A): Marine Geology

Course Objectives:

- Aims to know the history and structure of the ocean floor. It involves geophysical, geochemical, and sedimentological investigations of the ocean floor and coastal zone.

Course Outcomes:

- Students will have knowledge about concepts like structure, composition, petrology of the bottom of the ocean also throws light on changes in the oceanic crust and its history, Nearshore geological processes, sedimentological aspects of the oceanbottom and paleo-oceanography and sediment history.

Unit- I

Morphology of the oceans; oceanic crust- structure, petrology and source of oceanic crust;crustal changes after formation. Sea level history.

Unit- II

Nearshore geological processes on the continental shelf – Marine zones, Continental margintypes: Divergent margins, Convergent margins, Transform active margins; collision processes on convergent margins

Unit- III

Deep sea sediments; Classification; Terrigenous deep sea sediments; Biogenic sediments; Authgenic sediments. The geologic record of bottom currents- Method of study; erosion, transportation and deposition.

Unit- IV

Palaeo-oceanography and sediment history of the ocean basins- Pacific, Atlantic and Indian Oceans, Oceanic history of Calcium Carbonate Compensation Depth (CCD), Global palaeo-oceanography evolution- critical events in ocean history.

Reference Books:

1. James P. Kennett 1982, Marine Geology, Prentice Hall
2. Shepard, F.P. 1948, Sub Marine Geology, Harper and Row
3. Seibold, E and Berger, W.H. 1982 The Sea Floor, Springs- Verlag
4. William W.A. Nikovechine and R.W. Strenburg, The World Ocean
5. Pipkin, B.N., Gorsline, D.S., Cassey, R.E. Hammind, D.E., 1972 Laboratory Exercises in oceanography, Freeman.

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester VII

INTERNAL ELECTIVE Paper 76024 (B): Oceanography

Course Objectives:

- The student will get knowledge about fundamentals of the Physical, and chemical oceanography.
- To understand the concepts of the geochemical balance of the oceans and its implications.
- To get knowledge on the Biological activities in the Ocean/Estuarine Environment.

Course Outcomes:

- Understand the physical and chemical properties of the oceanic water/ Seawater which plays a key role in making the earth a living place for biogenic entities.
- Students will realize the geochemical balance of the various types of major and minor elements and their cycles between different types of spheres viz., Atmosphere, Hydrosphere, Lithosphere, etc.,
- Students will understand the basic concepts like Global Conveyor Belts, waves, and Tides and Tides theories, etc., that are playing a key role in the occurrence of seasons, full moon and new moon

Unit- I

Physical properties of sea water, salinity, temperature, density and their distribution. Specific volume anomaly, sound in the sea, color of sea water, light in sea, sea ice, absorption and extinction coefficient in the sea.

Unit-II

Waves and tides: Characteristics of waves, growth and decay, transformation of waves in shallow water, wave breaking, measurement of waves, characteristics of tides, tide theories, tide gauge. Global Conveyor belt circulation. Tsunami

Unit-III

Sea as source of raw materials; Chlorinity, Eh, pH of sea water, transparency; refractive index and electrical conductivity. Geochemical balance of oceans. Major and minor elements and factors affecting their distribution.

Unit-IV

Dissolved and particulate organic matter in the sea. Its nature, origin and distribution, photosynthesis and respiration. Dissolved gases- Oxygen, CO2, and their solubility in sea water. Factors effecting the concentration of sea water. Nitrogen and phosphorous cycle inthe sea.

Reference Books:

1. Descriptive Physical Oceanography by G.L.Pickard
2. Dynamical Oceanography by S.Pond and G.L.Pickard
3. Introduction to marine chemistry- J.P.Riley and R. Chester, Academic Press, London (1971) Chapters 1 to 9
4. Marine Chemistry- D.P.Martin, Vols. I & II 2nd Edition, Marcel, Dukker, Inc., New York (1976)
5. Practical hand book of sea water analysis by J.D.H.Stickland and T.R.Parson, Fis, Res. Board Canada, 2nd Ed., 1972

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester VII

INTERNAL ELECTIVE Paper 76024 (C): Geoinformatic Applications InSoil, Forestry, Environment and Agriculture

Course Objectives:

- It deals Effective management of agriculture, soils, and other natural resources requires characterizing, understanding, and managing the spatial variability of things such as soils and vegetation.

Course Outcomes:

- Digital Soil Mapping (DSM) utilizes numerical methods and information technologies to produce predictive maps of soil types and their properties. GIS has improved forest inventory data thus enabling foresters to improve forest conditions, plan adequately for the short and long term, estimate the growth of forests, calculate wildlife population, discover forest species, assess potential hazards such as forest fires and discover non-timber products in the GIS is an integral part of automated field operations, also referred to as precision agriculture or satellite farming

Unit I

Soil survey methods- soil classification Land evaluation- saline alkaline problems in soil identification and mapping, soil erosion, soil conservation.
Forest taxonomy, Invention of forest land- vegetation Assessment, Factors responsible for forest degradation and deforestation, Delineation of degrades forest damage assessment, emerging concepts in classification of forest and action plan- comparing forest genetic resource from theory and practical.

Unit II

Pollution control to air and water. Pollution studies and its significance on an environment: physico-chemical and geological parameters of near shore and fore shore ecosystems- marine pollution- oil spills, processes of oil- water interface- effects on ecosystems, sewage treatment and disposal, Solid waste Management

Unit III

Classification of crops, cropping seasons, integrated systems, High yielding varieties, hybrids, seeds, seed production.Introduction to agriculture, Importance of agriculture in Indian economy, General features of Indian Agriculture, Food production status, factors affecting plant growth.

Unit IV

Spectral characteristics of soil, crops and vegetation, Change detection study: crops and forest, forest damage assessment and forest fire, solid waste, Sewage treatment and disposal using Remote Sensing data

Reference Books:

1. Steven M.D and Clark, J.A. Application of Remote Sensing in Agriculture, Butterworths, London, 1990
2. Champion, H.G and Seth, S.K. Revised forest types of India. Government of India press, New Delhi, 1968.
3. Ghassem Asrar. Theory and Application of optical remote sensing. John Wiley & sons, New York, 1989.
4. Space Applications centre- Manual of procedure for forest Mapping and Damage Detection using Remote sensing Data, Report No. IRS-UP/SAC/FMDD/TN/16/90, 1990: pp-58.
5. Space Applications centre-Status Report on crop Acreage and Production Estimation, Report No. RSAM/SAC/CAPE/SR/25/90, October 1990, pp-253.

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester VII

76021P: Geochemistry Lab

Course Objectives: ➢ To give hands on practice to determine the various water quality parameters through titration methods and by using some instruments
Course Outcomes: ➢ Geochemical methods including field, laboratory and data analysis techniques, plan and carry out appropriate mathematical strategies for solvinggeochemical problems.

List of Practical's

1. Water quality analysis: Methods of preparation of laboratory pure water, reagents and solutions, expressing concentration of solution, diluting solutions,
2. Determination of various physico-chemical parameters like pH, Electrical conductivity, total dissolved solids, total hardness, sodium, potassium, calcium, magnesium, carbonate and bicarbonate, sulphate, chloride, nitrate and fluoride;
3. Accuracy analysis problems of physico-chemical parameters.

76022P: Geospatial Technology, GNSS and Digital Cartography Lab

Course Objectives: ➢ Aims to introduce the QGIS software and how to use the different types menus
Course Outcomes: ➢ The students able to generate the various thematic maps by using QGIS software,reprojection of raster data etc.,

List of Practical's

1. Data structures raster and vector data generation
2. Georeferncing of Topsheets
3. To create a Subset of the satellite imageries
4. Projection of Maps and Imageries
5. Types of file formats using QGIS
6. Creation of new vector layers

76023P: Field Geology and Surveying Lab

Course Objectives:

- To developed skills to draw mine plans
- To develop management of various types surveying instruments
- Planning and execution of surveys by using chains, plane table,

Course Outcomes:

- Students will able to handle the various types surveying instruments
- Will able to draw mine plans that are necessary for the mines and geology industry

List of Practical's

1. Measurement of distance by using chains
2. Measurement of distance between two points by chains
3. Measurement of distance two perpendicular line by using chain and tape
4. Measurement of pond distance between two points
5. Measurement of area of pond
6. Measurement of Building distance and its area by chain survey
7. Measurement of area by using chain and cross staff
8. Determination of included angles in a closed area
9. Rotation and Intersection method by plane table survey
10. Rise and fall method
11. Collination or height of the instrument method
12. Mining problems – Geological Map
13. Borehole problems (Total 3 problems)
14. Vein problem
15. Three point problem

INTERNAL ELECTIVE Paper 76024(A)P: Marine GeologyLab

Course Objectives:

- Aims to estimate the erosion and deposition rates
- To impart the recognize the erosion and depositional zones in the beach by usingtraverses

Course Outcomes: Student will able

- Estimate the sediment budget on the beach
- Will able to equip the interpretation of X-ray diffraction charts and Echo profiles

List of Practical's

1. Beach Profile studies: Estimation of deposition and erosion.
2. Interpretation of Echo-profiles – Continsenenetal Shelf, Slope, rise and Abyssal Plains.
3. Coarse fraction studies: Oolites, Glauconite and Phosphorite etc.
4. Clay mineral analysis – X- ray diffraction charts.
5. Estimation of calcium carbonate and Organic matter percentage in the sediments.

76024(B)P: OceanographyLab

Course Objectives:
➢ To determine the physio-chemical properties of seawater
Course Outcomes:
➢ Will gain knowledge to determine various physio-chemical properties of seawater ➢ Get to know the relationship between various parameters and how they affect eachother ➢ Understands to read and interpret the Ocean bathymetric Maps

List of Practical's

1. Determination of Chlorinity by agrentometric method, Salinity by using a Salinometer.
2. Compute a relation between chlorinity and salinity inan estuarine environment by the given data
3. Determination of Dissolved Oxygen by using Wrinkler's method as well as the electrochemical method
4. Determine the percentage of oxygen saturation in seawater.
5. Determination of Carbonate, Bicarbonate, and free Carbon dioxide in seawater from pH and alkalinity measurements
6. Determination of nutrients (dissolved inorganic phosphate – P, Nitrate – N, Sodium, Potassium, silicates, etc.,) by using the Spectrometric and FTIR Method
7. Plankton collection, preservation, and population counting
8. Identification of phytoplankton, Micro and Macro algae, Seagrasses, and Mangroves
9. Fourier analysis of Tidal Gauge curves
10. Interpretation of Topography and Bathymetric Maps

76024P (C): Geoinformatic Applications InSoil, Forestry, Environment and AgricultureLab

Course Objectives:

- To gain broad understanding of the geospatial approaches for detecting and characterizinglandscape pattern and the causes of landscape pattern

Course Outcomes:

- Student will gain knowledge on advanced Geospatial techniques for natural resourcesconservation and sustainable management.
- Student will get expertise on various mapping and decision making tools in soil, forestryenvironment and agriculture sectors.
- Student will acquire the knowledge of advanced geospatial techniques used in sewage andsolid waste management

List of Practical's

1. Classification of soils.
2. Classification of Vegetation using IDW/ Krigging
3. Spatial distribution mapping of water quality parameters
4. LU/LC mapping
5. Of shore and fore-shore ecosystems classification
6. Integration of DIP and GIS

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester VIII

86021: Fuel Geology

Course Objectives: ➢ To gain knowledge about the hydrocarbon formation, varieties and distribution. ➢ To understand the different sedimentary basins of India and methods
Course Outcomes: ➢ The students will gain knowledge on the mechanism of formation of coal,petroleum and Atomic Minerals. ➢ Understand the distribution of petroliferous and coaliferous basins of India. ➢ The students will know the technique of exploration of hydrocarbon resources

Unit-I

Petroleum: Composition- nature- origin: inorganic and organic theories- migration (primary and secondary) and accumulation of oil and gas- Geographic locations- petroleum reservoir rocks- Reservoir rock types, Geological age of reservoir rocks- Reservoir traps- Classification of traps, anticlinal theory- Structural traps caused by folding, faulting and fracturing.

Unit-II

Primary stratigraphic traps, Fluid traps, Salt domes, Salt plugs, Cap rocks association traps. Origin reservoir conditions. Oil bearing basins of India. Geology of the productive oil fields of India. Position of oil and natural gas in India. Future prospects and economic scenario.

Unit-III

Coal: Definition- origin, sedimentology of coal bearing strata. Macerals of Coal, Rank, grade and type of coal. Chemical characterization: Proximate and ultimate analysis.

Coal forming epochs in the geologic past. Geological and geographical distribution of coal in India. Detailed geology for important coal fields in India.

Unit-IV

Atomic minerals: Mode of occurrence and association of atomic minerals in nature. Atomic minerals in nature. Atomic minerals as source of energy. Methods of prospecting and productive geological horizons in India.

Nuclear power stations of country and future prospects. Atomic fuels and environment.

Reference books:

a. Petroleum formations and occurrences by Tissort B.P. and Welte D.H. 1984
b. Text book of coal by Chandra, D., et al., 2000
c. Uranium ore deposits by Dahlkamp F.J. 1993

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester VIII

86022: Mineral Exploration

Course Objectives:

- To comprehend the importance of Mineral Exploration
- To know the fundamentals and detailed concepts of geological, geophysical, andgeochemical methods that are used in the exploration of mineral deposit

Course Outcomes:

- At the end of the course, students will be able to
- Understand the application of physical, and chemical laws to geological concepts
- Develop skills to handle exploration of the instruments and equipment
- Develop the planning, execution, and interpretation of geological, geophysical,

Unit I

Definition of prospecting and exploration. Stages of mineral exploration. Different types of geophysical methods. Definition of Anomaly, factors controlling anomalies. Gravity methods – principles of gravity methods – field investigations, gravity anomaly, reduction of gravity data and its interpretation.

Unit II

Geomagnetic field of the earth: Magnetic properties of rocks and minerals, principles of magnetometers, Magnetic anomalies. Field procedures, corrections to magnetic data and its interpretation.

Resistivity methods: basic principles, various types of electrode configurations: field procedure profiling and sounding. Electrical methods in ground water investigation.

Unit III

Seismic methods: fundamental principles of wave propagation: reflection and refraction surveys, elastic properties of rock, different types of elastic waves. Radiometric methods: radio activity of rocks and minerals, and instruments used in detection and measurement of radiation in different exploration techniques.

Unit IV

Geochemical prospecting: Geochemical anomalies – Significant; non-significant and displaced anomalies. Geochemical Dispersion- primary and secondary. Geochemical mobility and associated elements. Sampling techniques bedrock, soil, vegetation, water, and stream sediment.

Reference Books:

1. Mining Geology by H.E. McKinstry
2. Mineral Exploration by P.K.Ramam
3. Introduction to Geophysical prospecting by Dorbin, M.B.
4. Geophysical methods in Geology by Sharma, P.V.
5. Outlines of Geophysical prospecting by Ramachandra Rao, M.B.
6. Fundamentals of Geophysics by William Lowrie.
7. Rose, A.W., Hakes, H.E. and Webb, U.S., Geochemistry of the Mineral Exploration.
8. Arogyaswamy: Courses in Mining Geology
9. Principles of Geochemistry, Brian Mason & Carleton B. Moore, Willey Eastern Limited.

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester VIII

86023: Digital Image Processing

Course Objectives:

- To introduce the concepts of image processing and basic analytical methods to be used in image processing. To familiarize students with image enhancement and restoration techniques, to explain different image compression techniques. To introduce segmentation andmorphological processing techniques

Course Outcomes:

- Students understand the fundamentals of digital image processing including the topics, statistical analysis of image processing, image pre-processing techniques, general concepts of map projections, image enhancement techniques and image classification techniques

Unit-I

Introduction of Digital Image Processing: Need for Digital Image Processing, interpretability of raw data, raster and vector files, Digital image, Image formats and its characteristics, Image magnification, Image reduction. Statistical analysis in image processing: Bin functions, Standard deviation, Variance, covariance, correlation coefficient. Significance of image statistics in image processing.

Unit-II

Image pre-processing: Introduction, radiometric errors due to sensor, sun angle and haze and its corrections. Geometric errors due to earth curvature, Earth rotation and unstable satellite platform. Panoramic distortion, General concepts on map projections, geometric rectification, georeferencing and image to image registration.

Unit-III

Image enhancement: Need for image enhancement. Radiometric enhancement: Contrast stretching- linear, non-linear, histogram equalization and histogram stretching. **Spatial enhancement:** Filtering in spatial domain: low-pass filtering, high-pass filtering, Edge enhancement, linear edge enhancement- Laplacian filtering, non-linear edge enhancement- Sober- prewitt filtering. **Spectral enhancement:** Principle component analysis, decorrelation stretch, tasselad cap transformation, hue, saturation and intensity transformation, band ratio/indices.

Unit- IV

Image classification: Need for image classification, image space and feature space. Process of classification, pattern recognition and feature extraction, supervised classification, minimum distance to mean, parallelepiped and maximum likelihood. Unsupervised classification, isodata clustering, pixel analysis and RGB clustering and data accuracy assessment. Problems in image classification, image mosaicing and change detection.

Reference Books:

1. American Society of Photogrammetry, 1983: Manual of Remote Sensing (2nd Ed), ASP Falls Church, Virginia.
2. Duda, R.D and PE Hart 1972: Pattern Classification and Scene analysis, Wiley Interscience. New York.
3. Jensen, J.R 1986: Introductory Digital Image Processing: A Remote Sensing Perspective. Prentice. Hall, New York.
4. Leviadi, S (Ed) 1984: Digital Image Analysis, Pitman, London.
5. Pratt, S.K. 1978 : Digital Image Processing, Wiley- Interscience, New York
6. Rosenfeld, A and A.C. kek, 1982: Digital Picture Processing, Academic Press, New York.
7. Schowengerdt, R.A 1983: Techniques for Image Processing and Classification in Remote Sensing, Academic Press, New York.

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester VIII

OPEN ELECTIVE Paper 86024 (A): Fundamentals of Earth Sciences

Course Objectives:

- Contents of this paper aims to provide fundamental concepts which are related to solar systems, Earth, atmospheric sciences, physical geology and some concepts of natural disasters or calamities

Course Outcomes:

- Students who opted for this paper will get basic knowledge of the various competitive examination syllabus.

Unit-I

The earth in relation to the solar system and the Universe, shape and internal structure of the earth, Structure and composition of hydrosphere, atmosphere, lithosphere and biosphere, abundance of elements in the earth, Theories on the origin of the Earth and age, composition of planets and meteorites, Uniformitarianism, geological time scale.

Unit-II

Concepts of Latitudes and Longitudes, Mathematical location of places on the globe, Atmosphere – Circulation, Planetary and local winds: Jet streams, Monsoons, EL-Nino and LA Nina phenomena, Inter Tropical Convergence Zone (ITCZ) and The Air - Masses-Cyclones and Anti Cyclones

Unit-III

Concept of Weathering, Erosion, transportation and deposition of earth's material, Drainage Pattern, Rocks-origin-classification-distribution, Classification of soils, soil types of India, Physiographic divisions of India.

Unit-IV

Geoenvironmental hazards – volcanoes, earthquakes, floods, landslides, coastal hazards. Global warming, Greenhouse effect, Types of Pollution and energy resources, water contamination, waste disposal, alternate sources of energy.

Reference Books:

1. Physical Geology - A.N. Strahler , 1980
2. Environmental Geosciences - A.N. Strahler and A.H. Strahler, 1973
3. An Introduction to Earth and Environment - A.K. Sinha, 1990
4. Certificate Physical and Human Geography- Goh Cheng Leong
5. Environmental Geology-Indian Contest, TATA-McGraw Hill, New Delhi-Valdiya, K.S. 1987
6. Text book of Engineering Geology, McMillan India Ltd. New Delhi- N.Chenna Kesavulu

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester VIII

OPEN ELECTIVE Paper 86024(B): Watershed Management

Course Objectives:

- This paper deals with the applied aspects of hydrogeology and waters resourcemanagement in dual aspects of science and humanities.

Course Outcomes:

- Students will get knowledge on fundamentals and importance of watershed management in the current water crisis scenario.
- Understands the hydrologic Processes viz., hydrological cycle, precipitation, transpiration, infiltration, runoff, etc. Ground Water recharge and its estimation.
- Get to know the soil and water conservation artificial recharge programmes including Bhungroo.
- Students get exposure to integrated and sustainable development approach. Geospatial techniques for ground water studies and land form analysis along participatory rural appraisal with case studies like Ralegaon Siddhi.

Unit- I

Watershed: Definition, scope, characteristics and classification. Topography, Channel Networks, Geomorphology and Soils, Vegetation and Landuse LandCover. Aquifers and derivation of aquifer parameters.Evaluation of aquifer characteristics.

Unit- II

Hydrologic Processes: Hydrological Cycle, Precipitation, Interception, Evaporation and Transpiration, Infiltration and Runoff. Ground Water recharge and its estimation.

Unit-III

Soil and Water conservation: Soil and soil erosion controlling measures on waste lands and agricultural lands and forests. Rain water harvesting, soil moisture conservation, Rain Water Harvesting Structures. Artificial Recharge Programmes - Bhungroo.

Unit- IV

Integrated approach for sustainable development. Geospatial techniques for ground water studies and land form analysis. Participatory Rural Appraisal (PRA): Basic principles, assumptions, important types and benefits. Case studies - Ralegaon Siddhi.

Reference Books:

1. Ground water flow and mass transport modeling for Assesment and Management of Aquifers by K.Palanisami, M.Thangarajan, and A.K.Sinha
2. Hydrology and watershed management, JNTU, by B.Venkateswara Rao, G.Jaganmohan Das, C.Sarala and M.V.S.S.Girdhar.
3. Engineering Hydrology by K.Subramanyam, Tata McGraw Hill, New Delhi

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester VIII

OPEN ELECTIVE Paper 86024(C): MOCCs/SWAYAM/NPTEL

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester VIII

Paper 86021P: Fuel Geology Lab

Course Objectives:

- To give the knowledge on fossil fuel formation quality and their controls
- To understand the geologic setting of coal baring lithounits and reservoirrocks
- To make the student familiar with computation and correlation of field data,
- logs, maps, stratigraphic sections etc.,

Course Outcomes:

- Student will able to distinguish different types of reservoir rocks, types of coal andits compositional origin.
- Student will gain knowledge on preparation and interpretation of sediment - sequence- straigraphic maps, sections and logs
- Student will able to analyse the structure, stratigraphic setting and distribution ofhydrocarbon bearing/ reservoir rocks

List of Practical's:

1. Study of hand-specimens of different reservoir rocks
2. Study of hand-specimens of different types of coal
3. Problems related to proximate analysis of coal
4. Study of thin sections of coal for macerals
5. Preparation of structural, Isopach and Isochore maps(contour maps)
6. Preparation of Facies maps, Fence diagrams, Isometric projections
7. Preparation of Paleontologic range chart, Sediment maps, Cross sections
8. Computation of stratigraphic thickness
9. Drafting of columnar section in graphic symbols
10. Correlation of electric logs

Paper 86022P: Mineral Exploration Lab

Course Objectives:

- To give a practical experience that was learned in mineral exploration theory classes
- To generate error-free data and graphs for interpretation

Course Outcomes: At the end of the paper students will be able to

- Do the calculations and reduction of data without error
- Will have skills to interpret the data and the location of mineral deposit

Practical's List:

1. Determine the Mass of the earth
2. Calculating the Earth's gravity field if the radius of the Earth is double, keeping the other parameters constant
3. Appling the Gravity Corrections to the raw data
4. Find the undisturbed gravity values from the equator to the pole with constant intervals
5. Calculate the Horizontal, Vertical, and inclination components of the magnetic field at a given latitude
6. Calculation of Total Earth's magnetic field by the given data
7. Planning and Execution of surveys by Electrical Resistivity Meter and Magnetometer
8. Interpretation of Wenner's configuration data and VES data to suggest a borehole
9. Finding the Epicenter of the Earthquake by using the Triangulation Method
10. Calculation of Vrms, and Vnmo's by the data obtained from the Seismic refraction survey.
11. Determination of Isotopic Composition of a mineral
12. Preparation of geochemical maps
13. Interpretation of Geochemical data

Paper 86023P: Digital Image Processing Lab

Course Objectives:

- Aims to equip the students with the image enhancement techniques and imagerectification techniques which helps to generate error free satellite

Course Outcomes:

- Students who successfully complete this practical will have demonstrates an ability to understand the fundamental concepts of image processing; histogram equalization and histogram stretching; Use of enhancement and filtering techniques in different domains and apply them in original images; Principle component analysis; image classification like supervised and unsupervised classification; Use of morphological operations and usefulness in segmentation problems leads tosolve research works

List of Practical's

1. Image display and study of Image Histogram and Image Statistics
2. Histogram generation using Calculator
3. Statistical analysis in DIP
4. Subset a scene of Intersect from LISS image
5. Linear Stretching using calculator
6. Historgram equalization using ERADAS Imagine Software
7. High pass and Low pass filtering using ERADAS Imagine software
8. Band ratioing
9. Generation of Indices using ERADAS Imagine Software
10. PCA by using calculator
11. Generation of PC1, PC2, PC3 and PC4 using ERADAS Imagine
12. Supervised classification of satellite imagery by using ERADAS Imagine
13. Unsupervised classification of satellite imagery by using ERADAS Imagine
14. Image processing and basic analytical methods
15. Spatial and spectral enhancement techniques

86024RP: MINOR RESEARCH PROJECT

Course Objectives:

- To understand the relevance, basic concepts and importance of research projects.
- To utilize the knowledge on the relevance, basic concepts and importance

Course Outcomes:

- To understand the importance of research concepts and to put them in practicewhile working on projects.

As per NEP-2020, the Committee recommends that all students must complete a 2 - credit requirement where they are engaged in 4-6 weeks of structured **minor research project** with an external organisation or within university campus under respective internal supervisor. The same mini research project will be used in 10^{th} semester for further extensive practical execution. This **minor Research project** at the end of 8^{th} semester will be assessed by the Head of Dept., one senior faculty in the department and concerned project Supervisor.

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester IX

Paper 96021: Engineering Geology

Course Objectives:

- To study and identify different engineering properties of rocks.
- To understand the various natural dynamic processes their influence on the surficialfeatures, natural material and their consequences.
- To know the how Remote Sensing and GIS is useful in Civil Engineering projects.
- To know the importance of geological maps and language helpful for Civil Engineering

Course Outcomes:

- The students will understand the influence of natural processes and geological factors on civil structures and help them to take decision while planning, design and execution stage of the structures in their professional life. The students will know the significance of geological investigations for civil engineering projects and site selection as well as for the

Unit I

Engineering properties of rocks, soils like specific gravity, porosity, permeability, compressive strength, hardness, toughness, percentage of wear, tensile strength, modules of elasticity, modules of compression and residual stress and their importance in construction of civil engineering structures. Definition of quarrying of rocks, site for quarry, methods of quarrying – quarrying with hand tools, quarrying with channeling machine, quarrying by blasting, precautions in blasting.

Unit II

Neotectonism, seismic hazard and damage assessment, seismic problems of India, Earthquake resisting structures, Classification, causes of landslides, controls of landslides subsidence and its importance, site selection for ghat roads. Detection of causative factors for soil erosion, soil conservative measures. Determination of magnitude measurement and location of epicenter and focus.

Unit III

Definition and parts of dam, types of dams, geotechnical considerations in selection of dam sites, case histories – Nagarjuna Sagar Dam and Srisailam Dam, characters for investigating relative suitability, geological consideration for reservoir sites. Types of tunnels, objects of geological investigations, methods of investigation, geological considerations in tunnels, types of bridges, Geology for bridge cites, problems of constructing civil engineering structures in areas prone to landslides, faulting, earthquake and coastal erosion.

Unit IV

Application of Remote Sensing and GIS in river valley projects: dams and reservoirs, site suitability evaluation (lithological, structural, geomorphological considerations). Application of Remote Sensing and GIS in Seismic hazards, Landslides Ghat roads- bridges, culverts, route location (highway and rail roads) canal and pipeline alignments, tunnel constructions. Site suitability evaluation (lithological, structural, geomorphological, slope, gradient,economic considerations).

Reference Books:

1. Engineering materials by S.C. Rangwala
2. Text book of Engineering Geology by N.Chennakesavulu.
3. Principles of Engineering Geology by K.V.G.K.Gokhele
4. Engineering and General geology by Parbin Singh.
5. Remote Sensing and Image Interpretation, Lillesand, T.M., Keifer, R.W.,
6. Remote Sensing Principles and interpretation, Sabins F.F.,
7. Remote Sensing Geology, Singh, R.P.,
8. Engineering Geology by D.Venkat Reddy

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester IX

Paper 96022:Mineral Processing Engineering

Course Objectives:

- Identification of ores and their constituents. Identification of various aspects of liberation and Separation methods. To know various aspects of comminution like- principles of comminution, classification and operation of comminution equipment, industrial practice.
- To know the methods of laboratory sizing practice and industrial aspects of sizingequipment.

Course Outcomes:

- Mineral processing engineering provides a proper understanding on various economic mineral processing and role of geologist in mineral processing. Understand the process of Jigging and Tabling and its applications. Understand the phenomenon Flotation Technique and its applications in industries and understand the magnetic separation application in

Unit I

Introduction fundamentals of mineral processing. Importance of mineral processing, economics of mineral processing, occurrence of ores in nature, justification for mineral processing, Role of geologist in mineral processing.

Unit II

Crushing, type of crushers, cone crushers, Hammer mill, stamp mill, recent advances in crushing, principles of grinding, dry and wet grinding, trembling mills – Ball mill, types of ball mills, rod mill, types of rod mills. Jigging, types of Jigging, tabling, types of tables, application.

Unit III

Classification in mineral processing. Types of classifiers, screening, types of screening, stationary screens, vibrating screens, laboratory screens, wet and dry screening. Flocculation and dispersion application, floatation and agglomeration application, magnetic separation, types of magnetic separators.

Unit IV

Flow sheet design, miscellaneous processes – hydro metallurgy, heap leaching, hot water drying of coals, radiometric methods of coal separation. Flow sheets of beach sand separation, copper, lead, zinc separation of Khetri and Jawar mines, coal washery design.

Reference Books:

1. Principles of mineral dressing – A.M. Gaudin.
2. Elements of ore dressing – A.F. Taggart.
3. Course in mining geology – R.N.P. Araogyaswamy.
4. Mineral processing – E.J. Pryor.
5. Ore Processing – S.K. Jain.
6. Ore deposits of India – Their distribution and processing – K.V.G.K. Gokhale and T.C. Rao.

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester IX

Paper 96023: Mineral Economics

Course Objectives:

- To learn about geology of the metallic, non-metallic minerals & fossil fuels and their industrial applications, distribution & mode of occurrences.
- To gain knowledge about the production, import and export of mineral in the Indiaand world's scenario.
- To gain knowledge about the mines legislation of India, National mineral policy,

Course Outcomes:

- The students will gain knowledge on mineral resources.
- The students will gain knowledge on principles and legislation of mineral policy of India.
- The students will know the new techniques of mineral production and mineralindustry growth in A.P...

Unit-I

Mineral economics as a concept. Importance of minerals in National Economy. Use of Metals, non-metals and fuels. Peculiarities inherent in Mineral Industry. International aspects.Legislation related to minerals. Minerals in India, National mineral policy.

Unit-II

Classification of minerals- Major, Minor, Fuels and Industrial minerals, Strategic, Criticaland essential minerals. Present and future minerals supply of the world.

Unit-III

Resources, production and import and export of minerals in the world and India's status.Tenor, grade and specification of important minerals with examples.

Unit-IV

Demand and supply of fuels and minerals. Conservation and substitution of minerals- low-Grade ore, use of scrap, new technologies, synthetics and synthesis. Changing pattern of Mineral consumption. Mineral Industry in Andhra Pradesh and its growth.

Reference Books:

1. Mineral Economics by R.K.Sinha and Sharma.
2. Minerals in world industry by Voskinil, W.H
3. An introduction to mineral economics by K.K.Chaterjee
4. Indian Bureau of Mines mineral year books
5. Mckinstry: Mining Geology
6. Rose, A.W., Hakes, H.E. and Webb, U.S., Geochemistry of the Mineral Exploration.

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester IX

OPEN ELECTIVE Paper 96024(A): Disaster Management

Course Objectives:

- Aims to let the students know about the fundamental concepts of disaster and

Course Outcomes:

- Students can understand how various types of disasters occur, how to predict them if possible and how to mitigate loss of life and property and other adversities. Comprehensive and thorough study of disaster management will help the students in getting the employment in national and state disaster management authorities. Social service as a volunteer can also be done in rescuing the people

Unit- I

Fundamental concepts of Disaster management: Hazard, Disaster, Risk, Vulnerality, Management. Natural and anthropogenic hazards.
Elements of hazard mapping, risk analysis, damage assessment, loss analysis, hazard mitigation.

Unit- II

Environmental Hazards: Soil and land degradation, Mining hazards, deforestation, forest fire. Flood mapping and monitoring. Drought prediction and monitoring. Cyclone prediction and hazard assessment. Tsunami and sea mounts

Unit- III

Volcanic hazards, volcanic belt girdling in India, sub continent origin and types of volcanic activity, nature of volcanic hazards, prediction of volcanic eruptions, Mitigation of volcanic hazards.

Unit- IV

Disaster management policy, National disaster framework. Disaster mitigation. Planning and strategies for implementation. Role of remote sensing and GIS in disaster mitigation measures.

Reference Books:

1. Environmental geology- Indian context K.S. Valdiya (1987).
2. Environmental geology- Flawn, P.T. (1970).
3. Environmental Geology- Keller, E.A. (1976).
4. Landslide and their control- Zaruba, Q and Menel, V (1969).
5. Focus on Environmental geology- Tank, R. W. (1973).
6. Environmental geology- C.W. Montgomery (1989).
7. Environmental geology- D.R. Coats (1981).
8. All you wanted to know about disasters- (Brig) B.K. Kanna (2005).

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester IX

OPEN ELECTIVE Paper 96024(B): Mineral Deposits of India

Course Objectives:

- Primarily focus on the types and processes of mineral or ore deposits and identification of ores by studying the physical properties.

Course Outcomes:

- Students will get knowledge about the formation, occurrence and geological distribution of various Economic mineral
- Student will gain expertise in identification of various ore minerals that are used

Unit I

Formation and distribution of Precious metals and Gem stones- gold, silver,platinum and diamond, amethyst, ruby, pearl, emerald, sapphire.

Unit II

Important industrial mineral and ore deposits in India- minerals used in refractory, Fertilizer,ceramic, cement, glass, paint industries

Unit III

Geological setting mode of occurrence, genesis, distribution and uses of chromite,manganese, iron, copper- lead- zinc, bauxite and placers.

Unit IV

Origin, distribution and economic importance - Atomic Minerals - Uranium and thorium;Fossil fuels - Coal and Petroleum.

Reference Books:

1. Economic Geology 2 nd Ed.- Umeshwar Prasad
2. Ore Deposits in India – Gokhale, K.V.G.K. and Rao, T.C.
3. Industrial Minerals and rocks in India – Deb, S.
4. Economic Minerals Deposits – Bateman, A.M. and Jenson, M.L.
5. Ore Deposits – Park Jr. C.F. and MacDiarmid, R.A.

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester IX

OPEN ELECTIVE Paper 96024(C): C. SWAYAM/MOOCS/NPTEL

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

S

emester IXPaper 96021:

Engineering Geology Lab

Course Objectives:

- To expose the students to identify the rocks based on their inherent properties anduses in civil engineering.
- To gain the Field knowledge by visiting the site like dams, reservoirs, geo engineering structures
- Helps to identify the suitable places for construction of Dams, reservoirs

Course Outcomes:

- Students will gain the geo technical knowledge that plays a major role in engineering structure
- Students will able recognize the suitable places for the construction of

List of Practical's

1. Acid test.
2. Smith test.
3. Water absorption test.
4. Attrition test.
5. Crushing test.
6. Toughness test.
7. Hardness test.
8. Dams models.
9. Tunnels models.

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

S

emester IXPaper 96022:

Mineral Processing

Engineering Lab

Course Objectives: ➢ Aims to get knowledge about the mineral processing after the excavation ofminerals from the mining sites ➢ To impart the knowledge and usage of mining processing equipment's
Course Outcomes: On successful completion of this course, the students will be able to ➢ Understand the basic principles of mineral processing equipment's ➢ Visit to mineral processing industry will get the knowledge that is required

List of Practical's:

1. Horse power (HP) calculation.
2. Mass balance of a flow sheet.
3. Flow sheet design.
4. Performance of a jaw crusher.
5. Performance of a hand jig.
6. Assignment on a topic of mineral processing design and presentation.
7. Visit to a mineral processing industry.

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester IX

96023SOC: Geological Mapping (Theory + Lab) Skill orientated course

Total marks	: 100 marks	Credits	4
Theory	: 50 marks (Internal – 10 + Semester end – 40 marks)		
Practical	: 50 marks		

Course Objectives:

- To get the basic concepts of geological mapping
- To comprehend the knowledge about different geological guides that unravels

Course Outcomes: On successful completion of this course, the students will be able to

- Know generation geological maps

96023SOC: Theory syllabus

Unit-I

Reconnaissance survey Geological mapping, Traverse, controls of mapping, etc. guides to ore search: Lithological guides, Stratigraphic guides, structural guides, rock alternation guides, and geobotanical guides.

Unit-II

Geological mapping: Surface and sub-surface mapping, Methods and types of sampling: Grab sample, channel sample, core sample. Controls of mineralization

Reference Books:

1. Mining Geology, H. E. McKinstry, Asia Publishing House.
2. Arogyaswamy: Courses in Mining Geology
3. Levinson, A.S., Introduction to Exploration Geochemistry

96023SOCP: Skill Practical syllabus

Course Objectives:
Course Outcomes: On successful completion of this course, the students will be able to ➢ Generate or draw the geological maps during field visits

Fieldwork is an important part of Geology as it provides muchof the data on which knowledge of the Earth and its evolution along with that of life through time. It can be considered as the glue that binds together all of the different subdisciplines within the studyof our planet.
So, students will be sent to mining sites for a fifteen days training program, to generate the geological maps with the help of geology experts at the mining areas/sites and should submit a report on the training program. In addition, field visits a day per week will be conducted and the students should submit the field visits reports.

Generation of Geological Maps

1. Selection of a Section
2. Identification of Structure or series of structures of the selected section
3. Drawing of Strike line
4. Observation of Dip, Dip direction & thickness of the beds
5. Rough Sketches & estimation for drawing of Cross Section
6. Making of the paper strip
7. Drawing of Cross Section
8. Relief Profile drawing
    - Beds and unconformity drawing
    - The sequence of beds and annotation
    - Succession of beds Heading & Caging
    - Scale of drawing

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester X

Paper 06021: Research Methodology

Course Objectives:

- Identify the essential components of research
- Design the various strategies involved in experimental research

Course Outcomes: At the end of course, the student can able to

- Build various steps involved in the conduct of proper research and writing article.
- Analyze systematic methods for data collection, data processing, and data analysis

Unit-I

Basic principles of Research, concept, objectives, types, approaches and significance of research. Scientific methods, research process and constraints for research in India. Identification of ore minerals - Megascopic, microscopic, polished techniques; minerals under reflected light, microscopic principles of ore dressing, processing methods - Jigging, tabling application of these methods.

Unit-II

Computation and analysis of geochemical data. Construction and interpretation of variation diagram. Calculation of mineral formulae, normative calculation of rock data, instruments for various analysis: methods, techniques and interpretation of chemical analysis by following instruments: Atomic Absorption Spectrometer (AAS), X-ray diffraction; Calorimeter, flame photometer and XRF. Eh and Ph diagrams.

Unit-III

Introduction to computer applications in geology, table formatting and graphs generations. Database Management System (DBMS), data models, data abstraction, geo statistics, tabulation, liner and multiple regression, constructions, preparation and interpretation of lithofacies map.

Unit-IV

Remote sensing application for preparation of topographic and thematic maps. Identification of land forms - fluvial, volcanic, glacial and coastal landforms. Methods and tools of acquisition, processing analysis and interpretation of remotely sensed data. Morphometric analysis of drainage data, delineation of drainage basin, sub basin and sampling techniques of surface, sub surface water samples for monitoring of water quality. Collection of soil samples and soil profiles.

Reference Books:

1. Research Methodology – C.R.Kothari
2. Remote Sensing principles and interpretation, by Sanfrancisco. Sabins, F.F.jr 1978.
3. Remote Sensing and Image Interpretration Lillis and,T.M. and P.W. Kiefer, 1986.
4. Remote Sensing Geology by R.P. Gupta, 1991.

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester X

INTERNAL ELECTIVE Paper 06022(A): Sedimentary Basins of India

Course Objectives:

- To learn about classification, depositional environments and mapping methods ofbasins.
- To gain knowledge about the distribution of petroliferous basins in India.
- To learn about stratigraphy, structures and tectonics of onshore and

Course Outcomes: At the end of course, the student can able to

- The students will gain knowledge on different basins of India and their formations.
- Know the salient features of onshore and offshore basins in India.

Unit I

Basins Classification and Depositional Environments: Tectonic Basin Classification, Tectonics and Basin Filling, Basin Morphology and Depositional Environments.

Basin Evolution and Sediments: Rift basins, Continental Margin and Slope Basins, Intracontinental Sag Basins. Deep-Sea Trenches, Foreland, Back arc and Retro arc Basins, Remnant and Foreland Basins, Collision – Related Basins, Pull-Apart Basins, Basin- Type Transitions (Polyphase Basins)

Unit II

Basin mapping methods: Structure and isopach contouring, Lithofacies maps, Geophysical techniques, Clastic petrographic data, Computer mapping methods, Stratigraphic cross sections, Paleocurrent analysis, Remote sensing. Depositional systems and sequence stratigraphy: Stratigraphic architecture, Non-marine depositional systems, Coastal depositional system. Clastic shelves and associated depositional systems, Carbonate andevaporate depositional systems.

Unit III

Stratigraphy, Structure and Tectonics of Onshore and Offshore Sedimentary basins of East Coast of India with special reference to – Bengal Basin – Mahanadi - Krishna -Godavari and Cauvery Basins.
Stratigraphy, Structure and Tectonics of Onshore and Offshore Sedimentary basins of West Coast of India with special reference to Kutch – Saurastra – Narmada – Cambay Bombay high, Kerala – Konkan Offshore Basins.

Unit IV

Stratigraphy, Structure and Tectonics of other Sedimentary basins of India withspecial reference to Cuddapah - Vindhyan – Rajasthan - Assam shelf – and Himalayan foothill Basins.

Reference Books:

1) Einsele G 1992 Sedimentary Basins. Springer Verlag.
2) Miall A 2000 Principles of Sedimentary Basin analysis.
3) Sengupta S 1997. Introduction to Sedimentology oxford – IBH.
4) Petrol ferrous Basins of India, ONGC, Petroleum Asia Journal.

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester X

INTERNAL ELECTIVE Paper 06022 (B): Environmental Geology

Course Objectives: ➢ To impart the knowledge of geologic hazards, natural resources, issues of concernto society (such as climate change),
Course Outcomes: At the end of course, the student can able to ➢ Enlightens how to conserve our environment in the face of increasing human population growth Natural disaster and anthropogenic activities that pollutes theenvironment ➢ Gains knowledge on monitoring and mitigation measures in natural hazards

Unit I

Principles of environmental geology; spectrum of environment, geologicalperspective of environment; Land and its use, land desertification and land degradation andlandmanagement.

Unit II

Soil profile, origin of soil, classification of soils, soil types of India, and soilconservation; Soil degradation due to irrigation, use of fertilizers and pesticides; Waterresources – hydrological considerations, problems and management.

Unit III

Environmental management in mining, Impacts of mining activities on theenvironment,erosion, causes and control.

Unit IV

Geoenvironmental hazards – volcanoes, earthquakes, floods, landslides, coastalhazards.
Pollution and energy – Global warming, water contamination, waste disposal,alternate sources of energy.

Reference Books:

1. Valdiya, K.S. 1987, Environmental Geology – Indian Contest, TATA-McGraw Hill, New Delhi
2. Keller, E.A. 1978, Environmental Geology- Bell and Howell, USA
3. Subramanian, V, 2001, Text book of Environmental Science, Narosa Publication, New Delhi.Chenna Kesavulu,

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester X

INTERNAL ELECTIVE Paper 06023 (C): Precambrian geology

Course Objectives: ➢ This papers primarily focuses on the earliest geological events, cratons, types ofcratons and their lithology in India, and mobile belts that were formed
Course Outcomes: At the end of course, the student can able to ➢ gain a detailed knowledge on cratons and mobile belts and basins formation and distribution of throughout India and which mainly helps to know the distributionof metallogenic provinces and epochs

Unit- I

Precambrian Geology of India: Introduction, previous studies, tectonic framework of India- Cratons and mobile belts. Dharwar craton: Introduction, regional stratigraphy structure, metamorphism and tectonic evolution. Granulite belts of India.

Unit- II

Introduction to Granite-Greenstone belts. Dharwar Schist belts: Sargur schist belt, Bababudan schist belt, Shimoga schist belt, Chitradurg schist belt, Gadag schist belt, Hutti schist belt, Sandeer schist belt, Hangund schist belt. Kolar Schist belt, Ramagiri- Penakacherla schist belt, Znnagiri schist belt, Veligallu schist belt.

Unit- III

Bastar Craton: Regional stratigraphy,description of stratigraphic units, Mafic dykes and tectonic evolution.

Singbhum Craton: Introduction, supracrustals and granitoids, volcanic succession, north Singbhum orogeny and tectonic evolution

Unit- IV

Bundelkhand Craton: Introduction, supracrustal- gneisses- Bundelkhand granite and tectonic evolution.

Aravalli Craton: Introduction, tectonic stratigraphic units and their description. Regional metamorphism and tectonic evolution.

Reference Books:

1. Geology of India and Burma by M.S.Krishnan
2. Geology of India by D.N.Valdiya
3. Principles of physical geology by A.Holmes and D.L.Holmes
4. Geology of India (2008) - M.Ramakrishna and R. Vaidyanadhan

YOGI VEMANA UNIVERSITY

5 Year M.Sc. Applied Geology (Integrated)

Semester X

INTERNAL ELECTIVE Paper 06021MPD : Major Project/ Dissertation

Course Objectives:

- To utilize the knowledge on the relevance, basic concepts and importance ofresearch projects to perform a research project.
- To utilize the understanding of the research methodology concepts to

Course Outcomes:

Duration of project - 3 months

Students are required to carry out a research project of 3-4 month duration related to Applied geology. Arrangements could also be made to pursue research studies at institutions other than the relevant faculties of Yogi Vemana University. In such circumstances, the student is assigned with two supervisors: an internal supervisor from the panel of teachers and an external supervisor from the institution where the research project is carried out. After completion of project, students have to submit their project dissertation to the Yogi Vemana University, Kadapa and also to be given project viva and presentations in the presence of departmental board (internal) and external examiner.

Paper No.	Title of paper	Marks in semester end exam	Internal marks for exam	Total marks
06021 MPD	Major Project Individual project Viva- voce	 200 100	 100 -	 300 100
		300	100	400

MODEL QUESTION PAPER

5 Year M.Sc., Degree Examinations (Model Paper)Semester: VI
Subject: Applied Geology

Paper 66023: Hydrogeology

Time: 3 Hours Max marks: 75 Marks

Part – A
Answer any FIVE (5) questions.
Each question carries Three (3) marks (5X3=15)

1. Porosity and Permeability
2. Storage coefficient
3. Well hydraulics
4. Radial flow
5. Hard and soft water
6. Sodium Absorption Ratio(SAR)
7. Electrical Resistivity Interpretation
8. Geological methods of groundwater exploration

Part B Answer all questions.
Each question comes FIFTEEN (15) Marks (4 X15=60)

9. Give an account of various subsurface zones in relation with groundwater accumulation

OR

10. Explain the occurrence of groundwater in hard rock terrain.

11. Give a detailed note on well hydraulics.

OR

12. Discuss about types of wells and different drilling methods used.

13. What is salt water intrusion? Explain the Ghyben-Hertzberg relationship.

OR

14. Explain in detail the quality of groundwater and their suitability for domestic purpose.

15. Discuss the electrical resistivity method and its application in groundwater exploration.

OR

16. Give a detailed note on groundwater prominence of India.

MODEL QUESTION PAPER

5 Year M.Sc., Degree Examinations (Model Paper)Semester: IX
Subject: Applied Geology

Paper 96023SOC: Geological Mapping

Time: 2 Hours Max marks: 40 Marks

Part – A
Answer any TWO (2) questions.
Each question carries Three (3) marks (2X5=10)

1. Controls of Mapping
2. Structural guides
3. Grab sampling
4. Chip sampling

Part B
Answer any TWO (2) questions.
Each question comes FIFTEEN (15) Marks (2 X15=30)

9. Discuss in detail about Reconnaissance survey of geological mapping.

OR

10. Describe in detail about Lithological, rock alteration and geobotanical guides to ore Search.

11. Give detailed account on Controls of Mineralization.

OR

12. Discuss in detail about surface and subsurface mapping.

5 Year M.Sc., Degree Examinations (Model Paper)

Semester: X

Subject: Applied Geology

Paper 06021: Research methodology

Time: 3 Hours Max marks: 100 Marks

Part – A

Answer any FIVE (5) questions.

Each question carries four (4) marks (5X4=20)

1. Basics of research
2. Properties of Minerals under reflected light
3. Variation Diagrams
4. Principles of calorimeter
5. Data abstraction
6. Linear and multiple regression
7. Preparation of thematic maps
8. Soil profile

Part B

Answer ALL questions.

Each question comes twenty (20) Marks (4 X20=80)

9. Discuss about scientific methods, research process and constraints for research in India.

OR

10. Discuss various methods of ore processing.

11. Write about the principle and operation of X-ray diffraction.

OR

12. Give the detailed procedure of normative calculation of rock analysis data.

13. Computer applications is essential in geology- discuss.

OR

14. What are computer graphics? Explain in detail in raster scan display processing units.

15. Explain the role of remote sensing application in preparation of various maps.

OR

16. Write about collection of soil sample and drawing of soil profile.

YOGI VEMANA UNIVERSITY: KADAPADEPARTMENT OF EARTH SCINECE

Pre PhD Examination Syllabus Paper

I: RESEARCH METHODOLOGY

Unit I

Introduction to Research Methodology: Meaning of Research, Objectives of Research, Types ofresearch, significance of research, Essential steps in research.Review of literature – Need for reviewing literature, kinds of literature, and sources of literature notetaking.

Unit II

Research Design: Meaning, need and features of good research design: Selection andFormulation of Research problems; Steps in research design or planning.Hypothesis – Meaning, sources and types of Hypothesis; Formulation and validation ofhypothesis.

Unit III

Data: Definition and Types of data; Sources and Methods of collecting data – Primary data – Inquiry forms, Questionnaire, Interview, Schedule, Experimental and case studies; SecondaryData – Published and Unpublished sources. Report writing: Basic concepts of reportGeneration;Types and significance of research reports

Research Funding Institutions: Indian Govt. Organizations – UGC, DST, GSI, CSIR, NIO,ISRO, NGRI, APCOST etc.; Non-Govt. organizations – ONGC, Indian Oil Corporation, Reliance etc.

Unit IV

Field Methods in Geology; Importance of various field instruments; Identification of rocks andminerals in field; Recognition of various structures in an outcrop.Maps: Introduction, types and uses of maps; Topographic maps – Features of topographic maps,symbols for topographic map reading; Interpretation of Geological maps.

Unit V

Basics of Computers – MS Office - Statistical applications in earth sciences, construction of Frequency, distribution, probability, averages, standard deviation, correlation, regression, geo Statistics, tabulation, anova.

References

1) Research Methodology – Methods and Techniques by Kothari, C.R.
2) Research Methodology and Statistical Techniques by Santosh Gupta.

YOGI VEMANA UNIVERSITY: KADAPADEPARTMENT OF EARTH SCIENCES

Pre PhD Examination

Paper I: Research Methodology

(Model question paper)

Time: 3 hours Max. Marks: 100

Answer all questions Each question carries 20 marks

1. Write an essay on objectives, significance and essential steps in Research?

OR

2. What is the importance of Review of literature in research and explain about various sources of literature for research in Earth Sciences.

3. Write an essay on various steps in research design or planning.

OR

4. Discuss in detail about the formulation and validation of hypothesis.

5. Write an essay on various methods of data collection.

OR

6. Discus in detail about various funding agencies in India.

7. Enumerate various field instruments and write their uses.

OR

8. What is a map? Write a brief note on types and uses of maps.

9. Give a list of different Operating systems, Languages and packages of Computer. How they are useful.

OR

10. What is central tendency? Explain the relationship of its parameters with various models of distribution.

~!~

YOGI VEMANA UNIVERSITY: KADAPA
DEPARTMENT OF EARTH SCIENCES

Panel of examiners for paper setting and evaluation for 5 Year M Sc

Eligibility:

Any Government university teacher (Professor, Associate Professor and Assistant Professor) or Institution Scientist are eligible for paper setting, evaluation and conducting practical examinations for 5 Year Integrated Applied geology (Integrated) course.

Panel of examiners for paper setting and evaluation forPre-Ph.D examination and Ph.D Thesis evaluation

Eligibility:

Any Government university teacher (Professor, and Associate Professor) or Institution Scientist (Above Scientist D cadre) are eligible for paper setting & evaluation of Pre-Ph.D examinations and also for thesis evaluation and conducting Viva-voce in 5 Year Integrated Applied geology (Integrated) course as per university norms.

BOS, CHAIRPERSON & CONVENER
(DR. T.Siva Prathap)

Syllabus for
M.Sc. Environmental Science

Programme:ENVYVUC

(NAAC Accreditation 'B' Grade with CGPA 2.54) http://www.yvu.edu.in/ NIRF Ranking -2020 in the band of 101-150

Choice Based Credit System (CBCS)

Based on
National Education Policy (NEP)-2020

(With effect from the Academic Year 2021-2022)

Board of Studies (BOS) members of Environmental Science

YOGI VEMANA UNIVERSITY::KADAPA

DEPARTMENT OF ENVIRONMENTAL SCIENCE – 516 005

Minutes of the meeting of Board of Studies Council held on 07.04.2022 at 10.00 AM in virtual mode and in the Dept. of Environmental Science, Yogi Vemana University, Kadapa

Members Present:

1. Prof. N. Parthasarathy : External member
2. Dr. P. Brahmaji Rao : External member
3. Dr. S. NazaneenParveen: Board of Studies - Chairman
4. Dr. M. Sridhar Reddy : Head
5. Dr. T. Chandrasekhar : Member
6. Dr. S. Sumithra : Member
7. Mr. K. VenkataSubba Reddy : Member (Industry)
8. Mr. K. Yavan Kumar : Member (PG Meritorious student)

The Board of Studies in Environmental Science considered the following agenda for the meeting.

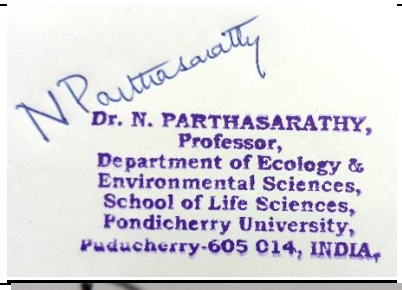
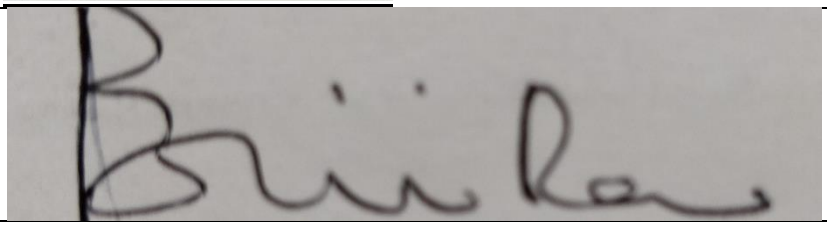
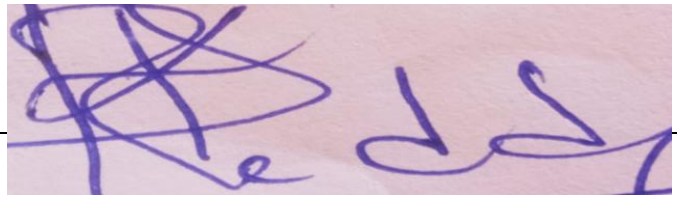
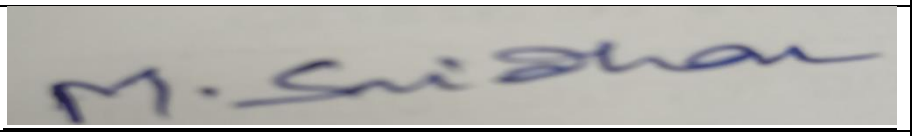
1. Course pattern, syllabus, scheme of examination for M.Sc. Environmental Science w.e.f. 2021-22 based National Education Policy 2020; along with Programme Educational Objectives (PEOs), Programme Outcomes (POs), Programme Specific Outcomes (PSOs), Course Objectives (COs) and Expected Course Outcomes (ECOs).

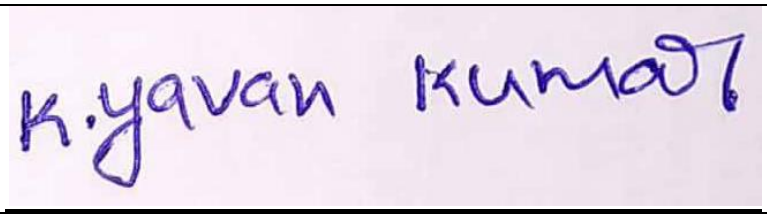
2. Modalities for implementation of National Education Policy (NEP) in M.Sc. course and encourage students to join in MOOCs/SWAYAM/NPTEL.
3. Panel of question paper setters for M.Sc. course in Environmental Science.
4. Panel of experts for selection committee.
5. Any other item.

Resolutions

1. Reviewed and resolved to approve CBCS pattern with National Education Policy as per the pattern suggested by University College.
2. Each course is holding four credits. The scheme of examinations for CBCS in University are as follows: 75+25 (Semester Examination + Internal)
3. It is resolved to motivate the students to participate in one SWAYAM/ MOOCs/ NPTEL programme of their choice in specified field.
4. Resolved to introduce community service programme for M.Sc. Environmental Science course of CBCS & NEP pattern. Modalities for implementation of community service programme will be worked out.
5. Previous year question papers of M.Sc. Environmental Science are scrutinized and found to be in order.
6. Resolved to approve the panel of examiners/paper setters for M.Sc.

Signatures:

Prof. N. Parthasarathy, Pondicherry Central University	
Dr. P. Brahmaji Rao Associate Professor Acharya Nagarjuna University Guntur	
Dr. K. VenkataSubba Reddy (Industry) : Atchutapuram Effluent Treatment Limited	
Dr. S. **Nazaneen Parveen** BOS Chairman :	
Dr. M. Sridhar Reddy Head & Member	
Dr. T. Chandrasekhar	

Member	
Dr. S. Sumithra Member	
Mr. K. Yavan Kumar Member (PG Meritorious student)	

Program Specific Objectives (PSOs)	
PSO1	Students are made to understand the basic principles in Ecology, Environmental chemistry aspects, Analytical and Instrumentation techniques. To obtain the knowledge on our Country's Energy and Mineral resources. The dependence on Fossil fuel energy and increasing importance of Renewable energy resources will be discussed. The qualitative and quantitative analysis techniques using different types of chromatographic techniques and spectroscopic techniques.
PSO2	Students are made to understand the modes of Environmental pollution and their effects on human health and biota productivity and pollution reduction techniques. Students are trained to look Earth resources at different scales and the importance of Remote sensing and GIS techniques in decision making aspects in the management of natural resources.
PSO3	By applying the knowledge of Ecology, the students are expected to understand the measures to conservation aspects of our Nations' rich biodiversity. Students will be able to apply biostatistical, environmental modeling and biotechnological approaches in understanding the environmental aspects.
PSO4	Students will be exposed to recent developments and our Nations approaches at both domestic and International levels with regard to Environmental policy Environmental law and goals. Recent developments in Engineering approaches and occupational health and safety measures will be discussed and be involved in the research projects.

Program Outcomes (POs)	
On successful completion of the M. Sc. Environmental Science program	
PO1	Acquire the knowledge on Ecological concepts, principles of Environmental chemistry and Instrumentation techniques.
PO2	Ability to understand the modern approaches in understanding Environmental problems and reporting them in a comprehensive manner.
PO3	The approach is to make students understand and tackle environmental issues in a comprehensive and multidimensional way
PO4	The students are trained in both laboratory and field based experiments to meet the needs of

	job opportunities in industries, academics, NGOs etc

M. Sc Environmental Science Syllabus

Semester	Components of study	Course Code	Title of the Course	No of credits	No of hours per week	Practical/ Project	Internal Assessment	Semester End Exams	Total
SEMESTER-I	Core	ENV-101	Ecology and Environment	04	04		25	75	100
		ENV-102	Environmental Chemistry	04	04		25	75	100
		ENV-103	Instrumentation and Techniques	04	04		25	75	100
	Internal Elective	ENV-104	A. Energy Resources	04	04		25	75	100
			B. Environmental Education		04				
			C. Environmental Geology		04				
			Tutorial & Seminar		04		00	00	000
		ENV-105	**Practical-I**	04		16		100	100
		ENV-106	**Practical-II**	04		16		100	100
	Sub-total			24	28	32	100	500	600
SEMESTER-II	Core	ENV-201	Environmental Pollution	04	04		25	75	100
		ENV-202	Environmental Microbiology and Toxicology	04	04		25	75	100
		ENV-203	Remote Sensing and Geographical Information System	04	04		25	75	100
	Open Elective	ENV-204	A. Basics in Environmental Science	04	04		25	75	100
			B. Natural Resources and Disaster Management		04				
			SWAYAM/MOOC/NPTEL		04				
	Practical	ENV-205	**ENV-201&202**	04		16		100	100
	Practical	ENV-206	**ENV-203**	04		16		100	100
	Sub-Total			24	28	32	100	500	600
SEMESTER-III	Core	ENV-301	Environmental Engineering	04	04		25	75	100
		ENV-302	Environmental Biotechnology	04	04		25	75	100
		ENV-303	Biostatistics and Environmental Modelling	04	04		25	75	100
	Open Elective	ENV-304	A. Climate Change & Sustainable Development	04	04		25	75	100
			B. Energy and Environment		04				
			C. Waste Management		04				
	Practical		ENV-301, 302 & 303	04		16		100	100
	Skill Oriented Course Practical	ENV-305	Advanced techniques in Environmental Analysis	04	04		10	40	
						08		50	100
			Tutorial/Seminar	00	04	00	00	00	000
	Sub-total			24	32	24	110	490	600
SEM	Core	ENV-401	Environmental Policy and Sustainable Development	04	04		25	75	100

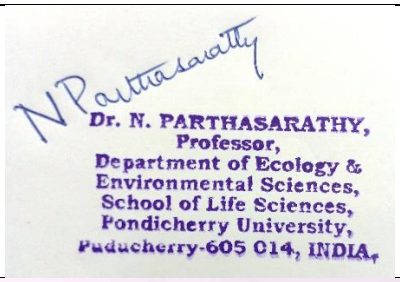
		ENV-402	Environmental Law, EIA and Audit	04	04		25	75	100
		ENV-403	Contemporary topics in Environmental Science	04	04		25	75	100
	Internal Elective	ENV-404	A. Biodiversity and Conservation	04	04		25	75	100
			B. Occupational Health and Safety		04				
			C. Environmenatal Nanoscience		04				
	Practical	ENV-404	ENV401,402&403	04		16		100	100
	Multi-Disciplinary/Project		Compulsory Project	04		16		100	100
	Sub-total			24	28	32	100	500	600
	Grand Total			96	116	120	400	2000	2400

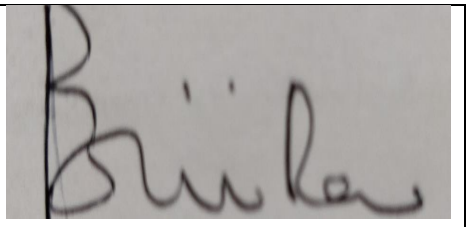
- All core papers are Mandatory.
- Internal/Open Elective – Choose one paper each. Open Electives are for the students of other Departments in the varsity.
- Skill Oriented course is mandatory. Relevant society along with practical (10 marks internal, 40 final theory and 50 for practical's).
- Interested students may register for SWAYAM /MOOCs/ NPTEL with the approval of the concerned DDC for the award of the grade as 'open elective'.
- Choose one from Multi-Disciplinary (Circle formation with other subjects/Dept. of Arts/ Commerce) Course or Project (Collaboration with various firms/companies/societies) work.

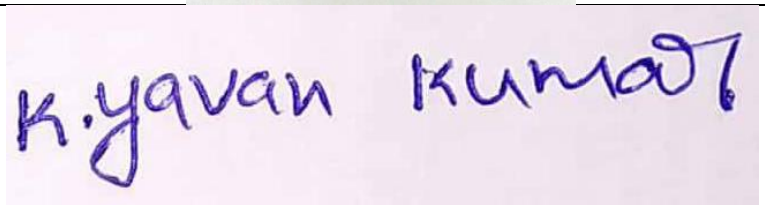
Total number of credits : 96

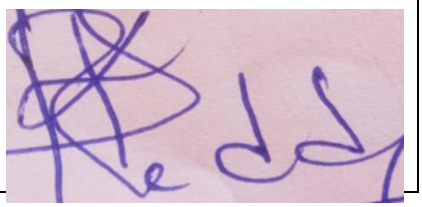
Total marks : 2400

Project Work: The project work is compulsory and the research work will be carried out by the candidate individually under the guidance of a faculty authenticated and countersigned by the HOD.









ENV -101

ECOLOGY AND ENVIRONMENT

UNIT –I

Definition, principles and scope of Environmental Science, Physico - Chemical and biological factors guiding the Environment, Biogeochemical cycles – (C, N, P, and S) and their importance. Earth, Man and Environment Relationship.

UNIT – II

Ecosystem: Definition Types of Ecosystems, Components of Ecosystems – Structure and Function. Trophic levels, Food chain, Food web and Ecological pyramids. Energy flow and Productivity, Biomes.

UNIT – III

Population Ecology: Definition – Characteristics of Population - Population Density, Natality, Mortality. Population Growth, Age distribution of population, Population fluctuations and dispersal.

Human population growth and trends, Impact of human population explosion on environment.

Community Ecology: Ecological Succession –Types and general process of succession Nudation, invasion, competition and Climax Community organization: Ecological Niche, Interaction between species - Mutualism, Commensalism, Competition, Predation, Parasitism and Allelopathy.

UNIT – IV

EARTH: Composition of Lithosphere, Types and Properties of rocks, Soil formation process – Physical, Chemical and biological weathering, soil erosion, Rare earth elements, Hydrosphere and Hydrological cycle.

REFERNCES:

1. Sharma P. D., (1994) Ecology and Environment, Rastogi Publications, Meerut.

2. Krebs, C.J. Ecology (2016). Pearson, Chennai.

3. Edward A Keller, (1981) Environmental Geology, III Edition, Charles E Merrill Publishing Co, Ohio.

5. Enger and Smith (2004) Environmental Science, Mc Graw Hill

6. P.S.Varma and V. K.Agarwal (2000) Environmental Biology, Chand & Company Ltd. Ramnagar, New Delhi.

7. Chapman, J.L. and Reiss, N.J. (1998) Ecology: Principles and Applications, Cambridge, NewYork.

ENV - 102

ENVIRONMENTAL CHEMISTRY

UNIT - I

Atmospheric Chemistry: Structure and composition of atmosphere, Gibb's energy, acid base reactions, Chemical equilibria, Solubility product, Solubility of gases in water, Photochemical reactions in the atmosphere – SO_x, NO_X, Ozone Chemistry–Particles in atmosphere – Types and effects.

UNIT – II

Soil Chemistry: Soil profile, Micro and Macronutrients Pesticides: classification,– degradation, Physico – chemical characteristics of soil , soil air, soil clays, organic carbon, soil humus and mineralization, cation exchange capacity, soil water solution , C/N ratio, soil acidity and salinity.

UNIT – III

Aquatic Chemistry: Sources– Heavy metals – Organic, Biological, Electrochemical theory of corrosion, Properties of water - pH, acidity, alkalinity, salinity, hardness, Concepts of DO, BOD, COD.

Green Chemistry: Introduction - Importance of solvents – Types of catalysts and their role – Applications.

UNIT – IV

Pollutant Chemistry: Chemistry of hydrocarbon decay, effects on macro and microorganisms - Surfactants: Cationic, anionic and non-ionic detergents, modified detergents**,** Pollution due to pesticides and DDT problems, Heavy metals: Toxic effects of Cd, Pb & Hg.

REFERNCES:

1. Environmental Chemistry, Stanley E Manahan., (2001), Lewis Publishers.
2. Environmental Chemistry, Sharma, B. K. Kaur H., (1995) Goel Publishing House.
3. A. Text book of Environmental Chemistry, V. Subramanian. (2011) IK International Publishing House Pvt. Ltd.,New Delhi.
4. A Text book of Environmental Chemistry and Pollution Control. Dara S. S.,
5. Environmental Chemistry Samir K. Banerji (2013) PHI Learning private Ltd.,
6. A text book of Environmental Chemistry, Balaram Pani (2007) IK International Publishing House Pvt. Ltd., New Delhi.

ENV 103: Instrumentation and Techniques

UNIT–I

Centrifugation & Separating techniques: General principles of centrifugation, Types of centrifugation, Microcentrifuge, High speed and Ultracentrifuges, Dialysis, Ultrafiltration, Reverse osmosis- Principles of electrophoresis, Agarose electrophoresis, Polyacrylamide gel electrophoresis, SDS-PAGE, 2D PAGE

UNIT–II

Microscopy and Spectroscopic techniques: Principles and applications of light, Phase contrast, Fluorescence, Scanning and Transmission electron microscopy- Titrimetry-Gravimetry- Colourimetry- Beer-Lambert's Law, UV-VIS Spectrophotometry, NMR Spectroscopy, Atomic absorption spectrophotometer (AAS), Flame photometry, X-Ray diffraction.

UNIT–III

Chromatographic techniques: Chromatographic techniques and types, Paper chromatography, Thin layer chromatography, Gas chromatography, Ion exchange chromatography, High performance liquid chromatography

UNIT–IV

Radiochemical and Nanomaterial techniques: Radioactivity- Detection and measurement of radioactivity- Radioactive isotopes-Applications of radioisotopes in biological sciences- Autoradiography- Nanotechnology processes, Nano materials, Nanoengineering materials for pollution prevention, Nanotechnology products

REFERENCES:

Marr, L.L. and Cresser, M.S. Environmental chemical analysis, International Text Book Company (pub), New York (1983).

Willard, Merritt, Dean and Settle, Instrumental methods of analysis, CBS Publishers, New Delhi (1986)

Lenore S. Clesceri, Arnold E. Greenberg, Andrew D. Eaton. Standard methods for the examination of water and waste water, APHA, Washington (1998)

Keith Wilson and John Walker, Principles and techniques of practical biochemistry, 5th Edition, Cambridge University Press, (2000)

Gurudeep R Chatwal and Sham K Anand, Instrumental methods of chemical analysis, Himalaya (2005)

Murugesan and Rajakumari, Environmental science and biotechnology- Theory and Practice, MJP Publishers, New Delhi (2005)

Keith Wilson, Kenneth H. Goulding, A biologist guide to principles and techniques of practical biochemistry, 3rd ed., ELBS Series. (2006)

Chatwal and Anand, Instrumental methods of chemical analysis, 5th ed., Himalaya Publications, (2006)

Douglas. A., Skoog & West, Fundamentals of analytical chemistry, 8th ed., Harcourt Publications, (2006)

Jo Anne Shatkin, Nanotechnology: Health and Environmental Risk, CRC press, (2008)

Mao Hong Fan, Chin-Pao Huang, Alan E Bland, Z Honglin Wang, Rachid Sliman, Ian Wright, Environanotechnology, Elsevier, (2010)

ENV- 104- A. INTERNAL ELECTIVE

ENERGY RESOURCES

UNIT – I

Basic Concepts of Energy

Energy – Definition – Forms of energy – Kinetic, Potential, Mechanical, Thermal, Electrical, Chemical and Nuclear energy, Energy production and consumption in India

Energy Sources – Conventional and Non – conventional energy sources, Laws of thermodynamics, Carnot cycle.

Fossil fuels: classification, composition, physico-chemical characteristics and energy content of coal, petroleum and natural gas. Shale oil, Coal bed Methane, Gas hydrates. Gross-calorific value and net-calorific value. Coal reserves in India – Petroleum and Natural Gas – Reserves in India.

UNIT – II

Conventional energy sources

Conventional energy sources: Energy from fossil fuels, Principles of generation of hydro-power energy from major hydroelectric power, Nuclear Energy – Sources – Nuclear fission and fusion reactions. Nuclear fuels

Climatic effects of power production.

- Advantages and disadvantages of conventional energy sources.

UNIT – III

Non Conventional Energy sources:

Different Types and Need for non renewable energy sources

Solar power: Importance – Solar collectors – Concentrations – Flat Plate and parabolic Collectors, Solar towers – Non – convective solar pond, Ocean Thermal Energy Conversion (OTEC). Solar Photovoltaic Systems – semi conductors, Solar PV Panel, Solar PV systems and applications.

Wind Energy: Wind Energy Conversion Systems, Application of Wind energy. Geothermal Energy: Geothermal Resources in India, small hydro resources in India their advantages, Ocean Energy – Tidal energy, Wave energy.

UNIT –IV

Non conventional energy sources: Emerging technologies and Conservation

Biomass energy – Biomass sources, Biofuels and Biogas –Bio ethanol, Biodiesel production Process - Gasification. Emerging technologies – Fuel cells, Hydrogen energy

Impacts of large scale exploitation of solar, wind, hydro and nuclear energy sources.Energy conservation through efficiency and sufficiency measures.

Role of Energy Conservation Act, BEE, Energy for sustainable development.

REFERNCES: 1. Buchla, DM, Kissell TE and Floyd TL, (2017) Renewable Energy Systems, Pearson Education.

2. Renewable Energy Resources. Tiwari G. N and Ghosal M. K., (2005) Narosa.

3. Bioenergy. Desai A. V Wiley Eastern Limited, International Development Research Center, Ottawa, Canada.

4. Non-conventional Energy Sources. Rai G. D., (2001) Khanna Publishers.

5. Boyle, G. Renewable Energy- Power for sustainable future. (2010). OXFORD.

6. Khan, B.H. Non-Conventional Energy Resources (2014), McGrawHill Education.

COURSE OUTCOME: Students will be able to understand the strengths and weaknesses of the different renewable energy technologies.

ENV-104- B. INTERNAL ELECTIVE- ENVIRONMENTAL EDUCATION

UNIT- I

Objectives of Environmental Education at secondary school level. Values and ethics related to environment, Approaches of Environmental Education, Salient features of environmental awareness through education: programs of environmental education for secondary school children

UNIT – II

Water resources of India, Integrated water resources management – Rain water harvesting and Watershed management, Ecological importance and conservation of wetlands in India, Water Logging and Soil salinity. Forest resources: Forest cover in India, Importance of NTFPs, Implications of deforestation, Community Forest management Mineral Resources: Uses and Environmental effects of extraction and over exploitation of mineral resources.

UNIT – III

Definition of Hazard, Risk and Disaster, Hazardous effects and impact of earth quakes, land slides, tsunami, cyclones, floods and volcanoes

UNIT – IV

Disaster Management and Mitigation: vulnerability analysis and risk analysis. Pre disaster Planning - preparedness, forecasting and warning, disaster education. Post disaster planning – relief measures and rehabilitation.

References

1. Education for the Environmental Concerns, Implications and Practices, Saxena, A.B. (1996), Radha Publication, New Delhi.
2. Environmental Biology, Sharma, P. D. (1993), Rastogi and Co. Meerut.
3. Shailendra K Singh, Subhash C Kundu and Shobu Singh (1998) Disaster Management. Mittal Publications, New Delhi.
4. Cuttler S (1994) Environmental Risk and Hazards. Prentice Hall of India, New Delhi.
5. Singh R. B (ed) (2000) Disaster Management. Rawat Publications. Jaipur & New Delhi.

INTERNAL ELECTIVE: ENV-104- C. Environmental Geology

UNIT- I

Origin of Earth. Primary geochemical differentiation and formation of core, mantle, crust, atmosphere and hydrosphere. Concept of minerals and rocks. Formation of igneous, sedimentary and metamorphic rocks.

UNIT- II

Climates of India, Indian monsoon, droughts, Tropical cyclones, El Nino, La Nina. Concept of residence time and rates of natural cycles. Effect of climate change of Indian climate, Concept of Plate tectonics

UNIT- III

Soil Weathering including weathering reactions, erosion, transportation and deposition of sediments. Soil forming minerals and process of soil formation. Geological hazards- study of floods, landslides, Earthquakes, Volcanoes

UNIT-IV

Mineral resources of India, Concept of Resources and Reserves, Major and trace Rare Earth Elements (REE), Distribution of water in earth, hydrology and hydrogeology, major basins and groundwater provinces of India, Darcy's law and its validity,

References

Reichard, J.S. Environmental Geology (2021). Mc.GrawHill Publications. N. Delhi

Montgomery, C.W. Environmental Geology (2019). Mc GrawHill Publications N.Delhi

Pipkin, B.W., Trent,D.D. and Hezlett, R. Geology and the Environment (2006). Cole Publishers. London

Keller, E.A. Introduction to Environmental Geology (2004). Pearson Publications N.Delhi.

ENV – 105: PRACTICAL - I

1. Environmental Inventory Studies – Quadrate Method.
2. Species – Area Curve
3. Estimation of productivity in Grass land
4. Plankton Analysis – Phytoplankton – Zooplankton. Counting – Identification –Primary productivity in water bodies.
5. Soil – Physico-Chemical Properties –

Soil texture- Sand, Silt, Clay percent by Hydrometer

6. To determine the Soil moisture content and Bulk Density by Oven method
7. Determination of Soil Organic Carbon by Walkley-Black Method
8. Soil pH – Conductivity by Glass rod Electrodes
9. Soil Microbial Biomass by Fumigation method.

ENV – 106: PRACTICAL – II

1. Determination of pH, Conductivity, Turbidity, Total Dissolved solids

   drinking water and Centrifugation

2. Estimation of Hardness, Alkalinity/ Acidity and Chlorides.

3. Determination of DO, BOD in given water sample.

4. To determine the Sulphates by Barium chloride method of the given water sample

5. Heavy metal stress and it impact on growth

6. Principles and applications of light

7. Microscopy
8. Centrifugation
9. Electrophoresis
10. SEM
11. Beer-Lambert's Law
12. UV-VIS Spectrophotometry
13. Paper chromatography
14. Thin layer chromatography
15. Gas chromatography
16, Radioactivity
17. Nanomaterials

IInd SEMESTER- CORE: ENV – 201

ENVIRONMENTAL POLLUTION

UNIT – I

Pressure, Temperature, Precipitation, Humidity, Atmospheric stability, Inversions and Mixing heights, wind roses, Sources and Classification of Air Pollutants: photochemical smog, Indoor air pollution, Vehicular pollution, Effect of air pollutants on man, plant, animals, materials and on climate.

UNIT – II

Speciation and Complexation. Water pollution - sources and classification of water pollutants, Eutrophication, Ground water pollution, Global discharge of heavy metals into water bodies. Potability of water, Effluent standards, Thermal pollution, Marine pollution.

UNIT – III

Soil Pollution; Sources – organic contaminants of soil, Industrial waste effluents and heavy metals, their interactions with soil components, Soil micro organisms and their functions, Sediment pollution, synthetic fertilizers (N, P & K) and their interactions with components of soil, Soil pollution control measures, Radioactive pollution.

UNIT – IV

Solid waste Pollution: Types, sources and consequences. Classification of wastes (Industrial, Municipal, Hospital) Recycle, Reuse, Reduce, Utilization of solid wastes into energy/manure, Disposal methods-non hazardous and hazardous solid waste, Basel Convention on transport of Hazardous Wastes.

Noise Pollution – Sources, measurement of noise and indices, Noise exposure levels and standards. Impact of noise on human health. Noise control and abatement measures.

REFERENCES:

1. Encyclopedia of Environmental Pollution and Control. Trivedy, R. K (1994) Environmedia Publications, Karad.
2. Textbook of Soil Science. 4th Ed., Biswar, T. D and Mukherjee, S. K (1987) McGraw Hill.
3. An Introduction to Soils and plant growth. 5th Ed, Roy I Donalue, Raymond W Miller and John C Shiekluna (1987) Prentice Hall of India.
4. Environmental Noise Pollution and its Control. Chhatwal, G. R., Mehra, M. O., Katyal T., Satake, K Mohan Katyal and Nagahiro, T (1989) Anmol Publications.
5. Water Pollution. Kudesia, V. P., (1985) Pragati Prakashan Publications.
6. Air Pollution. Henry C Perkins, (1974) McGraw – Hill.
7. An Introduction to Air Pollution. Trivedy, R. K and Goel, P. K., (1995) Techno Science Publications, Jaipur.
8. Environmental Pollution Management and control for sustainable development. Khitoliya R. K. (2014) S. Chand and Company Pvt. Ltd., New Delhi.

ENV – 202

ENVIRONMENTAL MICROBIOLOGY AND TOXICOLOGY

UNIT – I

Microbial diversity, Soil microorganisms and their functions, Aeromicroflora, Air borne diseases and allergens, Water borne diseases, Culture media, Types of media, Isolation of pure cultures, Growth curve, Microorganisms as source of food – Single Cell Protein – Fermented foods.

UNIT - II

Introduction to Toxicology, Toxicants, Toxicity, Acute, sub-acute and chronic Dose effect, LD_{50}, LC_{50} and response safe limits, Dose Response relationships, Toxic chemicals in the environment. Biochemical aspects Effect of Arsenic, Cadmium, Lead, Mercury, Carbon monoxide, MIC, Pesticides – Classification, Residual effects, Oceanic pollution by toxic wastes

UNIT – III

Xenobiotics in environment, PCB, Dioxins, Bioindicators, Bioaccumulation, Bioconcentration, Biomagnification, Cell receptors, Cell injury and Apoptosis, Toxicity Testing approaches, Environmental specimen banking

UNIT – IV

Public Health Programmes– Urban and rural health, Sanitation, Case studies with special reference to particular disease-Malarial Control Measure, AIDS, Polio, Chikungunya, Dengue, Cancer, Bacterial, viral and fungal diseases for plants, Covid-19.

REFERENCES

1. Leslie collier, Balows Albert and Sussman Max, Topley and Wilson's Microbiology and Microbial infections. Oxford University Press
2. Microbiology, Pelczar MJ Jr, Chan ECS, Krieg NR
3. Introduction to Soil Microbiology, Alexander, M., 1977, 2 ndEdn., Wiley John
4. Introduction to Environmental Toxicology: Impacts of chemicals upon Ecological systems. Landis, Wayne and Hing –ho Yu, Baca Raton, (1995) Lewis Publishers.

5. Environmental Toxicology and Chemistry. Crosby, Donald. G. (1998) Oxford University Press.

6. Ecotoxicology, Schuurmann, G. and Market, G. (1998) A. John Wiley & Sons, Inc.

7. Information Resources in Toxicology: Wexler, Philip et al, (2000) 3rd Ed. Academic press

8. Environmental Biology & Toxicology. Sharma P.D. (1994). Rastogy publications

9. Biotechnology from A to Z 1993. William Bains, IRL Press, Oxford, England PP 358.

ENV203 – REMOTE SENSING & GIS

UNIT – I

Remote Sensing components, Electromagnetic radiation, Energy interaction in the Atmosphere and Earth's surface

Spectral signatures, Spectral reflectance curve, Atmospheric windows

Spatial, Temporal, Radiometric Resolutions

UNIT – II

Sensors and Platforms classification- Land observation satellites and sensors – LANDSAT, IRS, CARTOSAT, SPOT ENVISAT.

Weather observation satellites/ Sensor–INSAT, NOAA,

Principles and Features involved in Image Interpretation,

Applications of different types of images in Agriculture, Land use land planning,, Forestry, water resources, Soils, Disaster management etc.

UNIT - III

Introduction and components Geographical Information Systems,

Map Characteristics, Scale, Topographic and Thematic

Map projections- Geographic Coordinate systems UTM projection, WGS Geodetic system

Fundamentals of Geospatial data – Layers, themes, Raster Model, Vector Model

UNIT – IV

Applications of GIS – Environmental Impact Assessment – Land Degradation, Desertification

Air Pollution Pollution Monitoring —– Industry – Mining – Ground Water –

GIS in coastal management and flood management, Damage Assessment –

REFERENCES:

1. Remote Sensing and GIS for Environmental Planning. Muralikrishna, I. V (1995). Tata – McGraw Hill.
2. Advances in Environmental Remote Sensing. Danson F. M and Plummer S. E (1995).
3. Fundamentals of Remote Sensing. George Joseph (2003). Universities Press (India) Ltd., Hyderabad.
4. Remote Sensing and Image interpretation. Lilles and Keifer (2004) John wiley and sons, New York.
5. Remote Sensing – Principle and Interpretation. Sabins. F. F (1987) Freeman and Co., New York.
6. Environmental Remote Sensing from Regional and Global Scales. Roody G. M and Curran P. J (1994).
7. GIS Fundamentals, Applications and Implications. Elangovan, (2006) NIPA, New Delhi.

IInd SEMESTER - OPEN ELECTIVE –I ENV-204-A.

BASICS IN ENVIRONMENTAL SCIENCE

Unit –I

Ecosystem: Concept, Structure, functions, food chain, food web, Ecological pyramids, Energy flow in ecosystem, Forest ecosystem, grassland, desert and Aquatic (ponds, rivers, estuaries).

Unit – II

Environment: Importance of environmental studies, Natural resources, Forest, Water, Mineral, energy, land, Acid Rain, Ozone depletion, Urbanization, Eutrophication,

Unit –III

Biodiversity and its conservation, Biogeographical classification of India, India as a megadiversity nation, value of biodiversity, Hotspots of biodiversity, Threats to biodiversity, Habitat loss, man –animal conflicts, endangered and endemic species of India.

Unit IV

Air pollution, water pollution, soil pollution, marine pollution, noise pollution, radioactive pollution, thermal pollution.

REFERENCES:

1. Fundamental and Environmental Ecology, III Edition, Odum, E. P., (1971) Prentice Hall.

2. Living in the Environment – Principles, Connections and Solutions, Tyler Miller Jr. G., (1996) Wadsworth Publishing Co., New York.

3. Ecology and Environment, Sharma P. D., (1994) Rastogi Publications, Meerut.

4. Environmental Science, Daniel D Chiras., (1994) The Benjamin/Cummings Publishing Co. Inc.

5. Environmental Pollution Control Engineering, C. S. Rao, (2006) New age International Publishers.

OPEN ELECTIVE ENV – 204-B.

-

NATURAL RESOURCES AND DISASTER MANGEMENT

UNIT – I

Renewable and non- renewable resources classification, Factors that influence scarcity of natural resources. Equitable resource use for sustainable life system.

Water resources of India, Integrated water resources management – Rain water harvesting and Watershed management, Ecological importance and conservation of wetlands in India.

UNIT – II

Food Resources: Sources of food, Changes caused by Intensive agriculture, Overgrazing, Fertilizer and Pesticide problems, Water Logging and Soil salinity.

Forest resources: Forest cover in India, Importance of NTFPs, Implications of deforestation, Community Forest management

Mineral Resources: Uses and Environmental effects of extraction and over exploitation of mineral resources.

UNIT – III

Definition of Hazard, Risk and Disaster, Hazardous effects and impact of earth quakes, land slides, tsunami, cyclones, floods and volcanoes

UNIT – IV

Disaster Management and Mitigation: vulnerability analysis and risk analysis.

Pre disaster Planning - preparedness, forecasting and warning, disaster education.

Post disaster planning – relief measures and rehabilitation.

REFERENCES:

1. Trivedi,R.K.(!994)Environment and Natural Resources Conservation.
2. Shafi. R. (1992).Forest Ecosystem of the World. New Delhi, Nice printers.
3. Singh. B. (1992) Social Forestry for Rural Development. Anmol Publishers, New Delhi.
4. Botkin D. B (1989) Changing the Global Environment. Academic Press, San.
5. Shailendra K Singh, Subhash C Kundu and Shobu Singh (1998)Disaster Management. Mittal Publications, New Delhi.
6. Cuttler S (1994) Environmental Risk and Hazards. Prentice Hall of India, New Delhi.
7. Singh R. B (ed) (2000) Disaster Management. Rawat Publications. Jaipur & New Delhi.
8. Savindra singh(2016)Environmental geography :– Pravallika publication, Allahabad.

ENV – 205: PRACTICAL – III

1. Measurement of sound by DB meter in silent, Industrial, Residential and Commercial Zones.
2. Chemical Coagulation Test – Jar test apparatus.
3. Estimation of Na and Ca by flame photometry.

4. Drinking Water Treatment (measure of 5 parameters before & after treatment) – pH, Chloride, Nitrate, Phosphate, Total Dissolved Solids).
5. Air quality – SPM – SO_x, - NOx.
6. Spectrophotometer methods of estimation: Phosphate, Nitrate, Chromium.

ENV – 206: PRACTICAL -IV

1. Isolation and identification of fungi and bacteria from the soil
2. Staining techniques – a) Simple staining b) Gram staining
3. Characterization of waste water
4. Determination of total carbohydrates in biological samples.
5. Estimation of protein contents
2. Study of effects of detergents on plants.
3. Observation of the effects of metals on plants.
4. Analysis of some ecological effects of urban pollution on plants.
6. Detection of some organic chlorine chemicals in fruits and vegetables.
7. Noise level survey at workplace using sound level meter.
8. Latitudes and Longitudes of given places in DMS and DD.
9. Interpretation of Toposheet.
10. Demarcation of land / Land Cover/ Forest cover
11. Water shed/ Drainage basin, paleochannels.
12. Geo-referencing and Georectification by using Arc-GIS / QGIS.
13. Preparation of Study Map by using QGIS

III[rd] SEMESTER-CORE: ENV 301- ENVIRONMENTAL ENGINEERING

UNIT – I

Design of Pressure Pipes, Pump types, Characteristic curves, General layout of Water Treatment Plant – Aerators – Types, Flash Mixer – Design – Clari–flocculator– Filtration – Rapid sand filter and Pressure sand filter design – chlorine demand, residual chlorine and chlorine dosage, Role of Ozone and UV as a Disinfectant.

UNIT – II

Primary and Secondary Settling Tanks – Activated Sludge Process – Types and modifications – Design of Aeration Tanks and Oxidation Ditch – Diffusers and Mechanical Aerators, Tricking Filters and their Design. Duncan Mara Systems (Waste Stabilization Ponds).

UNIT – III

Sludge Processing and Disposal Methods – Design of Anaerobic Digester and Sludge Drying Bed – Reverse Osmosis – Ion Exchange – Incinerators, Land filling – Composting, Vermicomposting, Fly ash utilization, Case studies: Dyeing, Paper and Pulp, Distillery, Thermal, Tannery.

UNIT – IV

Air Pollution Control - Minimum Stack Height – Plume Rise, Design of Settling Chamber, Cyclones, Fabric filters and Electrostatic Precipitators. Scrubber, Exhaust.

REFERENCES:

1. Introduction to Environmental Engineering and Science. Gilbert M. Masters (2004). Prentice – Hall of India Pvt. Ltd., New Delhi.
2. Wastewater Treatment. Rao M. N. and Datta, A. K (1987). Oxford & IBH Publishing Company Pvt. Ltd., New Delhi.
3. Environmental Engineering. Mackenzie L. Davis and David A. Cornwell (1991). Mc Graw Hill International Editions, New York.
4. Water and Wastewater Technology. Hammer M. J and Hammer Jr. M. J (2001). Prentice – Hall of India Pvt. Ltd., New Delhi.
5. Wastewater Engineering: Treatment and Reuse. Metcalf and Eddy (2003). Tata Mc Graw Hill Publishing Company Ltd., New Delhi.
6. Sewage Disposal and Air Pollution Engineering. Garg. S. K (1990) Khanna Publishers, India.
7. Advances in Industrial Wastewater Treatment. Goel P. K and Sharma K. P (1999). Technoscience Publications, Jaipur, India.
8. Chemistry for Environmental Engineering and Science. Sawyer C. N., Mc Carty P. L., and Parkin, G. F (2003) Tata McGraw – Hill Publishing Company Ltd., New Delhi.
9. Environmental Pollution Control Engineering, C. S. Rao, (2006) New age International Publishers.

ENV – 302

ENVIRONMENTAL BIOTECHNOLOGY

UNIT- I

Environmental Biotechnology- Bioremediation, Bioremediation in-situ and ex-situ, Phytoremediation, Biopesiticides, Biopesticides in integrated pest management, Biofertilizers- Rhizobial, Free living N_2 fixers and Phosphate solubilizing bacteria, mycorrhiza, BGA, their importance and practice, Vermicomposting

UNIT- II

Degradation of aliphatic and aromatic hydrocarbons, Degradation of pesticides, Bioindicators of hazardous pollutants, Extremophiles, Fermentation technology, Biofermentors, Major products of microbes- Alcohols, Antibiotics, Aminoacids and Organic acids, Immobilization technology, Methanogenesis

UNIT- III

Environmental stresses, Biotic and abiotic factors-Drought, Salinity, Extreme temperature, Light and Heavy metal stresses, Photobiology, *In vitro* techniques-Plant cell culture, Cloning/Recombinant DNA technology, Genetically engineered microbes, plants and animals, Drought and salt tolerance, Herbicide resistance, Dolly

UNIT- IV

Leaching, Germplasm, Conservation and gene banks, Pearl culture, Sericulture, Biosafety and Bioethics, Environmental risk assessment of genetically modified crop plants, Bt toxin types, Biopiracy and Bioprospecting, Patents

REFERENCES:

1. Environmental Biotechnology-SK Agarwal, APH Pub.1998
2. Microbial aspects of Pollution. Skyes and Skinner.
3. Microbial Biotechnology Glazer and Nikaido 1995.
4. Prescott and Dunns Industrial microbiology. Reed (Ed).
5. Biotechnology 3 rd edition by john E. Smith. Cambridge low price editions.
6. Plant Biotechnology, 1994. Prakash and Pierik. Oxford & IBH Publishing Co.
7. Environmental Risk & Hazards. Cuttler S. (1994). Prentice Hall of India. New Delhi

ENV – 303

BIO-STATISTICS & ENVIRONMENTAL MODELLING

UNIT-I

Fundamentals of Statistics: Collection of data, Classification and Tabulation, diagrammatic representation, Measures of central tendency-Mean, Median, Mode, Normal distribution, Skewness, Kurtosis, Measures of Dispersion – Variance, Standard deviation, standard error.

UNIT-II

Statistical analysis: Statistical hypothesis, Null hypothesis, level of significance and confidence limits, Statistical tests-Z test, t-test, Chi-square, One-way Analysis of variance, Correlation and Regression.

UNIT-III

Sampling, Stratified Random Sampling, Distributions - Normal, log-normal -distribution. linear regression model Environmental models- population growth Model, Lotka-Voltera model, Leslie's matrix model, Dispersion of air pollutants. Mixing height, lapse rates, Gaussian plume model.

UNIT-IV

Units of Measurement, Emission Standards for water, Noise, National Ambient Air Quality Standards Noise dose and Noise Pollution standards., Indian National Ambient Air Quality Standards, Indian standards for drinking water (IS:10500, 2012.), Life Cycle Assessment, Soil Health indicators,.

REFERENCES:

Gupta S. P. Statistical Methods. (1996) Sultan Chand & Sons Publications. New Delhi.

.

Statistics for people who hate statistics. Neil J Salkind (2000) Sage Publications. Inc. New Delhi.

Zar, J, H. (2010). Biostatistical Analysis. 5 th Edition, Pearson Publication.

Sokal RR and Rohlf FJ (2009) Introduction to Biostatics, 2nd Edition, Dover Publications, Inc, New York.

Gurumani, N. Introduction to Bio-Statistics. (2005) MJP Publications, Chennai.

Wayne, R. O. (1995). Environmental Statistics and Data analysis, CRC Press.

Manly (2001) statistics for environmental science and management, Chapman and Hall/CRC Press

COURSE OUTCOME: The students will be able to select appropriate statistical tool and to do statistical analysis.

ENV – 305: PRACTICAL (ENV-301,ENV302 & ENV 303)

1. Bioremediation of pollutants (phytoremediation of metals)
2. Enumeration of characteristics of bacterial colonies
3. Serial dilution experiments
4. Cell count by Haemocytometer
5. Preparation of microbial media
6. Antimicrobial experiments
7. *In vitro* techniques
8. Plant tissue culture media
9. Embryo, Axillary bud and Callus culture
10. Isolation of DNA
11. Electrophoresis
12. Genetic transformation
13. Effect of light, heavy metal on *in vitro* seed growth
14. Biosafety, bioethics experiments
15. Environmental risk assessment - plot design and field experiments.
16. Calculation of mean, median and mode, Standard deviation, Standard error.
17. Calculation of correlation coefficient and regression equation.

18. Application of ‘t’ test, ANOVA and correlation
19. Statistical tests by using MS Excel and SPSS

III[rd] SEMESTER OPEN ELECTIVE –304-A.

CLIMATE CHANGE AND SUSTAINABLE DEVLEOPMENT

Unit –I

Structure and composition of Atmosphere, Montreal protocol, El –Nino Phenomenon, Monsoon in India, urban heat island, New weather patterns, water resources, Agriculture.

Unit –II

Green house effect: Global warming – major green house gases, sources of green house gases, possible consequences of a green house warming, ozone layer depletion – stratospheric ozone, climate change: effect on organisms and human.

Unit – III

United Nations frame work convention on climate change (UNFCC), clean development mechanism (CDM), Kyoto Protocol, Intergovernmental panel for climate change (IPCC), Overview of Conference of Parties (CoP).

Unit IV

Sustainable development – Concept and key aspects, Sustainable Management of Water Resources, Food security and GMOS. Energy and sustainable development, Conservation of non- conventional energy resources – efficient use of energy,.

REFERENCES:

1. J. T. Hardy (2003) Climate change causes, effects and solutions, John Wiley and sons.
2. Tyler Miller Jr. G. (1996) Living in the environment – principles, connections and solutions, Wadsworth Publishing Co. New York.
3. Critchfield, Howard J., 1998. General Climatology, Prentice Hall Pvt. Ltd. New Delhi, India.
4. Text Books 1. Margaret Robertson (2017) Sustainability Principles and Practice, 2nd Ed, Routledge Publication

5. Rogers, P., Kazi, P., Jalal, F., Boyd, J.A. (2007) An Introduction to Sustainable Development Paperback, Routledge Publication
6. Blewitt, J. (2008) Understanding Sustainable Development, EarthScan Publishing, London, UK

ENV-304-B. OPEN ELECTIVE – ENERGY AND ENVIRONMENT

UNIT 1: Define energy, energy forms and importance, Global energy resources, Measurements of energy, Renewable and non-renewable resources, Energy conservation technologies, Energy demand and use in domestic, industrial, agriculture and transportation sectors.

UNIT 2: Origin of fossil fuels, Fossil fuel burning and related issues of air pollution, Nuclear energy, Hydroelectricity, Sun as source of energy, Solar radiation and its spectral characteristics, Estimation of solar radiation, Solar energy collectors, Photovoltaics, Solar ponds.

UNIT 3: Introduction of wind Energy, Basic principles of wind energy conversion, Basic components of a wind energy conversion system (WEC), Classification of WEC systems, Types of wind machines, Applications of wind energy, Tidal energy, Geothermal energy.

UNIT 4: Bioenergy, Define biomass, Biomass conversion technologies, Biogas generation, Types of biogas plants, Biodiesel generating plant species, Bioethanol, Biohydrogen, Biobutanol, Fuel cells

References

1. Trivedi R.P. and Gurudeep Raj, Encyclopedia of Environmental Sciences – Environmental Energy Resources.
2. Sukhatme S.P., Solar Energy, Tata McGraw Hill, New Delhi (1996).
3. Tiwari G.N. and Ghosal M.K., Renewable Energy Resources, Narosa (2005).
4. Rai G.D., Non-conventional Energy Sources, Khanna Publishers (2001).
5. Desai A.V., Bio energy, Wiley Eastern Limited, International Development Research Center, Ottawa, Canada.

ENV-304-C. OPEN ELECTIVE - WASTE MANAGEMENT

UNIT- I

Municipal waste management: Definition, sources, classification, Municipal solid wastes types, per capita generation, collection and transportation methods, Effects of municipal solid wastes on environment.

UNIT – II

Plastic and e – waste management – Plastic wastes: sources, types, Effects of plastic waste on environment, biodegradable plastic, control measures of plastic wastes. E- waste: sources, types of e – waste. Impacts of E- waste on environment, control measures of e- waste.

UNIT – III

Hazardous waste management- Hazardous waste: definition, sources, characteristics, classification of hazardous waste (Hospital, Domestic, Industrial), Hazardous waste labeling and handling.

UNIT –IV

Biomedical waste management – Biomedical waste: Sources, types of biomedical wastes, impact of biomedical wastes on environment, control and disposal of biomedical waste. Measures to reduce biomedical wastes.

References

1. Kinnaman, T.C and Takeuchi, K. (2014). Handbook on Waste Management, Edward Elgar Publishing, UK.
2. Ramesha Chandrappa and Jeff Brown, (2012). Solid Waste Management: Principles and Practice, Springer Science and Business Media Publishers.
3. Bhide and Sundaresan (2000) Solid Waste Management in Developing Countries – Indian National Scientific Documentation Center, New Delhi.
4. Surendra Kumar (2009) Solid waste management, Northern Book Centre

III[rd] SEMESTER – Skill Oriented Course Practical- ENV-306

Advanced techniques in Environmental analysis

UNIT – I

Separating of samples and analysis of samples using centrifuge, pH meter, UV spectrophotometer, electrophoresis and paper and gas chromatography.

UNIT - II

Imaging the pictures using light microscope, scanning electron microscope, dealing with nanoparticles and training in Atomic Absorption Spectroscopy.

UNIT – III

Analytical techniques: UV - Visible Spectrophotometer, Atomic Absorption Spectrometry, Sound Level Meter, BOD, COD, DO, Most Probable Number, Flame Photometer, Water Analysis, National Water and Waste water quality standards

UNIT - IV

Field visit to Forest, Laying of Quadrats, Inventory of trees, Calculation of Basal Area, Calculation of Importance Value Index,

Calculation of Shannon Weaver Index, Calculation of Above Ground Biomass using Volume equations. Interpretation of Correlation Graphs and Regression Equations

References

1. Douglas. A., Skoog & West, Fundamentals of analytical chemistry, 8th ed., Harcourt Publications, (2006)
2. Chatwal and Anand, Instrumental methods of chemical analysis, 5th ed., Himalaya Publications, (2006)
3. Lenore S. Clesceri, Arnold E. Greenberg, Andrew D. Eaton. Standard methods for the examination of water and waste water, APHA, Washington
4. Marr, L.L. and Cresser, M.S. Environmental chemical analysis, International Text Book Company (pub), New York (1983).
5. Willard, Merritt, Dean and Settle, Instrumental methods of analysis, CBS Publishers, New Delhi (1986)

IVth SEMESTER – CORE: ENV – 401

ENVIRONMENTAL POLICY AND SUSTAINABLE DEVELOPMENT

UNIT – I

National Environmental Policy (NEP, 2000) – Goals and Objectives, Environmental Policy Strategies in Pollution Control, National Policy on Climate Change and International Convention on climate change - UNFCCC, IPCC AR reports. Global Warming Potential.

UNIT -II

Coastal Regulation Zones (CRZ) 1991 amended from time to time. National Forest Policy, 1988, National Water Policy, 2002, National Environmental Policy, 2006, National Solar Mission, National Mission for Enhanced Energy Efficiency, National Mission for 'Green India', National Mission for Sustainable Agriculture,

UNIT - III

Role of Environment in Economic growth, Ecosystem services and goods –Environmental Valuation, Types of Environmental Values (Values of Biodiversity), Externalities - Methods of abatement of Externalities, Common Property resources, Net present value.

UNIT – IV

Sustainable Development: Definition and concept. The emergence Conceptualization of the notion of sustainable development, The Time line calendar of sustainable development, Key aspects and Strategies for Sustainable Development. Guidelines to Campaign for Sustainable Society.

REFERENCES:

1. Environmental Economics in Theory and Practice. Hanley, Nick, Jason F. Shogren and Ben White. (1997) Macmillan New Delhi, India.

2. Handbook of Natural Resource and Energy Economics. Allen V. Kneese and James L. Sweeney. (1985) North Holland.

3. Environmental Economics: An Introduction. Field B. C (1994) McGraw.

4. Environmental Economics: Theory and applications. Katar Singh and Anil Shishodia (2007) Sage Publications India Pvt. Ltd.

ENV – 402

ENVIRONMENTAL LAW, EIA AND AUDIT

UNIT – I

Definition – Purpose of EIA, Objectives of screening Projects;– Writing the Environmental Assessment report, Project Alternatives. Environmental Assessment Procedures. The Environmental Impact Statement Process- limitations EIA guidelines 2006 – Notification of Government of India, Public Participation, Environmental Management Plan ISO14000.

UNIT – II

Article 48 A & 58 A, Power and Functions of Central and State Pollution Control Boards to safeguard environment. Case studies: Land Clearing Projects – Urban localities Dam sites – EIA for Hydel, Thermal, Nuclear, Mining Projects– Highways Projects.

UNIT - III

EIA Methodologies – Adhoc Method – Checklist Methodologies – Matrix methods – Network Methods – Base line information and predictions - land, water, atmosphere, energy and Biota, Environmental audit: Objectives – Scope – Goals - Approach to audit, Kyoto Protocol 1997.

UNIT – IV

Environmental Laws and Acts: Need for Environmental Laws – Role of Indian Judiciary in the protection of Environment - Forest Conservation Act 1980, Wild Life Protection Act 1972, Air (Prevention and Control of pollution) Act 1981, The Water (Prevention and Control of pollution) Act 1974, Motor Vehicle Act 1988, Environment Protection Act 1986, Hazardous Waste (Management and handling) rules 1989, E –waste (management and handling) rules 2016, Biomedical waste rules 2016.

REFERENCES:

1. Environmental Impact Assessment. Canter L. W., (1996) Mc Graw Hill, New York.
2. Environmental Impact Statements. Bregman J.I., (1999) Lewis Publishers, London.
3. Environmental Impact Assessment – A Comprehensive Guide to project and Strategic Planning. Eccleston C. H., (2000) John Wiley and Sons.
4. Handbook of Environmental Laws, Guidelines, Compliances and Standards. Trivedi R. K Vol I and II, B. S. Publications.

5. Environmental Law and Policy in India. Shyam Divan and Armin Rosencranz, (2001) Oxford Uni Press.

6. Reddy, A and Mereddy (2017) Environmental Impact Assessment, 1st Edition, Elsevier Publication.

7. Lawrence, DP (2003).Environmental Impact Assessment: Practical Solutions to Recurrent Problems, John Wiley & Sons, Inc. [13]

8. Canter L.W. (1996) Environmental Impact Assessment, Mc Graw Hill Publication, New York

COURSE OUTCOME: Students will be equipped to identify technologies or policies to reduce environmental problems

ENV – 403

CONTEMPORARY TOPICS IN ENVIRONMENTAL SCIENCE

UNIT – I

Urban air quality, Acid Rain, Ozone depletion, Marine pollution- Drought-desertification, Water Crises, Conservation of water, Soil erosion, Narmada Dam, Tehri Dam, Almatti Dam, Cauvery and Mahanadi, National action plan on climate change, El Nino Phenomenon.

UNIT - II

Climate change, Green house effect, Global warming, Effect of global warming on hydrological cycle, agriculture, livelihoods, Glaciers melting, Sea level rise, Loss of deltas, Wetland conservation. Genesis and future of Kyoto protocol

UNIT – III

Deforestation, Mangroves, Utilization of Bioresources and Patents, Biodiversity loss, Hot spots of biodiversity and conservation, Endemic, Endangered and Threatened species, Disasters-Natural disasters, Disaster management initiatives in India, Case studies - Bhopal disaster, Chernobyl accident, Exxon Oil disaster etc.

UNIT – IV

Natural resources depletion/ management, Population growth, Urbanization, Food insecurity, Environmental ethics, Renewable and non-renewable energy, Hazardous waste and waste management, WHO, Ebola, Covid19, Environmental education and awareness.

References

1. Ecology and Environment, Sharma P. D., (1994) Rastogi Publications, Meerut.
2. Environmental Science, Daniel D Chiras., (1994) The Benjamin/Cummings Publishing Co. Inc.
3. Environmental Chemistry Sharma, B. K. Kaur H., (1995) Goel Publishing House.
4. Environmental Science – A study of Inter relationships. Enger, E. D and Smith, B. E, 5th Ed., W.C.B Publication.
5. A Text book of Environmental Chemistry and Pollution Control. Dara S. S.,
6. Environmental Science Enger and Smith (2004), Mc Graw Hill
7. Encyclopedia of Environmental Sciences – Environmental Energy Resources. Trivedi R. P and Gurudeep Raj (2005).
8. Renewable Energy Resources. Tiwari G. N and Ghosal M. K., (2005) Narosa.
9. Environment and Natural Resources Conservation. Trivedi, R. K. (1994).
10. Forest Ecosystem of the World. Shafi. R. (1992).
11. Disaster Management. Shailendra K Singh, Subhash C Kundu and Shobu Singh (1998) Mittal Publications, New Delhi.

INTERNAL ELECTIVE- ENV – 404 -A

BIODIVERSITY AND CONSERVATION

UNIT – I

Biological Diversity –– Concept, Definition and Scope of Biodiversity, Genetic Diversity, Species diversity and Ecosystem Diversity, Species Inventory. Direct and indirect uses of Biodiversity, Biogeographical zones of India-Global hotspots of Biodiversity, Vavilov centres of origin

UNIT – II

Biodiversity loss, Species extinction – Threats to biodiversity, Invasive species, IUCN categories of threatened species; Extinct, Endangered and Vulnerable species, Red data Book, Measures of biodiversity, Alpha and Beta diversities.

UNIT – III

National and International Organisations associated with Biodiversity Conservation – IUCN, UNEP, WWF, NBAGR, NBPGR, GREEN PEACE, Biodiversity registers.

UNIT – IV

Conservation and Management – National Biodiversity Authority, Current practices in conservation – *in- situ* Conservation - National Parks, Wildlife Sanctuaries and Biosphere reserves; *ex-situ*- Conservation of Threatened Species, National Biodiversity Bill 2002, Convention on Biodiversity.

REFERENCES:

1. Dadhich L. K and Sharma A. P (2002) Biodiversity – Strategies for Conservation, APH Publishing Corporation, New Delhi.
2. Khan, T. I and Dhari N Al Ajmi (1999) Global Biodiversity – Conservation MeasurePointer Publishers, Jaipur.
3. Krishnamurthy, K. V (2003) An Advanced Textbook on Biodiversity – Principles and Practice, Oxford and IBH Publishing, New Delhi.
4. Brian Groombridge (1992) Global Biodiversity – Status of the earths Living Resources, Chapman and Hall, London.
5. Kumar U and Asija M (2006) Biodiversity: Principles and Conservation. 2nd Edition. Agro bios Publication.

INTERNAL ELECTIVE -ENV 404-B

OCCUPATIONAL HEALTH AND INDUSTRIAL SAFETY

UNIT-I

Occupation health: Definition and scope. Overview of work place health hazards. Physical, chemical, biological and radiological health hazards. silicosis, asbestosis, pneumoconiosis, siderosis, Byssinosis. Ways to reduce occupational risks.

UNIT-II

Industrial hygiene: Definition, Environmental factors and their effects on Workers health. Hazards at work places. Benefits and goals of industrial hygiene program. Medical facilities in factories, Ventilation and heat stress, Significance of ventilation, Purpose of lighting, Uses of good illumination.

UNIT-III

Personal Protective Equipments (PPEs), Types of PPEs their use care and maintenance. Different air pollutants in Industries, Effect of different gases and particulate matter, acid fumes, smoke, fog on human health.

UNIT-IV

Industrial safety: Importance of Industrial safety, role of safety department, Safety committee and Function principles of safety management, fire prevention, accident prevention, handling of dangerous substances. First aid : Body structure and Functions, Position of causality, the unconscious casualty, fracture and dislocation, Injuries in

muscles and joints, Bleeding, Burns, and accidents caused by electricity, Safety activities of the ILO (International Labour Organization) Introduction to OSHAS 18001 and OSHA

REFERENCES:

1.Risk assessment- A Practical Guide, 1993, Institution of Occupational Safety and Health, United Kingdom

2.Industrial safety management By: L.M. Deshmukh Publishers: Tata Megraw Hill ,New Delhi Year: 2006 Edition: First

3. Industrial safety health and environment Management system By: R.K. Jain & Sunil S. Rao Publishers: Khanna Publishers Year: 2008 Edition: Second

4.R.K.Jain and Sunil S.Rao , Industrial Safety , Health and Environment Management Systems, Khanna publishers , New Delhi (2006)

5. Slote.L,Handbook of Occupational Safety and Health, John Willey and Sons, NewYork .

INTERNAL ELECTIVE -ENV 404-C

ENVIRONMENTAL NANOSCIENCE

UNIT- I

Introduction to Nanoscience and Nano technology, Nanoparticle, carbon based nanomaterials , carbon nanotubes, nanocomposite.

UNIT – II

Synthesis of nanomaterials, chemical methods – chemical reduction, sol –gel method, photochemical synthesis, sonochemical methods, green synthesis of nanoparticles using plant and plant metabolites.

UNIT – III

Environmental application of nanomaterials, nanomaterials for environmental remediation, titanium dioxide nanoparticles – silver nanoparticles, nanoadsorbents, soil remediation.

UNIT –IV

Nanotoxicity and environmental impacts – routes of nanomateirals into the water environment, impacts of nanomaterials on environmental microbial community, Hazardous effects of nanomaterials on human and animal health.

References

1. Niemeyer, C.M., Mirkin, C.A. (2004) Nanobiotechnology: Concepts, Applications and Perspectives, Wiley VCH.
2. Mirkin, C.A. Niemeyer, C.M. (2007) Nanobiotechnology - II more concepts and applications, Wiley VCH.
3. Z.hang, T.C., Hu, Z., Surampalli, R., Tyagi, R.D. Lai, K.C.K, Lao, I.Mc. (2009) Nanotechnologies for Water Environment Applications. American Society of Civil Engineers (ASCE) Publications.
4. Mark Wiesner, Jean-Yves Bottero (2007) Environmental Nanotechnology: Applications and Impacts of Nanomaterials, McGraw, Hill Professional.

ENV – 405: PRACTICAL – VII

1. Case study analysis for EIA of a major industry/Mining activity.
2. Preparation of Environmental Impact Statement.
3. Calculation of Global Warming Potential
4. Calculation of Net Present Values of Natural Resources
5. Methods of MeasuringTotal Economic Value

ENV= 406: PROJECT DISSERTATION & VIVA – VOCE- 100 Marks

M.Sc. Environmental Science

(MODEL QUESTION PAPER)

Time: 3 hours Max. Marks: 75

PART-A

Write short notes on any FIVE of the following 5X3 = 15

1)

2)

3)

4)

5)

6)

7)

8)

Part-B

Answer all questions 4X15 = 60

9. A) Essay Question

(or)

B) Essay Question

10.A) Essay Question

(or)

B) Essay Question

11. A) Essay Question

(or)

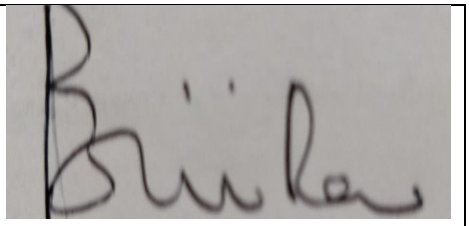
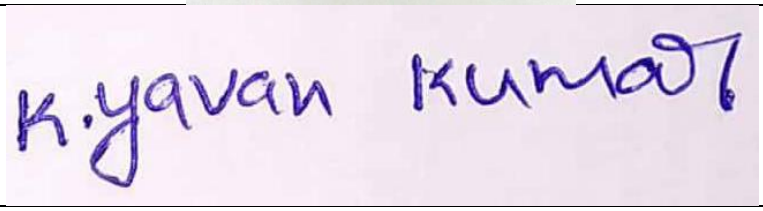
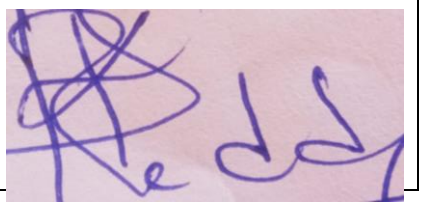
B)Essay Question

12. A) Essay Question

(or)

B) Essay Question

(Two short notes and two essay questions from each unit)

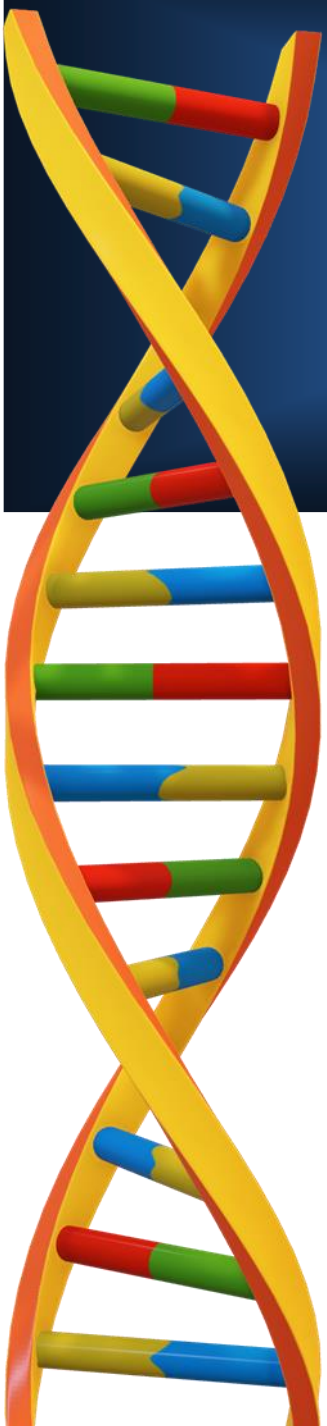
N Parthasarathy Dr. N. PARTHASARATHY, Professor, Department of Ecology & Environmental Sciences, School of Life Sciences, Pondicherry University, Puducherry-605 014, INDIA.	
	

Yogi Vemana University

(If Know thyself, Thou Art the Divinity)

nent of Genetics and Genomics

apuram, Kadapa, AP 516005



Syllabus copy

M.Sc. Genetics& Genomics

Code: GENYVUC

2021-2022 onwards

Program Educational Objectives (PEOs)	
After completion of M. Sc. Genetics and Genomics program, the students are expected to obtain	
PEO1	The basic knowledge in Genetics, Biomolecules, Cell Biology, Biotechniques and related subjects. Gain the practical, experimental knowledge to communicate their laboratory experiments orally or in written as needed.
PEO2	Students will be trained in microbial genetics, Bioenergetics, Molecular Genetics. Also, to train the students in understanding and performing experiments using advanced scientific methods. This is achieved via practical classes, seminars and a problem-based learning exercise. Students will be encouraged to complete online courses offered by SWAYAM, MOOCS or NPTEL
PEO3	Students gain a broad foundation base and build upon that base for understanding the Genetic Engineering, Pathogenomics, defense mechanisms of the human body and Transgenic technology. This program also aims to train the students in immune based techniques and Genetic engineering techniques. Students will be involved in discussions based on current research papers.
PEO4	Students will gain knowledge on the concepts of Genomics, Biostastics and Population Genetics and fundamentals of Bioinformatics. Designing and execution of Project work would help the students to obtain the practical aspects about the subject and scientific writing capacity. Ability to participate in research projects along with PhD students team work-based investigations of research problem assignments
PEO5	Ability to contribute their knowledge and experiences gained during the program toprofessional and/or communal activities in serving the society.

.

Program Specific Objectives (PSOs)	
PSO1	Students would understand the basic principles in Genetics, structure, chemical properties and reactions of the biomolecules and cell biology. To obtain the knowledge about the qualitative and quantitative analysis of different biomolecules using different types of techniques such as microscopy, chromatography,spectroscopy, and electrophoresis.
PSO2	Expect to isolate mutants, bacterial conjugation and transformation experiments,to perform several enzyme assays and enzyme kinetic studies, and to identify the pathogenic microbes in the laboratory by applying the knowledge of microbial culture techniques. Students will be trained to isolate and characterize DNA and RNA.
PSO3	By applying the knowledge of Genetic engineering, the students will be able to perform restriction digestion, ligation and Polymerase Chain Reaction. The skill based course of immunology knowledge would help to understand the various antigen-antibody techniques and to detect various disorders
PSO4	Students will get expertise on population Genetics & Genomics and fundamentals of Bioinformatics. More importantly, to gain hands on experience by doing the research projects in the fourth semester.

Program Outcomes (POs)	
On successful completion of the M. Sc. Genetics and Genomics program	
PO1	Acquire the knowledge of Genetics and other related advanced life sciences and the ability to apply the gained knowledge
PO2	Ability to function competently in a laboratory setting, design and conduct experimentsand simulations, operating and calibrating technical equipment as well as analyzing the experimental results.
PO3	Apply ethical principles in the field of Genetics and transfer the knowledge effectively to the general society
PO4	Ability to understand contemporary issues in allied fields. Identify problems in specific research area and contribute to those research problems.

.
.

M.Sc. Genetics and Genomics Program Curriculum

YOGI VEMANA UNIVERSITY

Vemanapuram, Kadapa, AP 516 005, INDIA

[AState University, Accreditedwith"B"GradebyNAAC]

M.Sc.Genetics and Genomics Syllabus

(Forthestudentsadmitted during theacademicyear2021 – 22onwards)

Semester	Components ofStudy	Course Code	Title of the Course	No. of credits	Theory hours / week	Practical hours/week	Internal Assessment	Semester End Exams	Total Marks
SEMESTER-I	Core	GEN15121	Principles of Genetics	04	04		25	75	100
		GEN15122	Biomolecules	04	04		25	75	100
		GEN15123	Cell Biology	04	04		25	75	100
	Internal Elective	GEN15124	(A) Analytical Bio-Techniques (Skill development course)	04	04		25	75	100
			(B) Medical Genetics		04				
			(C) Research Methodology		04				
			Tutorial and Seminar	00	04		00	00	000
	Practical	GEN15125	Practical-I**[>15 students 2-batches]**	04		16		100	100
	Practical	GEN15126	Practical-II**[>15 students 2-batches]**	04		16		100	100
	Sub-total			24	28	32	100	500	600
SEMESTER-II	Core	GEN25121	Microbial Genetics	04	04		25	75	100
		GEN25122	Energy Metabolism	04	04		25	75	100
		GEN25123	Molecular Genetics	04	04		25	75	100
	Open Elective	GEN25124	(A) Basics in Genetics	04	04		25	75	100
			(B) Immunotechnology		04				
			(C)SWAYAM /MOOCs/ NPTEL		04				
			Tutorial and Seminar	00	04	00	00	00	000
	Practical	GEN25125	Practical-I**[>15 students 2-batches]**	04		16		100	100
	Practical	GEN25126	Practical-II**[>15 students 2-batches]**	04		16		100	100
	Sub-total			24	28	32	100	500	600
SEMESTER-III	Core	GEN35121	Genetic Engineering (Skill enhancement course)	04	04		25	75	100
		GEN35122	Pathogenomics (Community engagement activity)	04	04		25	75	100
		GEN35123	Immunology (Skill oriented course)	04	04		25	75	100
	Open Electives	GEN35124	(A) Inherited Diseases of Human	04	04		25	75	100
			(B) Basics in Transgenic Technology		04				
			(C) SWAYAM /MOOCs/ NPTEL		04				
			Tutorial and Seminar	00	04	00	00	00	000

	Practical	GEN35125	Practical-I**[>15 students 2-batches]**	04		16		100	100
	Skill Oriented Course Practical	GEN35126	Practical-II**[>15 students 2-batches]**	04		16		100	100
	Sub-total			24	28	32	100	500	600
SEMESTER-IV	Core	GEN45121	Concepts of Genomics	04	04		25	75	100
		GEN45122	Biostatistics and Population Genetics	04	04		25	75	100
		GEN45123	Fundamentals of Bioinformatics	04	04		25	75	100
	Internal Elective	GEN45124	(A) Epigenetics	04	04		25	75	100
			(B) Animal& Plant Breeding		04				
			(C) Biotechnology Methods and Applications		04				
	Practical	GEN45125	Practical-I**[>15 students 2-batches]**	04		16		100	100
	Multi-Disci-plinary/ Project	GEN45126	Project Work	04		16		100	100
	Sub-total			24	28	32	100	500	600
Grand Total				**96**	**112**	**128**	**400**	**2000**	**2400**

- All core papers are Mandatory
- Internal/Open Elective – Choose one paper,Open Electives are for the students of other Departments in the varsity.
- Skill Oriented course is mandatory.
- Interested students may register for SWAYAM /MOOCs/ NPTEL with the approval of the concerned DDC for the award of the grade as ‘open elective’.
- Project work is Mandatory(Collaboration with various firms/companies/societies).

Semester I

Department of Genetics and Genomics
Semester I
GEN15121: Principles of Genetics

Course Objectives: The students will familiarize themselves with (1) A historical perspective of genetics and a working understanding of the genetic terminology, (2) An understanding of the concepts of heterosis, cytogenetics and molecular mechanism of mutations and (3) Pedigree Analysis, sex-linked traits, crossing over, linkage and mapping.

Course Outcome: By completing the Principles of Genetics course, students are expected to have achieved the following skills and capabilities.Comprehensive, detailed understanding of the chemical basis of heredity, understanding of how genetic concepts affect broad societal issues, the knowledge required to design, execute, and analyze the results of genetic experimentation, Insight into the mathematical, and statistical basis of genetic analyses, demonstrate knowledge and practical skills of molecular genetic analysis of genetic diseases.

UNIT-I

History and milestones in genetics, importance and applications of genetics; Terminology of genetics;Life cycles and application of model organisms *Saccharomyces cerevisiae, Drosophila melanogaster, C. elegance, Arabidapsis thaliana, Mus musculus*; Outlines of cell structure, Chromosome structure- Bacterial chromosome, eukaryotic chromosome (primary constriction, secondary constriction, satellite chromosomes, telomeres, euchromatin, heterocromatin); chromosome number, special type of chromosomes-salivary gland chromosome, lamp brush chromosomes, accessory chromosomes; Spermatogenesis and Oogenesis.

UNIT-II

Mendel's principles of inheritance-Principles of dominance, segregation and independent assortment, punnet square method and forked-line method; The rediscovery of mendelian principles; Extensions of Mendel's principles-incomplete dominance, codominance, multiple alleles, allelic series, testing gene mutations for allelism; Genetic interactions, Epistasis- recessive epistasis, dominant epistasis, duplicate dominant genes, duplicate recessive genes, duplicate genes with cumulative effect, dominant-and-recessive interaction; non epistatic interactions and pleiotropism; Penetrance and Expressivity, The classical genetics of organelles-Leaf variation in plant and antibiotic resistance in *Chlamydomonas*.

UNIT-III

Methods to know genotype of an organism-Test cross, back cross, tri-hybrid cross and polyhybrid cross; Inheritable characters in human beings; Influence and effect of environmental factors on gene expression. Heterosis- Occurrence and causes of heterosis, effect of heterosis, role of heterosis in increasing production.
Cytological techniques-analysis of mitotic chromosomes, the human karyotyping; Cytogenetic variations : Overview of cytogenetic variation; Polyploidy- sterile polyploids, fertile polyploids, tissue-specific polyploidy and polyteny; Aneuploidy - Trisomy, monosomy, deletion and duplications of chromosome segments; Rearrangement of chromosome structure-inversion, translocations, Mutations : Origin and frequency of spontaneous mutations, Induced mutations-physical and chemical mutagens, screening and selection of mutations, molecular basis of spontaneous and induced mutations. Transposable element, detection of transposition in bacteria.

UNIT-IV

Sex determination, sex linked genes, sex limited traits, sex influenced traits, Linkage- complete and incomplete linkage, strength of linkage, factors affecting strength of linkage, measurement of linkage strength, importance of linkage; Recombination and crossing over; Chromosome mapping-crossing over as measure of genetic distance, Morgan's cross and strut's event map; recombination mapping with two point test cross, determination of gene order by three point test cross; Mapping of genes by tetrad analysis; Interference and the coefficient of coincidence; Linkage analysis in humans (pedigree analysis).

Reference Books:

1. Principles of genetics, by Snustad . Simmons.7thEd.2019.
2. Genetics *A molecular approach* by Peter J.Russell.3ndEd.2016.
3. Genetics fundamentals and applications by Srivastava and Debmalya barch.1stEd.2008.

4. Genetics by Winter, Hickey and Fletcher.2nd Ed.2003.
5. Genetics Analysis of genes and genomes by Jones and Bartlett.6th Ed.2005.
6. Genetics, Schaum's outlines. 5th Ed. TATA McGraw-hilledition.2010.
7. Principles of genetics by Robert H. Tamarin. 7th Ed. TATA McGraw-hilledition. 2010.
8. Genetics *A conceptual approach* by Benjamin A. Pierce , 7th Ed.2019.
9. Genetics *Analysis and principles* by Robert J.Brooker 7th Ed.2021.
10. Genomes 4 by T.A.Brown (2017).
11. iGenetics*A molecular approach*, second ed. By Peter J.Russell (2009).

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://nptel.ac.in/courses/121/106/121106008/
2. https://nptel.ac.in/courses/102/104/102104052/
3. https://www.toppr.com/guides/biology/human-reproduction/gametogenesis-in-humans/
4. https://www.ndsu.edu/pubweb/~mcclean/plsc431/mutation/mutation4.htm

Department of Genetics and Genomics
Semester I
GEN15122: Biomolecules

Course Objectives:This course will provide the knowledge in biomolecules such as Carbohydrates, Proteins, Enzymes, Lipids, and Nucleic Acids. To obtain the knowledge about the qualitative and quantitative analysis of different molecules using different types of chromatographic techniques, spectroscopic techniques, and electrophoretic techniques.

Course Outcome:Students will understand the structure, classification and biological significance of various Biomolecules in research, clinics and industry. Classification, nomenclature and function of enzymes and their application in various areas of research will be discussed in detail which will equip the students to fit for enzymology research and also industrial applications. Students gain the knowledge about the qualitative and quantitative analysis of different molecules using different types of chromatographic techniques, spectroscopic techniques, and electrophoretic techniques.

UNIT-I

Carbohydrates:Introduction of biomolecules, importance of carbohydrates,classification of carbohydrates, outline, structure and properties of monosaccharides such as glucose, galactose and fructose, glycosidic bond, disaccharides such as lactose, maltose and sucrose. Polysaccharides: Structure, occurrence and biological significance of polysaccharides such as starch, cellulose, glycogen, structural peptidoglycans, glycoproteins,mucopolysaccharides.

UNIT-II

Amino acids: Amino acids functions, classification of Amino acids, structure of Amino acids and physiochemical properties of Amino acids, nonstandard amino acids: Ornithine, citrulline, L-Dopa. Peptide bond,glutathione, higher peptides.

Proteins: Biological functions of proteins. Structural organization:Primary, Secondary, tertiary and quaternarystructure of proteins. Ramachandran plot. Structural & functional relationship of proteins, denaturation, renaturation, Ribonuclease.

UNIT-III

Lipids: Structure, classification and properties of lipids, fatty acids, waxes, phospholipids, cerebrosides and gangliosides, lipoproteins, prostaglandins, leukotrienes, thromboxanes, steroids and bile acids.

Nucleic acids: Purine and Pyrimidine Bases, Nucleosides, Nucleotides, Formation of phosphodiester bond and its stability, Structure of DNA-Watson and Crick model, different typesof DNAand RNA,Denaturation and Renaturation of DNA, melting curves.

UNIT-IV

Enzymes: Classification and nomenclature of enzymes: The Six main classes of enzymes, Kinetics of enzyme catalyzed reaction: Michaelis –Menten equation, determination of Vmax, Km and their significance. Line weaver-Burk plots. Factors affecting enzyme activity:substrate concentration, pH, temperature. Enzyme inhibition- reversible and irreversible inhibition, competitive and noncompetitive inhibitors, Allosteric inhibition. Catalytic mechanism of Lysozyme, Chymotrypsin and Ribonuclease.

Reference Books:

1. Principles of Biochemistry by LEHNINGER 8th edition, NELSON &COX (Worth) Publ. 2021.
2. Principles of Biochemistry by Donald Voet and Judith G. Voet .– 5th Ed.. John Willey and Sons,Inc. 2018

3. Biochemistry by Jeremy M Berg, LubertStryer, John Tymoczko, Gregory Gatto W.H. Freeman andcompany,9th Ed.NewYork, 2019.
4. Harper's Illustrated Biochemistry Thirty-First Edition (A & L LANGE SERIES),2018.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. Biochemistry of Biomolecules.
   https://onlinecourses.swayam2.ac.in/cec20_bt12/preview
2. Biomolecules: Structure, Function in Health and Disease.
   http://ugcmoocs.inflibnet.ac.in/ugcmoocs/view_module_ug.php/353
3. Introduction to Carbohydrates.
   https://aklectures.com/lecture/carbohydrates/introduction-to-carbohydrates
4. Introduction to Nucleic Acids.
   https://www.youtube.com/watch?v=1Wc4jTH2v_w&list=PL9jo2wQj1WCNG9mFuNBm
   J 1m7x1skBNKw

Department of Genetics and Genomics
Semester I
GEN15123: Cell Biology

Course objective: To understand the basic unit of life, how it is organized, theories and concepts etc. and further to explore the structure of cell, arrangement of various cellular organelles, cell division, singling and communication for constructive metabolic processes in the cell.

Course outcomes: Students will be able to gain overall knowledge on various cells, cell organelles and their précised functions. Following the Cell biology practical's, students enable to discriminate one to other cells and their respective functions based on their characteristic attributes. Further it gives foundation for understanding biological aspects at molecular levels.

UNIT-I

Structural organization of prokaryotic and eukaryotic cells, Ultrastructure and functions of nucleus, mitochondria, plastids, endoplasmic reticulum, Glogi complex, lysosomes, microbodies, ribosomes. Cytoskeleton – microtubules and microfilaments.

UNIT-II

Plant and animal cells – variation in structure and function, Types of tissues – Epithelial tissues, basement membrane, extracellular matrix – Collagen, elastin, fibrillin, Chromatin organization, telomere, centromere, cell receptors, endocytosis and exocytosis. Biomembranes - composition of membranes including plasma and organelle membranes. Membrane lipids, proteins and carbohydrates. Molecular structure of membranes, Membrane fluidity, fluid mosaic model ofbiological membranes.

UNIT-III

Membrane transport: Active transport, Active transport of Na+/K+(sodium/potassium ATPase) Ca2+ (Ca2+ - ATPase). Basic concepts of cell signaling and transduction, different signaling molecules, second messengers, calcium, calmodulin, inositol phosphate, cAMP, cGMP, NO. Signal cascades, inhibition of cell signaling pathways.

UNIT-IV

Cell cycle (eukaryotic cell cycle): Phases of cell cycle, Control of the cell cycle-Role of protein kinases, checkpoints, kinase inhibitors and cellular responses; M-Phase: Prophase-Formation of the mitotic chromosome and spindle, dissolution of the nuclear envelope and partitioning of cytoplasmic organelles; Pro-metaphase; Metaphase-metaphase plate, microtubule flux; Anaphase- role of proteolysis in progression through mitosis, events of anaphase, spindle assembly checkpoints; Telophase, forces required for mitotic movement, cytokinesis; Meiosis and fertilization-stages and process of meiosis, regulation of Oocyte meiosis, fertilization.

Reference Books:

1. Karp's Cell Biology, 8th Edition, Global Edition.Gerald Karp, Janet Iwasa, Wallace Marshall: 2018.
2. The Cell a molecular approach by G M Cooper &E Hausman, 6thEd. Sinauer Associates Inc.,U.S.; 7th edition,2015.
3. Molecular Cell Biology by Lodish et al., 2008, 9thEd. W.H Freeman andCompany,2021.
4. Essential Cell Biology by Alberts et al, 4thEd. Garland Science, Taylor & Francis group, 2014.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://bio.libretexts.org/Bookshelves/Cell_and_Molecular_Biology/Book%3A_Cells_-Molecules_and_Mechanisms_(Wong)

2. https://nptel.ac.in/courses/102/106/102106025/#
3. https://www.easybiologyclass.com/molecular-biology-online-tutorials-lecture-notes-studymaterials/

Department of Genetics and Genomics
Semester I
Internal Elective GEN15124 A: Analytical Bio-Techniques

Course objective: To understand the principle, method and applications of various analyticalbio-techniques. To facilitate the students to prepare and handlevarious experiments and knowtheir significance.

Course outcomes: Students will be able to gain knowledge on various techniques such as buffer preparations using pH meter and understanding their significance in biological system. Techniques for isolation, identification and estimation of biological substances like DNA,RNA,Protein using centrifugation, chromatography, electrophoresis, spectroscopy and blotting techniques, handling, usage and applications of microscope. Understanding radioactivity and its applications.

UNIT-I

pH and Buffers: pH meter, glass electrode, reference electrodes, ion selective electrodes and oxygen electrode. Measurement of pH,pKa. Importance of pH and buffers in biological systems, Solutions - Molarity, Molality, Normality.

Centrifugation:Basic principles of centrifugation, Preparative and analytical, Rotors: Fixed Angle and Swinging Bucket, Differential Centrifugation, Ultra-centrifugation. Centrifuge-uses and Safety.

UNIT-II

Chromatography: Principles, method and applications of Chromatography: Paper Chromatography, Thin Layer Chromatography (TLC), Column Chromatography, Gas liquid chromatography (GLC), High Performance Liquid Chromatography (HPLC), Affinity Chromatography.

Electrophoresis: Principles,method and applications of Agarose Gel Electrophoresis, Sodium Dodecyl Sulphate Polyacrylamide Gel Electrophoresis (SDS-PAGE), Native PAGE, Immuno-electrophoresis, Isoelectric-Focusing and Two-Dimensional Gel Electrophoresis; **Blotting techniques:** Northern blotting, Southern blotting, Western blotting.

UNIT-III

Radioactivity: Half –life, decay constant, average life, units of radioactivity, Radioactivity measuring techniques and correction factors.GM counter, liquid scintillation counter, γ-counter. Isotope dilution techniques and Radioactive disposal. Biological effects of radiation, applications of Radioisotopes in medicine.

UNIT-IV

Microscopy: Principles, method and applications of light microscopy, Phase contrast Microscopy, Transmission electron microscopy(TEM), Scanning electron microscopy (SEM) and fluorescence microscopy.

Spectroscopy: Electromagnetic radiations, Beer – Lamberts law, principles and applications of colorimetry, spectrophotometry: UV, fluorimetry, flame photometry, Infrared, ESR, NMR

spectroscopy, polarimetry.

Reference Books:

1. Principles and Techniques of Practical Biochemistry, Ed. Williams andWilson.,8th edition-April-2018.
2. Biophysical chemistry, principle and Techniques,Himalaya Pub. House, 2009.
3. An Introduction to Practical Biochemistry. David t. Plummer, Tata Mac grew – Hill 3rd Ed.2017.
4. Physical Biochemistry: Applications to Biochemistry and Molecular Biology (Life
5. Sciences/Biochemistry), 1983.
6. Analytical Techniques in Biochemistry and Molecular Biology by RajanKatoch, Springer,2011.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. http://epgp.inflibnet.ac.in/
2. http://epgp.inflibnet.ac.in/Home/ViewSubject?catid=944

Department of Genetics and Genomics
Semester I
Internal Elective GEN15124 B: Medical Genetics

Course objective:To facilitate the understanding on basic aspects of clinical genetics including the reasons for various genetic disorders such as chromosomal or gene specific variation/mutations and their prenatal diagnosis, counselling and treatment.

Course outcomes: Students will be able to gain knowledge on various genetic disorders and their prenatal diagnosis and management.

UNIT-I:

Reasons for genetic disorders: Introduction, background,brief history**,** types of genetic diseases.Chromosome mutations - Chromosome rearrangement-duplication, deletions, inversion and translocation; aneuploidy and polyploidy. Gene mutations- Base substitution, base insertion and base deletion, transposable elements in humans (SINEs and LINEs).

UNIT-II:

Genetic basis of syndromes and disorders: Introduction, Monogenic disorders- Cystic fibrosis, Huntington's disease, Hemophilia, Neurofibromatosis, sickle cell disease and thalassemias; Chromosome disorders- cri-du-chat syndrome, Down syndrome; Inborn errors of metabolism- Albinism, Alkaptonuria, cystinuria and pentosuria; DNA repair defects,xerodermpigmentosum; and multifactorial disorders – Diabetes mellitus, coronary artery disease, mitochondrial syndromes and congenital malformation

UNIT-III:

Genetic basis of eye disorders: Colour Blindness, Retinitis pigmentosa, Glaucoma & Cataracts; Genetics of skeleton and skin disorders; Genetics of Syndromes & Genomic Imprinting: Neurofibromatosis I, Prader-Willi and Angelman syndromes, BeckwithWiedeman syndrome

UNIT-IV:

Diagnosis, Genetic counseling and treatment: Prenatal diagnosis- Ultrasonography and fetal echocardiography, Maternal serum screening, Amniocentesis and chorionic villus sampling; Genetic testing for common mutations - protein truncation test, Single stranded conformation polymorphism test and full resequencing of the gene. Genetic counseling- introduction, psychotherapeutic counseling, genetic susceptibility and treatment of genetic diseases.

Reference Books:

1. Human Genetics by Gardner andDavies,2nd Ed.2012
2. Elements of Medical Genetics, Emery's.15th Ed.2017
3. Medical genetics / Lynn B. Jorde, John C. Carey, Michael J. Bamshad.6th Ed.2020
4. Human Genetics by Gangane, 6th Ed.2021.
5. Principles of genetics, by Snustad . Simmons.7thEd.2015.

Department of Genetics and Genomics
Semester I
Internal Elective GEN15124 C: Research Methodology

Course Objectives: The course is intended to give an introduction to research methodologywhich includes to design the research projects, scientific writing, research communications, uploading of manuscript, plagiarism,ethics to be followed, patents registration,knowing about different scientific funding agencies for research funding in India and abroad.

Course Outcome: Students can ableto gain skills to writeand upload research articles to various journals for publication, towrite project proposals to various funding agencies, to design methodology with respect to objectives of the research problem/proposal etc.

UNIT-I

Introduction to research methodology- Define research and research methodology? Applications of basic and applied research. Significance of Research. Essential steps in doing research:literature survey, defining the research problem, formulation and validation of hypothesis,designing experimental techniques and execution of designed experiments, data compilation and analysis. Presentation of research findings in graphs and tables, preparation of technical report or manuscript for publication in peer reviewed scientific journals.

UNIT-II

Design of the experimental program-Introduction of research problem, variables in the experiments, materials and methods, application of methods. Progress of research – evaluation of results, statistical approach, comparison with existing methodologies, validation of findings, research communications.

UNIT-III

Scientific writing - Research report, thesis and dissertation, manuscript/research article, review monographs. Preparation of manuscript/dissertation for research proposals. Introduction or review of literature, aims and objectives, Materials and methods, result analysis, evaluation of results, statistical approach, discussion and comparison of results, literature citation, bibliography and reference, impact factor of journals.

UNIT-IV

Plagiarism:Software's used in plagiarism,ethics in manuscript writing,conflicts of interest,copyright issues, patents.Uploading of manuscript,thesis,dissertation,Shodhganga and its importance. Themes and role of different scientific funding agencies of India and abroad.

References:

1. Encyclopaedia of Research Methodology in Life Sciences by Vinaya Sahay (Author), Pradumna Singh (Author),2009.
2. https://pubmed.ncbi.nlm.nih.gov
3. Intellectual Property Rights in Agricultural Research by N. Ramachandran (Author), S.P. Singh (Author), S.K. Jinddal Et. 2019
4. Intellectual Property and Genetically Modified Organisms: A Convergence in Laws
5. by Charles Lawson, Berris Charnley, Routledge; 1st edition,2017.
6. Biosecurity: Origins, Transformations and Practices (New Security Challenges) by Dr Brian Rappert, Dr Chandré Gould,2009.
7. Biotechnology, Security and the Search for Limits: An Inquiry into Research and Methods (New Security Challenges) by by Dr Brian Rappert,2007.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. Data handling and Analytics– Lecture 55
2. http://nptel.ac.in/courses/106/105/106105166
3. Introduction to IoTs Part I & Part II - Lectures 1 & 2
4. http://nptel.ac.in/courses/108108098/
5. Introduction to IoT – Lecture I –
6. https://ocw.cs.pub.ro/course/iot/courses/01

Department of Genetics and Genomics
Semester I
GEN15125Practical Paper I: Principles of Genetics &Biomolecules

1. Problems in Genetics.
2. Microscopic observation of chromosomes.
3. Karyotyping.
4. Qualitative tests for identification of carbohydrates.
5. Qualitative tests for identification of amino acids.
6. Qualitative tests for identification of nucleic acids.
7. Qualitative tests for identification of Lipids.
7. Quantitative tests for protein estimation (Lowry /Bardfoed's methods).
8. Quantitative tests for glucose estimation (DNS /Nelson Somagy Method).
9. Quantitative tests for Free Amino acids estimation (Ninhydrin Method).
10. Quantitative tests for Cholesterol estimation (Zak's method).
11.Quantative estimation of Bilirubin by Vanden Bergh method.
12. Glycine estimation by Sorensen method.
13. Estimation of DNA by diphenylamine method.
14.Estimation of RNA by orcinol method.

Department of Genetics and Genomics

Semester I

GEN15126PracticalPaper II: Cell Biology & Analytical Bio-Techniques/ Medical Genetics/Research Methodology

Cell Biology

1. Preparation of plant and animal cells slides for observation under microscope.
2. Preparation of blood smear and differential staining of blood cells.
3. Study of divisional stages in Mitosis.
4. Study of divisional stages in Meiosis
5. Estimation of chlorophyll in the leaf extract.
6. Isolation of chloroplasts by sucrose density gradient centrifugation.

Analytical Bio-Techniques

1. Preparation of buffers and measurement of pH.
2. Verification of Beer's Law and determination of λ max for color solutions.
3. Paper chromatography for separation of amino acids and plant pigments.
4. Thin layer chromatography (TLC) for separation of lipids and amino acids.
5. Protein precipitation by Ammonium Sulphate and Dialysis.
6. SDS-PAGE for separation of proteins.
7. Submarine Agarose gel electrophoresis for DNA separation.
8. Ion-exchange column chromatography (Demonstration).
9. Gel permeation column chromatography (Demonstration).

Medical Genetics

1. Karyotyping
2. Assignments on Genetic disorders and Genetic counselling methods.
3. Kinetics of blood groups: ABO-typing, Rh(D) typing, ABH secretor status.
4. Genetic traits: color blindness, Phenyl ThioCarbamide(PTC).
5. Sickling test.

Research Methodology

Assignments on following:

1. Literature survey.
2. Methods to select a research problem/topic.

3. Designing the experimental methods for a research topic.
4. Analysis and evaluation of results.
5. Presentation of the results.
6. Steps to follow to prepare manuscripts and review articles.
7. Importance of Plagiarism.
8. Bibliography.

Semester II

Department of Genetics and Genomics
Semester II
GEN25121: Microbial Genetics

Course objective: To learn the microbial genetics of bacteria and viruses, the process of mutations, replication, pathogen evolution and the reasons for various diseases.

Course outcomes: Students will gain knowledge about the bacterial and viral genetics. The students will beknowing the process of mutations, mapping, replication, evolution, interactions with the host and the process of bacterial and viral disease occurrence.

UNIT-I

Essentials of bacterial genetics: General properties of bacteria.Growth and culture of bacteria: nutritional requirements, pure cultures and methods of isolation of pure cultures,synchronous cultures, continuous cultures.Genetic nomenclature.Mutants and mutations: Types of mutants, isolation and characterizations of mutants, revertant & reversion, uses of mutations;

UNIT-II

Transformation:Transformation in the history of molecular biology, uptake of DNA in transformation and Integration of transforming DNA.

Transduction: Generalized transduction and specialized transduction.

Conjugation: Essential features and mechanism of DNA transfer during conjugation, Formation of Hfr strains, Use of Hfr strains in genetic cross, transfer of chromosomal genes to F plasmid.

UNIT-III

Classification and replications of viruses: General properties, nucleic acid-based classification (Baltimore classification), Replication. DNA viruses: SV40, CaMV, Bacteriophage T4 and λ. RNA viruses: TMV, Influenza.Defective-interfering virus (DI), Poliovirus and Potyvirus. Retroviruses- HIV, Human hepatitis B virus.

UNIT-IV

Genetics of viruses: Phage mutants, recombination in phages, fine-structure mapping of T4 rII locus; Evolution in RNA viruses: The potential for rapid evolution in RNA viruses, phenotypic mixing, recombination and reassortment. Sub-viral agents: Satellite RNA, DI particles, viroids and prions.

Reference Books:

1. Microbilal genetics by Stanley R.Maloy, John E.Cronan and David Frieflder(1994), second ed.,Jones and Bartlettpublishers.
2. Molecular genetics of bacterial by Larry syder and Wendy champnes (2013), 4th Ed.,
3. ASMpress.
4. Modern virology by N.J.Dimmock, A.J.Easton and K.N.Leppard (2016), 7th
5. Ed.,Blackwellpublishing.
1. Principles of Virology, byS.J.Flint et al.,5th Ed.ASMpress, 2020.
2. Principles of Molecular Virology by A.Cann , 6th Ed. AcademicPress,2015.

Department of Genetics and Genomics
Semester II
GEN25122: Energy Metabolism

Course Objectives: The course includes extensive study on Bioenergetics, ATP synthesis and regulation of ATP producing pathways, Broad outlines of metabolism and the recent advancements in contributing to various disease conditions. Biosynthesis and degradation of various biomolecules. To explore the enzyme activities and the factors that influence the enzyme activity.

Course Outcome: Understanding Energy transductions in biological system and Electron transfer reactions in mitochondria. Ability to function competently in a laboratory setting, design and conduct experiments related to enzyme assays and the factors influencing the enzyme activity like pH, temperature, substate concentration, enzyme concentration etc.

UNIT-I

Bioenergetics: Thermodynamic principles – Chemical equilibria; Gibbs free energy(G), enthalpy (H), entropy (S). Free energy change in biological transformations in living systems; Actual free energy change, standard free energy change.High energy compounds. oxidation- reduction reactions. Mitochondrial electron transport system-organization of components and importance. Substrate level phosphorylation and oxidative phosphorylation. Respiratory chain inhibitors and uncouplers of oxidative phosphorylation. ATP synthesis and regulation of ATP producing pathways. Regulation of oxidative phosphorylation.

UNIT-II

Metabolism of carbohydrates: Glycolysis: Preparative and payoff phases of Glycolysis, Regulation of glycolysis, Fermentation: the anaerobic fate of pyruvate, Metabolism of hexoses other than glucose: fructose, galactose and mannose, Citric acid cycle: pyruvate dehydrogenase complex, metabolic sources of acetyl CoA, reactions and regulation of citric acid cycle, Amphibolic nature of citric acid cycle.

UNIT-III

Other pathways of carbohydrate metabolism:Uronic acid pathway, metabolism of amino sugars, glycogen metabolism: Glycogen synthesis and break down, Regulation of glycogen synthesis and breakdown. Gluconeogenesis and maintenance of blood glucose levels, glyoxylate cycle. Pentose phosphate pathway of glucose oxidation, Disorders of carbohydrate metabolism – Glycogen, galactose, Fructose.

UNIT-IV

Lipid Metabolism: Biosynthesis and degradation of saturated and unsaturated fatty acids, energy yield and regulation, Biosynthesis of triacyl glycerols, and membrane phospholipids. Biosynthesis and degradation of cholesterol and its regulation. Metabolism of lipoproteins and Ketone bodies.

Reference Books:

1. Principles of Biochemistry by LEHNINGER 8th edition, NELSON &COX (Worth) Publ. 2021.
2. Principles of Biochemistry by Donald Voet and Judith G. Voet .– 5th Ed.. John Willey and Sons,Inc. 2018
3. Biochemistry by Jeremy M Berg, LubertStryer, John Tymoczko, Gregory Gatto W.H. Freeman andcompany,9th Ed.NewYork, 2019.
4. Harper's Illustrated Biochemistry Thirty-First Edition (A & L LANGE SERIES),2018.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://www.researchgate.net/publication/322407168_Machine_Learning_Methods_for_Analysis_of_Metabolic_Data_and_Metabolic_Pathway_Modeling
2. https://www.nature.com/articles/s41540-018-0054-3
3. https://www.researchgate.net/publication/263474674_A_Comprehensive_View_on_Metabolic_Pathway_Analysis_Methodologies
4. https://www.classcentral.com/course/swayam-enzymology-19860https://www.udemy.com/course/enzymology/

Department of Genetics and Genomics
Semester II
GEN25123: Molecular Genetics

Course objective: To describe genome organization and mechanisms by which DNA can be replicated and transcribed, translation, post-translational modifications, protein targeting etc. Further, to explain the molecular mechanisms by which protein complexes repair different forms of DNA damage, to provide examples of how homologous recombination occurs.

Course outcomes: Student will gain knowledgeon fundamentals of molecular biology and practical experience in setup of molecular biology laboratory and isolation of genomic DNA and RNA from bacterial, plant and animal systems.Electrophoresis of nucleic acids, quantification and purity of nucleic acids by UV spectroscopy. At the end of the course students will be expertise in understanding basic molecular biology concepts with relevant practical experiments.

UNIT-I

Genetic material: Functions of the genetic material; Evidence for DNA is the genetic material; Evidence for RNA is the genetic material.

Nucleic acids: Types, chemistry of DNA and RNA; Chargaff's ratios; Chemical, physical and spectroscopic properties of nucleic acids; Denaturation and renaturation kinetics of nucleic acids; Hydrolysis of nucleic acids-Exonucleases, endonucleases and ribozymes; DNA topology-linking, writhing, twisting number, positive and negative supercoiling, significance of supercoiling *in vivo*, topoisomerases types and mechanism; Unusual DNA secondary structures.

UNIT-II

Genome organization: Bacterial genome, plasmids, Eukaryotic Chromosome-Histone proteins, non-histone chromosomal proteins, nucleosome, linkers, chromatin fibers, centromeres, telomeres and alternative chromatin structures. **DNA replication**: Concepts and strategies/models for replication. Relation between cell cycle and DNA replication. Molecular mechanisms of DNA replication in prokaryotes and eukaryotes. Replication models- mtDNA and phage θX174. Inhibitors of DNA replication. DNA damage andrepair.

UNIT-III

Recombination: Homologous recombination, site-specific recombination and transposition. **Gene expression** (Transcription and translation): Overview of gene expression. **Transcription (RNA biosynthesis)**: Types of RNA and their role; RNA polymerases involved in transcription of prokaryotes and eukaryotes. Mechanism in pro and eukaryotic cells-promoter recognition, initiation, elongation and termination of RNA synthesis. Maturation and processing of different RNA transcripts-capping, methylation, polyadenylation, splicing, RNA editing and modification of nucleosides in tRNAs. Inhibitors of transcription.

UNIT-IV

Translation (protein biosynthesis) : Genetic code and its elucidation, structure and composition of prokaryotic and eukaryotic ribosome's; Structural features of rRNA, mRNA and tRNAs in relation to function, mechanisms of protein biosynthesis in prokaryotic and eukaryotes; post- translational modification of proteins and their sorting and targeting and degradation; regulation of translation; inhibitors of protein biosyntheses.

Regulation of gene expression: Principles of gene regulation, terminology and operon concepts, enzyme induction and repression; positive and negative regulation in *E.coli*–lac, and regulation by attenuation-trp operons.

Reference Books:

1. Fundamental Molecular Biologyby Lizabeth A.Allison. 3rd Ed.Blackwellpublishing, 2021.

2. Molecular Biology of the gene by Watson et al.,7thEd,,AddisonWesleyLongman. 2022
3. Principles of Biochemistry by LEHNINGER 8th edition, NELSON &COX (Worth) Publ. 2021.
4. Advanced Molecular Biology by A Concise reference. by R.M.Twyman. Viva Book Pvt.Ltd. 1998.
5. Molecular Biology of the Gene by Curtis Holmes,2019.
6. Molecular Biology by David Fdreifelder,1995 NarosaPubl.House.
7. Molecular Cell Biology by Lodish et al.9th ed, ,W.H.Freeman and Company 2021.
8. Genes VIII by Lewin,Oxford UniversityPress. 2017.

Department of Genetics and Genomics
Semester II
Open Electives GEN25124 A: Basics in Genetics

Course Objective: The course main objective is to introduce basic concepts of classical genetics to the students (other than the Genetics students). It gives a brief idea on biomolecules, structure and functions of different cells including prokaryotic and eukaryotic cells, cell division, genome organization and basic concepts of inheritance.

Course Outcome: By completing Basics in Geneticstudies, students are expected to have achieved the following skills and capabilities.Comprehensive, detailed understanding of the basic molecules structure, chemical basis of heredity, cell structure, understanding of genetic concepts

UNIT-I

An over view on biological organization (eg. human); Introduction, role and functions of different cell components- carbohydrates, lipids, proteins, and nucleic acids generalized structure of DNA and RNA, types and role of RNA molecules; DNA as genetic material; Introduction to enzymes and hormones.

UNIT-II:

Structure and functions of cells: Bacterial cell – cell wall, membrane, cytoplasm, arrangement of DNA; Plant and animal cells- variation, cell membrane, cell wall, endoplasmic reticulum, golgi complex, mitochondria, plastids, nucleus.

UNIT-III:

Chromosome- generalized classification, structure and organization of eukaryotic chromosome; chromosome number, euchromatin, heterochromatin, telomere, centromere, homologous and non-homologous chromosomes; Cell cycle and its importance, Mitosis – prophase, metaphase, anaphase, telophase, and cytokinesis; Meiosis-generalized mechanism; diploid (body cells), haploid (sperm and egg) and stem cells.

UNIT-IV:

Mile stones in genetics, Inheritance and its importance, terminology: genotype, phenotype, self- fertilization, cross-fertilization, true-breeding strain, P,F1 and F2 generations, monohybrid crosses, reciprocal crosses, allele, Mendelian experiments of inheritance-, principles of dominance, segregation and independent assortment; a generalized over view of non-mendelian inheritance.

Reference Books:

1. Principles of genetics, by Snustad. Simmons.7thEd.2015.
2. The science of genetics by Atherly, Girton andMcDonald.1999.
3. Genetics *A molecular approach* by Peter J. Russell.3rdEd.2016.
4. Genetics fundamentals and applications by Srivastava and Debmalya barch.1stEd.2008.
5. Genetics by Winter, Hickey and Fletcher.2ndEd.2003.
6. Genetics Analysis of genes and genomes by Jones and Bartlett.6thEd.2005.
7. Genetics, Schaum's outlines. 5thEd. TATA McGraw-hilledition.2010.
8. Principles of genetics by Robert H. Tamarin. 7thEd. TATA McGraw-hilledition. 2010.

Department of Genetics and Genomics
Semester II
Open Electives GEN25122 B: Immunotechnology

Course Objectives: The study of immunetechnology will enable the student to gain the knowledge to perform various immunology techniques to diagnose the infectious diseases and immune disorders. It will enable the student in understanding the functioning of the immune system in health and disease conditions. To gain the knowledge on the malfunctions of the immune system in immune disorder such as autoimmune disease, immune deficiency, hypersensitive reactions and transplant rejection.

Course Outcome: The students obtain hands on experience to perform various immunology techniques for the diagnosis of various infectious diseases and immune disorderssuch as Immuno-diffusion, Immuno-electrophoresis, Immuno-florescence, ELISA, western blot, FACS for research and diagnosis purposes. Student will be able to understand causes of autoimmune diseases and their treatment. Students gain knowledge onimmune response to tumor, hypersensitivity reactions and immunization procedures.

UNIT-I

Introduction to Immunology, Types of immunity: innate immunityand acquired immunity. Cell of the Immune system: Hematopoiesis,natural killer cells, B cells, T cells, macrophages, dendritic cells. Organs of the Immune system:Primary and secondary lymphoid organs.

UNIT-II

Antigen and Antibody interactions: Affinity and avidity, Immunodiffusion, Immuno-electrophoresis, Immuno-florescence, ELISA, western blot, FACS. Complement system; complement components, complement activation, regulation of complement system, biological consequences and pathways of complement activation, and complement deficiencies.

UNIT-III

Structure and functions of MHC and HLA system; HLA and tissue transplantation – tissue typing, methods for organ and tissue transplantations in humans; graft versus host reaction and rejection. Auto immunity, autoimmune diseases and their treatment, tumor immunology– tumor specific antigens, immune response to tumor, Immunotherapy of tumors.

UNIT-IV

Hypersensitivity reactions: Classification, Antibody–mediated–type I. Anaphylaxis; type II Antibody dependent cell cytotoxicity; Type III Immune complex mediated reactions; type IV cell mediated hypersensitivity reactions.

Immunization: Active and passive immunization**;** objectives of immunization, types of vaccines: whole organism vaccines, recombinant vector vaccines, DNA vaccines, synthetic peptide vaccines, subunit vaccines, immunization procedures.

Reference Books:

1. Essentials of Immunology - Ian Roitt - 13thEd.BlackwellScinentific Publications.2017.
2. KubyImmunology by Jenni punt et al.,8th Ed.2018.
3. 3.Paul's Fundamental Immunology by by Martin Flajnik et al.,2022.
4. Janeway's Immunobiology by Kenneth M. Murphy, Casey Weaver 9thEd.,2016.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://www.hindawi.com/journals/bmri/2014/437987/
2. https://www.tandfonline.com/doi/full/10.1080/1744666X.2019.1623670
3. https://www.technologynetworks.com/immunology/articles/using-the-internet-of-things-tofight-
4. virus-outbreaks-331992
5. Course Designed By: Dr. K. M. Saradhadevi

Department of Genetics and Genomics
Semester II
GEN25125 Practical Paper I): Microbial Genetics &Energy Metabolism

1. Bacterial growth curve.
2. Isolation of mutants by gradient plate technique.
3. Isolation of mutants by replica plate technique.
4. Bacterial survival curve in the presence of UV.
5. Isolation of mutations in bacteria by physical agents.
6. Isolation of mutations in bacteria by chemical agents.
7. Bacterial conjugation and transformation.
8. Isolation and estimation of glycogen/starch.
9. Determination of activity of α- Salivary amylase.
10. Isolation and assay of activity of acid phosphatase from potatoes.
13. Assay of activities of urease, Invertaseand trypsin.
17. Effect of substrate concentration on enzyme activity.
18. Effect of enzyme concentration on enzyme activity.
19. Effect of temperature on enzyme activity.
20. Effect of pHon enzyme activity.

Department of Genetics and Genomics
Semester II
GEN25126Practical Paper II: Molecular Genetics

1. Setting of molecular biology laboratorycreating of ribonuclease free environment in the laboratory.
2. Quantification of DNA and RNA by UV-spectrophotometer.
3. Isolation of total DNA from *E.coli*cells.
4. Isolation of total DNA from Plant leaf tissue
5. Isolation of total RNA from plant leaf tissue
6. Isolation of plasmid DNA from *E.coli*cells.
7. Agarose gel electrophoresis analysis of nucleic acids.

Semester III

Department of Genetics and Genomics
Semester III
GEN35121: Genetic Engineering

Course objective: To introduce the importance of the genetic engineering in the agriculture, medicine and poultry to meet the meaningful social needs. To aware the students on various tools used in genetic engineering, gene amplification, molecular cloning, gene transformation methods, preparation of genomic, cDNA libraries, site directed mutagenesis, sequencing of genes and genomes, expression of various proteins in different hosts cells etc.,

Course outcomes: Upon following this course, students can able to isolate plasmids from bacterial systems, amplify target genes by PCR, clone into suitable vector, transformation, clone confirmation, sequencing and protein expression in different host cells.

UNIT-I

Tools for genetic engineering: Introduction to Genetic engineering; Enzymes - Restriction nucleases (exo- and endonuclease), *Restriction endonuclease*: Nomenclature, classification, cleavage pattern and applications; *Enzymes in modification*- Polynucleotide phosphorylase, DNase (DnaseI, DNaseII, Exonuclease III and Mung bean nuclease), Phosphatases, Methylases, Ligases, Polynucleotide kinase and RNase.Oligonucleotides- primers, linkers and adaptors; **Vectors for cloning**- types, plasmid and phage vectors, cosmids, phagemids, BAC & YAC.

UNIT-II

PCR for gene amplification and detection: PCR principle and mechanism, Enzymes of PCR-Taq polymerase, Reverse Transcriptase, factors affecting PCR, different types of PCR (RT-PCR, nested PCR, Multiplex PCR and real time PCR) and their applications, **Probes**: Oligonucleotide, DNA and RNA probes, methods for radioactive and non-radioactive labeling; **Strategies for molecular cloning**: Choice of vector for cloning, preparation of DNA molecules for cloning, ligation, transformation into bacterial cells, screening and identification of positive clones.

UNIT-III

Libraries: Construction and screening of cDNA and genomic DNA libraries; **DNA sequencing**- Chemical method of Maxam and Gilbert, Sanger's dideoxy chain termination and automated sequencing; **Site-directed mutagenesis**: Oligonucleotide directed mutagenesis, site-directed mutagenesis by means of the PCR and importance of site-directed mutagenesis.

UNIT-IV

Gene expression: Construction of vectors for expression- choice of promoter, ribosome binding sites, transcription terminator, fusion protein tags, purification tags, protease cleavage sites and reporter genes; Over expression of heterologous protein in bacterial, purification and detection and analysis of recombinant protein. Vaccines-Types of vaccines, subunit vaccines, peptide vaccine, vector vaccines. **Gene therapy**- Ex vivo and In vivo gene therapy methods; Applications of genetic engineering.

Reference Books:

1. Principles of Gene Manipulation and genomics: An Introduction to genetic engineeringby Primrose andTwyman, 7thEd. . 2013.
2. Fundamental Molecular Biology by Lizabeth A.Allison. 3rdEd.Blackwell publishing, 2021.
3. Molecular Biotechnology: Principles and Applications of Recombinant DNA (ASM Books) by Bernard R. Glick, Cheryl L. Patten 6th Ed.2022.
4. Advanced Molecular Biology by A Concise reference.1998, by R.M.Twyman. Viva BookPvt.Ltd.
5. Fundamental Molecular Biology by Lizabeth A.Allison. 3rdEd.Blackwell publishing, 2021.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://onlinecourses.nptel.ac.in/noc19_bt15/preview
2. https://www.classcentral.com/course/swayam-genetic-engineering-theory-and-application-14090 http://biology.kenyon.edu/courses/biol114/Chap08/Chapter_08a.html
3. Course Designed By: Dr. S. Selvakumar

Department of Genetics and Genomics
Semester III
GEN35122: Pathogenomics

Course objectives: To aware the students on the concepts of epidemiology, disease transmission, progression, disease resistance factors and molecular diagnostics,emergence of(new viral and bacterial) diseases, genomic analysis, applications in new drug discovery and vaccine development.

Course outcomes: Students will gain knowledge about the concepts of epidemiology, disease cycle, pathogens detection at molecular levels, analysis of viral and bacterial genomes for new drug discovery and vaccine development.

UNIT-I

Epidemiology: Principles of epidemiology, Pandemic diseases, Common epidemic diseases in humans. Agent, sources and reservoir, Stages of disease progression, infectious disease transmission- Direct host –to-host, indirect host-to-host transmission; Natural Host resistance, Harmful microbial interactions with humans: entry, colonization and growth, virulence, virulence factors and toxins; Host risk factors in infection: age, stress and diet, compromised host. **New diagnostics** Advanced molecular diagnostic methods for detection of microbial infections: PCR, SNP, FISH, Flow-cytometry, Microarray.

UNIT-II

Emerging and reemerging infectious diseases- Chikungunya, Swine flu (H1N1), Dengue, Covid-19 -history, symptoms, viral replication, genetic variability, diagnosis, prevention.

HIV pathogenesis-gene-therapy: Overview of HIV pathogenesis: structure and genome, replication, target-cell depletion and apoptosis, genetic variability; Bioinformatic analysis of HIV. Ribozyme as gene therapeutic agents for HIV/AIDS: Ribozyme design and in vitro efficacy.

UNIT-III

Genomics of the *Mycobacterium tuberculosis* and BCG vaccines: *Mycobacterium* pathogenesis- tuberculosis, drug resistance, information from complete genome sequencing of *Mycobacterium tuberculosis*, strain-to –strain variability with *M.tuberculosis*sp., genomic analysis of *M.bovis*BCG vaccines;

HPV pathogenesis-microarray technology: Application of microarray technology in understanding HPV pathogenesis, Tissue-culture systems for studying HPV, alternation of cellular gene expression during latent infection by HPV.

UNIT-IV

Applications of Patho Genomics: Search for new antibiotics,Need for novel antibiotics, genomic technologies in antibacterial research, targeting the resistance mechanism, extremely narrow-spectrum drugs, strategies for reducing virulence, gene therapy; **Recombinant Vaccines**: Polyvalent vaccine, Subunit Vaccines, DNA Vaccines.Reverse vaccinology:Development of a vaccine against meningococcus B (MenB) by reverse vaccinology

Reference Books:

1. Pathogenomics impact on human health by Kares Joy Schaw (2002)
2. Pathogenomics-Genome analysis of pathogenomic microbes by Jory Hacker, Ulrich Dobrindt(2006)
3. Encyclopedia of genetics, genomics, proteomics and bioinformatics by Lynn B.Jorde et al., 2005.
4. Brock biology of Microorganisms. Pearson International Edition. By Michael Madigan, Kelly Bender, Daniel Buckley, W. Sattley, David Stahl. 2017.
5. Molecular Diagnostics for the Clinical Laboratorian SECOND EDITION Edited by William B. Coleman Gregory J. TsongalisHumana Press 2010.

6. Microbial Pathogenomics by de Reuse, H. (Paris), Bereswill, S. (Berlin),2009.
7. Genomic diversity of Escherichia coli, associated with Bacteremia: Practical guide to pathogenomics and genome sizing of bacterial cells,by Ali Bin Thani 2014

Department of Genetics and Genomics
Semester III
GEN35123: Immunology

Course Objectives: The study of immunology will enable the student in understanding the functioning of the immune system in health and disease conditions. To gain the knowledge on the malfunctions of the immune system in immune disorder such as autoimmune disease, immune deficiency, hypersensitive reactions and transplant rejection.

Course Outcome: The students will gain the knowledge about the immune system, as a host defense system comprising many organs and cells within the organism that protect against disease. The students obtain hands on experience to perform various immunology techniques for the diagnosis of various infectious diseases and immune disorders.
Provides the knowledge on what happens if our immune system overreacts to foreign substances (hypersensitivities and allergies) and also what happens if our body recognize self as non-self (autoimmunity). Understand the biology of different vaccines against infectious agents and cancer and solutions to produce better vaccines.

UNIT-I

Basic concepts in Immunology: Innate immunity and Adaptive immunity. Cells of the immune system - B cells, T cells, NK cells, phagocytes, inflammatory cells, antigen presenting cells, organs of immune system - primary, secondary and tertiary lymphoid organs. Immunohematology: blood groups, blood transfusion and Rh-incompatibility.

UNIT-II

Antigens - nature, types, factors influencing antigenecity, haptens, adjuvants and superantigens. Antibodies - structure, types, classes and functions. Antigen – antibody interactions: Immunological techniques: Flocculation, Precipitation, immunodiffusion, Phagocytosis, Opsonization, Enzyme Linked Immunosorbent Assay, Immunohistochemistry, Flow Cytometry. Polyclonal antibodies, Monoclonal antibodies: production and applications;

UNIT-III

Immune Response: Humoral immune response, cell mediated immune response. Recognition of antigen: MHC - Types, Antigen processing and presentation, activation and differentiation of B cells and T cells. Effector mechanisms: Cytokines, CTL, NK cell mechanism of cytolysis and Antibody dependent cell mediated cytotoxicity. Complement activation pathways: Classical, alternate and lectin pathway. Hypersensitivity, Autoimmunity, Regulation of immune response. Vaccines, Immunization: Passive and active immunization, WHO recommended Immunization Schedule.

UNIT-IV

Immunogenetics: Organization, rearrangement and expression of Ig genes. Generation of antibody diversity, Inherited and acquired immunodeficiency diseases: Recessive gene defects, X- linked lymphoproliferative syndrom, SCID, Type 1 diabetes mellitus, multiple sclerosis, Inflammatory bowl disease, Rheumatoid arthritis, Chronic lymphocytic leukemia, haemophilia, sickle cell anemia, erythroblastosis fetalis, AIDS.

Reference Books:

1. Essentials of Immunology - Ian Roitt - 13th Ed.BlackwellScinentific Publications.2017.
2. Kuby Immunology by Jenni punt et al.,8th Ed.2018.
3. 3.Paul's Fundamental Immunology by by Martin Flajnik et al.,2022.
4. Janeway's Immunobiology by Kenneth M. Murphy, Casey Weaver 9th Ed.,2016.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://www.hindawi.com/journals/bmri/2014/437987/
2. https://www.tandfonline.com/doi/full/10.1080/1744666X.2019.1623670
3. https://www.technologynetworks.com/immunology/articles/using-the-internet-of-things-tofight-virus-outbreaks-331992
4. Course Designed By: Dr. K. M. Saradhadev

Department of Genetics and Genomics
Semester III
Open Electives GEN35124 A: Inherited Diseases of Human

Course objective: The course is intended to give an overview on basic aspects of clinical genetics including the reasons for various genetic disorder and their prenatal diagnosis, counselling and treatment.

Course outcomes: At the end of this course students gain meaningful understanding on importance of chromosomal and gene mutations and consequences, different genetic disorders, clinical and prenatal diagnosis and management.

UNIT-I

Reasons for genetic disorders, syndromes: Chromosome mutations - Chromosome rearrangement-duplication, deletions, inversion and translocation; aneuploidy and polyploidy; Gene mutations- Base substitution, base insertion and base deletion, transposable elements in humans (SINEs and LINEs).

UNIT-II

Genetic basis of syndromes and disorders: Introduction, Monogenic disorders- Cystic fibrosis, Huntington's disease, Hemophilia, Neurofibromatosis, sickle cell disease and thalassemias; chromosome disorders- cri-du-chat syndrome, Down syndrome; Inborn errors of metabolism- Albinism, Alkaptonuria, cystinuria and pentosuria; DNA repair defects- Xerodermpigmentosum; and multifactorial disorders – diabetes, coronary artery disease and congenital malformation.

UNIT-III

Cancer genetics: Definition, types, relationship of the cell cycle to cancer, cancer and programmed cell death, genetic basis for cancer, oncogenes, tumor suppressor genes, role of environmental factors in cancer and genetic pathways to cancer. An overview of epigenetic modifications for cancer.

UNIT-IV

Diagnosis, Genetic counseling and treatment: Prenatal diagnosis- Ultrasonography and fetal echocardiography, Maternal serum screening, Amniocentesis and chorionic villus sampling; Genetic testing for common mutations - protein truncation test, Single stranded conformation polymorphism test and full resequencing of the gene. Genetic counseling- introduction, psychotherapeutic counseling, genetic susceptibility and treatment of genetic diseases.

Reference Books:

1. Human Genetics by Gardner and Davies,2nd Ed.2012
2. Elements of Medical Genetics, Emery's.15th Ed.2017
3. Medical genetics / Lynn B. Jorde, John C. Carey, Michael J. Bamshad.6th Ed.2020
4. 4.Human Genetics by Gangane, 6th Ed.2021.
5. Principles of genetics, by Snustad . Simmons.7thEd.2015.

Department of Genetics and Genomics
Semester III
Open ElectivesGEN35124 B: Basics in Transgenic Technology

Course objectives: To facilitate the students to understand the basic aspects of transgenic technology including the techniques of molecular cloning, enzymes and vectors. Studying about Transgenic plants and animals.

Course outcomes: Students will be able to gain knowledge on transgenic technology. Clear understanding of method of molecular cloning and the vectors and enzymes used. Detailed study about transgenic plants, transgenic animals and their roles and applications.

UNIT-I

An overview of transgenic technology, transgene, genetargeting, **RestrictionEnzymes and Vectors for molecular cloning** - Restriction nucleases (exo- and endonuclease), *Restriction endonuclease*: **Vectors for cloning**- types, plasmid andphagevectors, cosmids, phagemids, BAC&YAC.

UNIT-II

Molecular cloning- method of molecular cloning.**Genetransfermethods**:Physicalmethods-Electrophoration,microinjectionandparticlebombardment; chemical methods-Liposomes,receptormediatedgene transfer;Biologicalmethods- Viral vectors, bacteria (Ti plasmid of *Agrobacterium tumefaciencs*). Genetically modified organisms bacteria, virus and fungi.

UNIT-III

Transgenicplants: Genetically modified crops for insect resistance,virus resistance, herbicide resistance, salt and droughtstress,Transgenesis and crop improvement, transgenic manipulation of wheatGenetically modified food- nutrients, taste and color, Environmentalriskassessment ofgeneticallymodifiedcrops.

UNIT-IV:

Transgenicanimals:Methods for productionoftransgenic mice. Applicationsof transgenic mice, cloning livestock by nuclear transfer (sheep-Dolly), Transgenic livestock for disease resistance. Transgenic poultry, Transgenic Fish, Determining eukaryotic gene function: by gene elimination,invitro mutagenesis, knockout mice, RNA interference.

Reference Books:

1. Principles of Gene Manipulation and genomics: An Introduction to genetic engineering by Primrose and Twyman, 7th Ed. . 2013.
2. Fundamental Molecular Biology by Lizabeth A.Allison. 3rd Ed.Blackwell publishing, 2021.
3. Molecular Biotechnology: Principles and Applications of Recombinant DNA (ASM Books) by Bernard R. Glick, Cheryl L. Patten 6th Ed.2022.
4. Advanced Molecular Biology by A Concise reference.1998, by R.M.Twyman. Viva BookPvt.Ltd.
5. Fundamental Molecular Biology by Lizabeth A.Allison. 3rd Ed.Blackwell publishing, 2021.

Department of Genetics and Genomics
Semester III
GEN35125 Practical Paper I: Genetic Engineering&Pathogenomics

1. Determination of type of nucleic acid by nucleases.
2.Restriction digestion of plasmid DNA.
3.Ligation of inset with Plasmid DNA.
4.Polymerase chain reaction (PCR).
5.Preparation of *E.coli*competent cells for transformation.
6.Transformation of Plasmid DNA into competent cells.
7. Screening and confirmation of recombinant clone.
8.Over-expression of recombinant proteins in *E. coli* system.
9.Purification and confirmation of recombinant proteins.
10. Sothern blotting (Capillary and diffusion methods).
11. Solving the black board problems.
12. Restriction digestion and comparison of methylated and unmethylated DNA by agarose gel.

Department of Genetics and Genomics
Semester III
GEN35126 Practical Paper II: Immunology (Skill Oriented Course Practical)

1. Preparation of serum and plasma from blood.
2. Trypan blue exclusion test to measure the viability of the cells.
3. Isolation of peripheral blood lymphocytes by Ficoll- Hypaque gradient.
4. Mixed Lymphocyte Reactionassay.
5. MTT assay to measure the proliferation of lymphocytes.
6. Cell counting by Hemocytometer (WBC andRBC).
7.Quantitative precipitation test:
(A)Redial immunodiffusion.
(B)Ouchterloneydouble diffusion.
8. Immuno-elecrophoresis
9. Venereal Disease Research Laboratory (VDRL) test for syphilis
10. Widalagglutination test for typhoid fever
11. Determination of A, B, O and Rh grouping & Rh typing by Agglutination.
12. Hepatitis B surface antigen test
13. Human Chorionic Gonadotropin (HCG) test
14. Enzyme Linked Immunosorbent Assay (ELISA) / Tridot test.

Semester IV

Department of Genetics and Genomics
Semester IV
GEN45121: Concepts of Genomics

Course objective: The syllabus familiarizes the students with genomic methods, to think on a genomic scale, exposes modern genomics methods and concepts, discovers basic biology in the context of theoretical and applied genomics research, understands the broad applications of genomics, appreciate the benefits of using math and computer sciences to understand biology in genome-scale. The course will help students by learning how scientists solve problems at the genome level and make discoveries.

Course outcomes: The course outcome is (1) to instill in those students who complete the course sufficient knowledge for them to be familiar with the areas of Genetic, physical, and QTL mapping (2) to provide a knowledge base that enables the student to understand the DNA and protein microarray and (3) basic concepts of functional proteomics.

UNIT-I

Introduction to Genomics: Definitions, classification based on system attributes, relationships to other scientific disciplines and types of organisms studied. Historical perspective of Genomics; Concepts and applications of Functional genomics; Forward genetics and Reverse genetics approaches, Loss of function, Gain of function. DNA markers:-RFLP, AFLP, RAPD, SSRs, SNPs, CAPS, SCAR markers; Mapping in prokaryotes by Transformation, Mapping in prokaryotes by Transduction, Mapping in prokaryotes by Conjugation.

UNIT-II

Construction of the genetic linkage maps:-human, plants; Development of F_2, BC and RIL mapping population; **Map based cloning-** Mutant Mapping, LOD score**;** Heritability and description of continuous variation of wheat kernel color and human skin color; QTL mapping.

Physical mapping: Cytogenetic maps of chromosomal banding, STS, FISH, restriction maps, radiation hybrid mapping (RH), clone contig maps; Genome wide association studies

UNIT-III

Mutagenesis as Functional Genomics Tool: T-DNA insertional mutagenesis, Transposon-based mutagenesis (*Ac/Ds*), Activation tagging, Floxing, Viral mediated transfection.

Genome wide mutation screening: TILLING (Targeted Induced Local Lesion IN Genome) - principle and experimental approach, ECO-TILLING; DEALING (Detecting Adducts Local Lesion IN Genome); Site directed Mutagenesis.

DNA Microarray Technology- Types of Microarrays and Advantages, Experimental design; **RNA silencing:** Antisense RNA technology, RNAi and Si RNA; **CRISPR (CRISPR/Cas9)-** Mechanism and applications.

UNIT-IV

Gene functions through protein interactions: Identification of Protein–Ligand Interactions. **Yeast Two-Hybrid Selection System:** Analysis of genome-wide protein–protein interactions in organisms, Use of M13, T7 Phage to Detect Protein–Ligand Interactions, combining yeast two-hybrid and phage display data, Detecting Interactions with Protein Fragment Complementation Assays.

Mass Spectrometry for Protein–Protein Interaction Mapping: Overview, Identification of substrates for E. coli GroEL, **Protein microarrays:** overview, principle, limitations;Microarray for protein-carbohydrate interaction (phage display technology); protein microarray for drug discovery.

Reference Books:

1. Protein Microarrays, edited by Mark schena, Jones and Bartlet publisher, 2005.
2. Microbial Functional Genomics, Jizhong Zhou, Dorothea K. Thompson, Ying Xu, James M. Tiedje, A John Wiley & Sons, Inc., Publication, 2004.
3. Microarrays for an Integratiul J. But. Kho and Atte, Published in India by Ane Books, 2003.
4. Gene Cloning and DNA analysis An Introduction, Sixth Edition, T. A. Brown, Wiley-Blackwell publications, A John Wiley & Sons, Inc., Publication, 2010.
5. Genomes 4th edition by T.A.Brown (2018)
6. 6.Principles of Gene Manipulation and genomics: An Introduction to genetic engineering by Primrose and Twyman, 7thEd. . 2013.
7. Microbial functional genomics by Jizhgahov, Dorothea K.Thompson Ying xu, James M.Tiedje.
8. 8.Protein Arrays, Biochips and Proteomics: The Next Phase of Genomic Discovery
9. by Joanna S. Albala and Ian Humphery-Smith,2019.

Department of Genetics and Genomics
Semester IV
GEN45122: Biostatistics and Population genetics

Course objectives: To understand the statistical tools commonly used in biological research.To assimilate the concepts of hypothesis testing and its importance in understanding the Population Genetics.

Course outcomes: Students will gain clear understanding about the basic statistical analysis, probability and its applications in Population Genetics. Provides the sampling distribution techniques,its analysis and applications.

UNIT-I

Population, sample, variables, classification and Tabulation of date, Diagrams & graphs, frequency distribution, skewness, kurtosis, central tendency, Average, mean, median, mode, Dispersion, Measures of dispersion, Standard deviation, coefficient of Poisson, Normal distribution, standard error.

UNIT-II

Hypothesis testing, Null hypothesis, Type-I & Type-II errors, level of significance, Decision about Null hypothesis (HO), Student's 't' test-applications, chi-square fest, Application Analysis of Variance (ANOVA) - F test- Applications Correlation, Types-Applications, Regression- Applications.

UNIT-III

Population genetics: Fundamental concepts, genetic structure of populations- Genotype frequencies, Allele frequencies

; The Hardy-Weinberg Law- Assumption, prediction, deviation and extensions; Genetic variation- in space and time, in natural populations; Forces that changes gene frequencies in population- Mutation, genetic drift, migration; Hardy-Weinberg and natural selection.

UNIT-IV

Quantitative genetics: Quantitative characteristics-variability, relation between genotype and phenotype, types of quantitative characteristics, phenotypic inheritance, determining gene number for a polygenic characteristic, QTL data analysis; Heritability- phenotypic variance, Types of heritability, calculating heritability, limitations of heritability; Locating genes that affect quantitative characteristics.

Reference Books:

1. Genetics *A conceptual approach* by Benjamin A. Pierce , 7th Ed.2019.
2. Genetics *Analysis and principles* by Robert J.Brooker7th Ed.2021.
3. Genomes 4 by T.A.Brown (2017).
4. iGenetics*A molecular approach*, second ed. By Peter J.Russell (2009).
5. Biostatistics: A Foundation for Analysis in the Health Sciences, 11th Edition, Wayne W.Daniel, Chad L. Cross, Wiley, 2018.
6. Biostatistical analysis - Jerrold H.Zar. Pearson Education, 5th Edition Pearson Education,2010.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. Mathematical Biostatistics Boot Camp 1
2. https://www.coursera.org/learn/biostatistics
3. Mathematical Biostatistics Boot Camp 1
4. https://www.coursera.org/learn/biostatistics-2
5. Application of big data
6. https://journalofbigdata.springeropen.com/articles/10.1186/s40537-019-02

Department of Genetics and Genomics
Semester IV
GEN45123: Fundamentals of Bioinformatics

Course objective: To facilitate the understanding on basic aspects of biological data bases, usage of DNA or protein sequence and structural databases, comparative analysis sequences and construction of phylograms and prediction of structures of proteins.

Course outcomes: Students will gain theoretical and practical knowledge on utilization of data bases for retrieving of various genomic or proteomic sequences/data for their further analysis; on comparison of sequences for understanding the diversity; on prediction of genes and protein structure.

UNIT-I

Introduction to windows: Desktop files and folders; simple operations like creation, deletion, moving, copying files or folders using window explorer. Searching files and foldersand other simple operations. **Word processing:** creating, saving and opening documents.Typing, navigating,selecting,editingandsorting,checkingspellingandgrammarformatting– changingappearanceofpage–importinggraphics,workingwithtables,documents printing.

Excel Basics: Touring the Excel Program Window, Touring the Workbook Window,Entering and editing Data in cells, Excel Formulas and Functions, entering a formula in to aWorksheet Cell, Using the Chart wizard, Understanding Data Series and Data Categories,Pickingachart type,AddingandeditingTitles,Legendsand Data labels.

UNIT-II

Basics of power point: Creating a power point presentation, Entering and formatting thetext on slides, creating a table slide, Ways of viewing and working on slides, Inserting,deleting,rearrangingandcopyingslides.

Internet Basics: Introduction, Evaluation of internet: Basic internet terms, getting connected to Internet, Internet applications. Electronic mail (e-mail): Introduction, creating an e-mail account, composing and sending emails, searching the Web (search engines), language of internet and viruses.

UNIT-III

Introduction to Genomic data and Data Organization: Sequence data banks,introduction to sequence date banks, Nucleic acid sequence data bank – GenBank, EMBL, DDBJ nucleotide sequence data bank,AIDS virus sequence data bank, protein sequence data bank- NBFR-PIR, SWISSPROT, Signal peptide data bank; NCBI-BLAST; Structural data banks, Protein Data Bank (PDB), The Cambridge Structural Database (CSD): Genome data bank, Metabolic path way data: Microbial and Cellular Data Banks. Sequence comparison: Sequence alignment-pair wise sequence alignment, multiple sequence alignment and their importance.

UNIT-IV

Phylogenetic analysis: Background terminology and basics, tree construction and importance; Predictive methods using DNA sequences: Gene prediction methods and programs, promoter characterization and prediction, strategies and considerations. common software; Protein structure prediction: Determination of protein structures, secondary structure prediction; visualizing proteins; three-dimensional structure of protein, homology modelling, threading or Ab initio method, protein structure evaluation and protein structure comparison.

Reference Books:

1. Lesk, A.M. 2005, 2nd edition, Introduction to Bioinformatics. Oxford University Press.
2. Bioinformatics-A practical guide to the analysis of Genes and proteins, by Andreas D.Baxevanis, B.F.Francis Ouellette,3rd.

3. Bioinformatics-Tools and applications by David Edwards, Jason strajich and David Hansen(2009)
4. Fundamental Concepts of Bioinformatics - Dan E. Krane, Michael L. Raymer, Pearson education (2004)
5. The Complete Reference Office 2000: Stephen L.Nelson: TATA McGRAW-HILLEDITION2002.ISBN0-07-463768-1.
6. Introductiontocomputerscience:ITLEducationSolutionsLtd.ISBN978-81-317-0436-3
7. PeterNorton'sIntroductiontocomputers:IIeditionTataMCGrawHillPublication

Department of Genetics and Genomics
Semester IV
Internal Elective GEN45124 A: Epigenetics

Course Objectives: This course covers in detail about the DNA methylation and analysis of gene-specific DNA methylation, the molecular mechanism of cancer development with emphasis on tumors, oncogenes, tumor suppressor genes, cell cycle and its control and other hallmarks of cancer. It also covers the molecular approaches to cancer diagnostics and role of epigenetics in treating cancer.

Course Outcome: Students gain knowledge on the difference between Genetics and Epigenetics, epigenetic modifications, basic reasons for various genetic disorders and management of diseases. Understanding the molecular mechanism of cancer development and its applications in the treatment of cancer.

UNIT-I

DNA methylation: Introduction, De Novo methylation, Maintaining methylation and DNA methylation and transcriptional silencing; DNA methylation in prokaryotes and eukaryotes; Histone modifications and Histone code- Acetylation, Methylation, Phosphorylation, Ubiquitination and ADP-Ribosylation and Sumoylation; Non-coding RNA (ncRNA)-MicroRNA(miRNA) biogenesis and function, small interfering RNA biogenesis and function and Epigenetic regulation by ncRNA.

UNIT-II

Epigenetic regulation of gene expression: Heterochromatin spreading and position effect variegation, transvection, paramutaion, imprinting and X-chromosome inactivation; Epigenetics in Cancer: Epigenetic features of a normal cell, DNA hypomethylation in tumours, inactivation of tumor suppressor genes, histone modifications of cancer cells, role of miRNA in cancer, epigenetics in cancer management, epigenetic therapy of cancer.

UNIT-III

Epigenetics and its genetic syndromes: Introduction, Chromatin remodeling- X-Linked Thalassemia Mental Retardation syndrome, CHARGE syndrome, Cockayne syndrome (CSB), ICF syndrome, Rett syndrome, CLS syndrome and FSHD. Epigenetics and Immunity: Introduction, Epigenetics in immune differentiation and the immune response, Epigenetics in Autoimmunity, Epigenetic changes in other Autoimmune disorders.

UNIT-IV

Analysis of gene-specific DNA methylation: Introduction, principles of DNA methylation analysis, characteristics of individual techniques: Southern blot hybridization, Bisulfite sequencing, Combined Bisulfite restriction analysis (COBRA), Methylation-specific PCR (MSP), Real-Time MSP, pyrosequencing andMethyLight.

Methods for Assessing genome-wide DNA methylation: Introduction, Restriction Landmark

genomic scanning (RLGS), Methylation sensitive restriction finger printing (MSRF), Methylated CpG island amplification coupled microarray (MCAM).

Reference Books:

1. Epigenomics by Anne C.Ferguson Smith(2009) .
2. Epigenetics and diseases by Susan M.Gasser, En Li(2011) .
3. Epigenetics in Biology and Medicine by NanelEsteller(2009).
4. Handbook of Epigenetics-The new molecular and medical genetics by TrygveTollefsbol (2011) .
5. Epigenetics in Cancer-The new England journal of medicine by Manel Esteller(2008)
6. Advanced Molecular Biology by Twyman(1999).

Department of Genetics and Genomics
Semester IV
Internal Elective GEN45124 B: Animal & Plant Breeding

Course Objectives: This course aimed to cover the Introduction to laboratory animal genetics, Livestock Products Technology and Veterinary and Animal Husbandry Extension, Principles of Plant Breeding and Plant Breeding Methodologies.

Course Outcome: Students obtain the knowledge on ethics to use animals for research, importance of maintaining the livestocks. Understanding the Principles of Plant Breeding and Plant Breeding Methodologies.

UNIT-I

Introduction to laboratory animal genetics: Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA): General CPCSEA guidelines to conduct experiments on animals, Breeding colonies of mice. Development of genetically controlled laboratory animals – Rules for nomenclature, inbred strains, outbred stocks, mutant stocks, recombinant inbred strains, transgenic strains, gene targeting and production of 'gene knock-out' animals.

UNIT-II

Livestock Products Technology and Veterinary and Animal Husbandry Extension: General concepts of livestock production and management: status of dairy and poultry industry, impact of livestock farming in Indian agriculture. Livestock housing, production and reproduction management, lactation management, breeding programmes for livestock and poultry. Composition, quality control and preservation of livestock products, methods of processing and storage livestock products. International Trade/WTO/IPR issues related to livestock products.

UNIT-III

Principles of Plant Breeding-Introduction to plant breeding; Objectives of plant breeding;Plant genetic resources: Importance of plant genetic resources and diversity in plant breeding, collection, evaluation and conservation of germplasm; Reproductive systems in plants: Sexual reproduction – self and cross fertilization – Autogamy, Allogamy and often cross pollinated plants; Asexual reproduction and Apomixis;Genetic basis of breeding: Mating systems of plants; Wide hybridization – Inter-specific crosses and inter-generic hybridization; Role of wide hybridization in crop improvement.

UNIT-IV

Plant Breeding Methodologies-Breeding Methods in self-pollinating crops: Pure line selection, Pedigree method, Bulk population methods, Single seed descent method, Back cross method and Multi lines; Breeding methods in cross pollinating crops: Mass selection, Ear-to-row selection, Progeny selection and Recurrent selection methods, Hybrid Breeding –

Development and evaluation of inbred lines, A, B and R lines, Development of hybrids, male sterility systems; Mutation breeding: Physical and Chemical mutagens; Mutation breeding in seed crops and vegetative propagationand Tilling; Cultivar release and certification: Cultivar release; Seed certification and multiplication; Plant breeders rights.

Reference Books:

1. Principles of Plant Genetics and Breeding (2012) by George Acquaah, Second Edition Wiley- Blackwell Publishers
2. General Plant Breeding (2006) by A.R. Dabholkar Concept Publishing Company, New Delhi
3. Hand book of Laboratory Animal Science (2003), Second Edition, Volume II, Edited by Jann Hau and Gerald L. Van Hoosier, Jr. CRC Press.
4. Textbook of Animal Husbandry & Livestock Extension (2021), Fourth Edition by Mathialagan, International Book Distributing Co, Lucknow.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://cpcsea.nic.in/Content/55_1_GUIDELINES.aspx
2. http://aulanni.lecture.ub.ac.id/files/2012/01/Handbook-of-Laboratory-Animal-Science-2nd-edition-Vol-2.pdf

Department of Genetics and Genomics

Semester IV

Internal ElectivesGEN45124C: Biotechnology Methods and Applications

Course objective: Students understand advances of biotechnology. Plant and animal tissue culture, essential concepts of ecology and application of biotechnology in environment safety, concept of GMOs, biopiracy and patents. Students also gain knowledge in nanobiotechnology and its applications in medicine.

Courseoutcomes: Helps to gain knowledge about the advancements inbiotechnology, Plant and animal tissue culture, concepts of ecology, environment pollution and application of biotechnology in environment safety, GMOs, biopiracy and patents. Students gaina clear understanding about Nanobiotechnology and its applications in medicine.

UNIT-I

Plant tissue culture: Definition, scope and importance of Biotechnology.Terms used in tissue culture, plasticity and totipotency. Conditionsandmediaforplant tissueculture, nutrients and growth harmones, callus production,cell-suspension cultures, root cultures, shoot tip and meristem culture, embryocultures,microsporeculture;applicationsof plant tissue culture.Mushroom Cultivation.

Animaltissueculture: Historyanddevelopmentofanimaltissueculture,conditions and mediaforanimalcellculture,primary cellculture, cell lines, stem cell cultures, scale up insuspensionand monolayer. Applicationsof animal cell cultures

UNIT-II

Genetransfermethods: Physical methods,electrophoration,microinjectionandparticlebombardment.Chemicalmethods:Liposomes,receptormediatedgene transfer.Biologicalmethods: Viral vectors, bacteria (Ti plasmid of *Agrobacterium tumefaciencs*).

Transgenicplants: Genetically modified plants and crop enhancement, insect, virusandherbicidesresistantplants.**Transgenicanimals**:Productionoftransgenic mice and its applications in medicine, cloning livestock by nuclear transfer (sheep-Dolly).

UNIT-III

Biodiversity: Bioremediation, Phytoremediation,Biofertilizers, Biopesticides, Biofuels, Biosafety, Bioethics, Biopiracy, Patents, Environmentalriskassessment ofgeneticallymodifiedcrops. Genetically modified organisms' applications and risk factors.

UNIT-IV

Nanobiotechnology: Introduction to nanoparticles. nanofibers, nanoplates, nanotubes, nanocarpets. **Imaging nanostructures**: Scanning tunneling microscope (STM) andAtomic force microscope (AFM), Nanoparticle synthesis: Chemical and Biological

methods. Applications of nanoparticles in agriculture. Drug delivery, cancertherapy, antimicrobial nanoparticles, nanoparticles in detection of viruses.**Biological effects of nanoparticles:** Toxicity, triggering an adverse immuneresponse.

Reference Books:

1. BiotechnologyapplyingthegeneticrevolutionbyDavidP.Clark&NanetteJ.Pazdernik,(2009)AccademicpressElsevier
2. Molecular Biotechnology: Principles and Applications of Recombinant DNA. Bernard R. Glick, Cheryl L.Patten
3. CultureofAnimalCells: AManualofBasicTechniqueandSpecializedbyR.IanFreshney(2005)
4. Planttussueculture:TheoryandpracticearevisededitionbyS.S.Bhojwani,M.K.Razdan(1996)Elsevier
5. PlanttissueculturetechniquesandexperimentsbyRobertaH.Smith(2000)
6. IntroductiontoplanttissueculturebyM.K.Razdan(2003)
7. PrinciplesofGeneManipulationandgenomics: AnIntroductiontogeneticengineering.2007,byPrimroseandTwyman
8. FundamentalMolecularBiology.2007,byLizabethA.Allison.Blackwellpublishing.
9. Principles of Genetics by Snustad Simmons, Fourth edition, 2006.
10. Genetics A molecular approach by Peter Russell Second edition, 2006.

Department of Genetics and Genomics

Semester IV

GEN45125Practical Paper I: Concepts of Genomics &Biostatistics and Population Genetics & Fundamentals of Bioinformatics

Frequency tables and bandiagrams
1. Normal distribution Z-test
2. Calculation of standard deviation, 20.χ2 test calculation
3. Student t-test for measuring significance between sample and population test
4. Correlation between two parameters
5. Prepare a resume in MS-word
6. Prepare a visiting card in MS-word
7. Create a chart for students marks in excel
8. Prepare a presentation using MS-power point
9. spotters
10. Nucleotide and amino acid sequence based practical's using online public databases and offline bioinformatics software tools
11. Work with Mega5
12. Work with Bio-edit
13. Primer designing oligo6/online tools
14. Computer based protein structure prediction experiments
15. DNA sequence based Phylogenetic tree construction and analysis
16. Protein sequence based Phylogenetic tree construction and analysis
17. Mapmaker
18. RFLP
19. QTL Cartographer

Semester IV

GEN45126 Multidisciplinary project:Project work

Yogi Vemana University College: Kadapa

M.Sc Semester Examinations
Code No:

MODEL QUESTION PAPER-2022

Subject: Genetics and Genomics
Paper:

Time: 3 hours Max. Marks: 75

PART-A

Write short notes on any FIVE of the following 5 X 3 = 15 Marks

1.
2.
3.
4.
5.
6.
7.
8.

Part-B

Answer ALL the questions 4 X 15 = 60 Marks

9. Essay question from Unit-I
OR
10. Essay question from Unit-I

11. Essay question from Unit-II
OR
12. Essay question from Unit-II

13. Essay question from Unit-III
OR
14. Essay question from Unit-III

15. Essay question from Unit-IV
OR
16. Essay question from Unit-IV

(Two short notes and two essay questions from each unit)

Yogi Vemana University College: Kadapa

M. Sc., Dept. of Genetics and Genomics

INTERNAL EXAMINATION PATTERN

Time: 1 hr 30 min. Marks: 25

Section – A

Write short notes on any **FIVE** of the following 5 **x 3 = 15 Marks**

1.

2.

3.

4.

5.

6.

7.

8.

Section – B **1 x 10= 10 Marks**

Answer any **ONE** of the following

9.

OR

10.

Yogi Vemana University College: Kadapa

M. Sc.,Genetics and Genomics

Model question paper for Practical exam - 2022

Total Marks: 100

6. Major Experiment	- 30 Marks	(1x30=30)
7. Minor Experiment	- 20 Marks	(1x20-20)
8. Spotters	- 30 Marks	(6x5=30)
9. Record	- 10 Marks	
10. Viva-voce	- 10 Marks	

Yogi Vemana University College: Kadapa

M. Sc., Genetics and Genomics

Project work-2022

Total Marks: 100

i.	Project work (Dissertation)	: 80 Marks
ii.	Student presentation and Viva - Voce	: 20 Marks

The project work should have the following

1.Introduction

2. Review of literature

3. Aim and Objectives

4. Materials & Methodology

5. Results

6. Discussion

7. References

Useful links or Summer Training Programs

https://www.ccmb.res.in/Academics/Training-Programs

Indian Academy of Sciences, Bengaluru- Science Academies' Summer Research Fellowship Program for Students and Teachers

https://srip.iitgn.ac.in/info/

https://www.jncasr.ac.in/academic/fandeprogrammes/srfp

https://www.cdc.gov/genomics/about/basics.htm

http://www.genesinlife.org/

https://www.ashg.org/discover-genetics/

https://www.goldenhelix.com/products/VarSeq/index.html

https://www.amnh.org/explore/ology/genetics/what-is-genetics

https://www.cancer.gov/publications/dictionaries/genetics-dictionary

https://www.genome.gov/genetics-glossary

https://www.cancer.net/navigating-cancer-care/cancer-basics/genetics/genetics-cancer

https://www.theguardian.com/science/human-genome-project

Faculty in the Department of Genetics and Genomics

Name of the Faculty	Designation	Contact Details	
		Mobile	E-mail
Dr. L. Dakshayani	Associate Professor Head& BOS	9652001184	dlomadayvu@gmail.com
Dr. A. Muni Kumari	Associate Professor	9000999658	Munikumari29@gmail.com
Dr. P. Osman Basha	Associate Professor	9701725190	osmanbasha@yahoo..com
Dr. B. Ramesh	Associate Professor	9000488637	adenoramesh@gmail.com

Board of Studies (BOS) of Genetics and Genomics

S. No	Name of the member	BOS committee
1	Dr. L. Dakshayani	Chairman
2	Dr. A. Muni Kumari	Internal Members
3	Dr. P. Osman Basha	
4	Dr. B. Ramesh	
5	Prof. Ch. Kumari Chitturi Dept. of Applied Microbiology Sri Padmavathi MahilaVisvavidyalayam Tirupati, AP 517502	External members
6	Dr. Challa Suresh Scientist F and Senior Director National Institute of Nutrition Hyderabad, TS 500007	
7	Dr. Adinarayana Reddy Director IgYImmunologix India Pvt. Ltd.	Industry management/ Institute

	2903, LH-17,Lanco Hills, Manikonda, Hyderabad 500089	
8	Mr. K. Surendra	PG meritorious student

I SEMESTER

11081: History of Ancient India from earliest times to A.D. 750.

11082: History of Ancient Andhra from earliest times to 1323 A.D.

11083: Introduction to Archaeology.

11084: History of Medieval India from A.D. 1206 to A.D. 1526.

11085: Principles of Tourism and Travel Management.

11086: History of Buddhism in India.

PAPER –I: HISTORY OF ANCIENT INDIA FROM EARLIST TIMES TO A.D. 750.

Unit I : Impact of Geographical Features on History-Different Races and Tribes-Unity in Diversity.

UnitII : Sources-Archaeological: Monuments, Inscriptions, Coins- Literary Sources: Indigenous, Religious and Secular-Foreign Accounts.

Unit III : Harappa Culture-Characteristic Features-Vedic and Later Vedic Culture-Salient Features, Varna, Jati Formations-Caste System-Rituals and Religious Cultures-Conditions during6th Century B.C.-Dissent Groups, *Lokayata* and *Charavakas*-Emergence of New Religious Sects: Jainism and Buddhism.

Unit IV: Mauryas:Chandragupta Maurya, Bindusara, Ashoka-Kushans : Kanishka- Pushyabhuti: Harshavardhana in the North- Kingdoms-Administration-Society, Caste System, Status of Women-Economy, Trade and Commerce-Religion-Literature-Art and Architecture-Science and Technology.

Suggested Readings

1.D.D.Koshambi, *Introduction to the Study of Ancient Indian History.*
2. D.D.Koshambi, *The Culture and Civilization of Ancient India in Historical Outline.*
3. D.D.Koshambi, *Myth and Reality.*
4. R.S.Sarma, *Perspectives of Social and Economic History of India.*
5. R.S.Sarma, *Sudras in Ancient India.*
6. R.S.Sarma, *Material Culture and Social Formation in Ancient India.*
7.Romila Thapar, *Ancient Indian Social History*.
8. Romila Thapar, *History of India, vol.I.*
9. Romila Thapar, *From Lineage to State.*
10. Romila Thapar, *Interpreting Early India.*
11.A.L.Basham, *A Cultural History of India.*
12. A.L.Basham, *The Wonder That Was India.*

13. K.A.Nilakanta Sastry, *A History of South India.*
14. Noburu Karashima, *History of South India.*
15. Noburu Karashima, *Towards a New Formation.*
16.R.S.Tripati, *History of Ancient India.*

MODEL PAPER

M. A DEGREE EXAMINATIONS

FIRST SEMESTER

HISTORY & ARCHAEOLOGY

PAPET – I: HISTORY OF ANCIENT INDIA FROM EARLIEST TIMES TO A.D 750

Time: 3 hours Max Marks: 75

PART–A

5x3 = 15 Marks

Answer ***any Five*** questions.
Each question carries ***Three (3)*** marks.
Each answer should not exceed ***One(1)*** page.

1. Unity in Diversity.
2. Edicts of Asoka.
3. Trade during Harappa Culture.
4. Causes for the rise of heterodox sects in 6th century B.C.
5. Bhagavatism.
6. Status of women during Gupta period.
7. Mahendra style of Architecture.
8. Guild System.

PART – B

4x15 = 60 Marks

Answer the following questions.
Each question carries ***Fifteen (15)*** marks.
Each answer should not exceed ***Six (6)*** pages.

9. Write an account of the different racial groups and tribes found in India.

OR

10. Critically examine the importance of literary sources for the reconstruction of Ancient India.
11. Discuss the similarities and differences between Harappa Culture and Vedic Civilisation.

OR

12. Describe the main tenets of Buddhism. What were the reasons for its growth.
13. Examine the social and economic conditioins during the Mauryan period.

OR

14. Account for the Art, Architecture, literature and Science during Gupta Age.

15. Trace the society, economy and religion with special reference to the five physiographical divisions during the Sangam Age.

OR

16. Give an account of the socio – economic life under the Satavahana rulers.

PAPER –II : HISTORY OF ANCIENT ANDHRA FROM EARLIST TIMES TO 1323 A.D.

Unit I : Sources for the reconstruction of Ancient Andhra History – Archaeological, Literary Sources – Satavahanas, Cultural conditions – Administration – Relation with Western Kshatrapas.

Unit II: Successors of Satavahanas in Andhradesa – Early Pallavas, Ikshavakus – contribution to Buddhism, Vishnukundins, Anandagotras - Cultural conditions and Development of Art & Architecture.

Unit III : Eastern Chalukyas of Vengi – Political History; Cultural conditions and Architectural Development during their period – Relation with Rashtrakutas, Western Chalukyas of Kalyani and Cholas.

Unit IV : Foundation of Kakatiya empire – Early and Prominent Kakatiya rulers – Art & Architecture – Administration – Society- Economy : Irrigation and Maritime Trade- Religion-Literature-Art & Architecture.

Suggested Readings

1.D.D.Koshambi, *Introduction to the Study of Ancient Indian History.*
2. D.D.Koshambi, *The Culture and Civilization of Ancient India in Historical Outline.*
3. D.D.Koshambi, *Myth and Reality.*
4. R.S.Sarma, *Perspectives of Social and Economic History of India.*
5. Romila Thapar, *Interpreting Early India.*
6.A.L.Basham, *A Cultural History of India.*
7. A.L.Basham, *The Wonder That Was India.*
8. K.A.Nilakanta Sastry, *A History of South India.*
9. Noburu Karashima, *History of South India.*

10. P.R. Rao., *Ancient and Medieval History of Andhra Pradesh.*
11. BSL. Hanumantha Rao, *Religion in Andhra.*
12. M.S.Sharma, *History of Reddy Kingdoms*, Waltair.
13. P. Chenna reddy, *Guilds in Medieval Andhradesa, A.D. 1000-A.D. 1500*, Delhi, 1991.
14. M. Krishnakumari, *History of Medieval Andhradesa*.
15. PVP. Sastry, *Kakatiyas,* Warangal.
16. R.Soma Reddy, *Religious Institutions in Medieval Andhra.*

***

MODEL PAPER
M. A DEGREE EXAMINATIONS
FIRST SEMESTER
HISTORY & ARCHAEOLOGY
PAPER –II: HISTORY OF ANCIENT ANDHRA FROM EARLIST TIMES TO 1323 A.D.

Time: 3 hours Max Marks: 75

PART–A

5x3 = 15 Marks

Answer ***any Five*** questions.
Each question carries ***Three (3)*** marks.
Each answer should not exceed ***One(1)*** page.

1. Nanaghat inscription
2. Gautami balasri
3. Santamula I
4. Vishnukundins
5. Kubjavishnu vardhana
6. Vengi
7. Prola I
8. Prathaparudra II

PART – B

4x15 = 60 Marks

Answer the following questions.
Each question carries ***Fifteen (15)*** marks.
Each answer should not exceed ***Six (6)*** pages.

9. Explain various for the reconstruction of Ancient Andhra History

OR

10. Describe cultural conditions of Satavahana period

11. Describe the contribution of Santhisri for the propagation of Buddhism

OR

12. Describe the cultural conditions during the period of Successors of Satavahanas

13. Describe the development of Art and Architecture during the period of Eastern Chalukyas
OR
14. Examine critically the role of Raja Raja Narendra in the Eastern Chalukyan dynasty
15. How can you say Ganapathideva was great among the Kakatiya rulers justify
OR
16. Explain the development of Art and Architecture with special reference to temple Architecture during the reign of Kakatiya rulers

PAPER –III: INTRODUCTION TO ARCHAEOLOGY

Unit I : i) Definition, Meaning and Scope of Archaeology-Beginning of Scientific Archaeology Archaeology a Science of Art-Value of Archaeology- Archaeology and other subjects- Archaeology and History- Archaeology and Anthropology- Archaeology and other Sciences-Physics and Chemistry-Geology and Geography.

ii) Dating Methods in Archaeology-Relative Dating Method-Absolute Dating Method.

Unit II: Exploration-Chance Finds-Prospecting and Preliminary Survey-Literary Research-Maps -Place Names-Surveying of Ground Level-Electrical Resistance-Surveying-Magnetic Surveying-Sound Wave Surveying-Probe Checking-Drill Method Surveying-Ariel Photography.

Unit III: Excavation Methods–Preliminaries of Horizontal Surveying-Lay out of the Site-Excavation of Tool Site-Excavation of Fortification-Excavation of Cemetery-Excavation of Megalithic Burials-Recording Archaeological Data-Three Dimensional Recording-Drawings and Maps-Photography.

UnitIV: Underwater Archaeology-Traditional Methods-Surveying Aids and Methods-Limitation of Work under water-Recording Data under water-Archaeological Surveying-Chain Surveying-Plane Table Survey-Level Surveying-Stone Age Tool-Early Stone Age-Middle and Late Stone Ages-Neolithic Tools.

Suggested Readings

1. H.D.Sankalia, *The Pre-history and Proto-history of India and Pakistan.*
2. K.V.Raman, *Principles and Methods of Archaeology.*
3. C.B.Memoria, *Geography of India.*
4. A.Gosh, *An Encyclopaedia of Indian Archaeology.*

5. B.Subba Rao, *The Personality of India.*
6. D.N.Wadia, *Geology of India.*
7. MLK. Murthy, *Pre & Proto-Historic Andhra Pradesh up to 500 B.C.*
8. K. Paddayya, *Recent studies in Indian Archaeology*.
9. D.R. Raju, *Stone Age Hunter Gatherers*, Pune, 2004.
10. K.P. Rao, *Deccan Megaliths*, New Delhi, 1988.

***

MODEL PAPER
M. A DEGREE EXAMINATIONS
FIRST SEMESTER
HISTORY & ARCHAEOLOGY
PAPER –III: INTRODUCTION TO ARCHAEOLOGY

Time: 3 hours Max Marks: 75

PART–A

5x3 = 15 Marks

Answer ***any Five*** questions.
Each question carries ***Three (3)*** marks.
Each answer should not exceed ***One(1)*** page.

1. Archaeology as a science.
2. Homosapiens.
3. Aerial photography
4. Chance – finds
5. Significance of maps in excavations
6. Trench
7. Surveying aids in under – water Archaeology
8. Mesolithic tools

PART – B

4x15 = 60 Marks

Answer the following questions.
Each question carries ***Fifteen (15)*** marks.
Each answer should not exceed ***Six (6)*** pages.

9. Discuss the relation of archaeology and anthropology and History.

OR

10. Explain the methods of Dating in archaeology.

11. Explain the role of Research maps and place –names in explorations.

OR

12. Describe the surveying methods of exploration.

13. Explain the procedures of excavating a Tool – site and a fortification.

OR

14. Explain the methods of recording data in archaeological excavations.

15. Give an account of the traditional methods of under – water archaeology.

OR

16. Explain the data recording methods in under – water archaeology

PAPER IV: HISTORY OF MEDIEVAL INDIA,A.D. 1206 – A.D.1526.

Unit I : Sources – Archaeological, Literary and foreign Travelers Accounts-Foundation of Delhi Sultanate-Slave Dynasty: Ibak, Iltutmish, Razia, Balban.

Unit II : Khajli rulers- Jalaluddin Firoz, Allauddin Khilji- Critical Analysis of the Reforms of Allauddin Khilji.

Unit III: Tuglak dynasty:Ghiyasuddin Tuglak, Mohammad bin-Tuglak and Feroz Shah Tuglak – Their Reforms –Invasion of Timur-The Sayyids-Lodis.

Unit IV : Administration and Ruling Classes-Society, Position of Women-Economy: agriculture, industry, trade, commerce and urban centres-Religion-Literature-Art and Architecture.

Suggested Readings

1. Sastry, K.A.N., *History of South India*
2. Satish Chandra, *Medieval India, from Sultanate to the Mughals.*
3. Burton Stein, *Peasant State and Society in Medieval South India.*
4. Rizvi, S.A.A., *The Wonder that was India, Vol. II.*
5. Tripati, R.P., *Rise and Fall of the Mughal Empire.*
6. Kulkarni, A.R., *Medieval Maharashtra.*
7. Pandey, A.B., *Early Medieval India.*
8. Richards, John, F., *Mughal Empire.*
9. Champakalakshmi, *Trade, Ideology and Urbanization: South India, 300 B.C. to 1300 A.D.*
10. Vijaya Ramaswamy, *Textiles and Weavers in South India.*

***

MODEL PAPER
M. A DEGREE EXAMINATIONS
FIRST SEMESTER
HISTORY & ARCHAEOLOGY
PAPER IV : HISTORY OF MEDIEVAL INDIA, A.D. 1206 – 1526.

Time : 3 hours Max Marks: 75

PART–A

5x3 = 15 Marks

Answer ***any Five*** questions.
Each question carries ***Three (3)*** marks.
Each answer should not exceed ***One(1)*** page.

1. Marcopolo
2. Peter Mundi
3. Qutubuddin Aibak
4. Sultana Rajiya
5. Alauddin Khilji
6. Taimur
7. Mukuaddam
8. Dagh

PART – B

4x15 = 60 Marks

Answer the following questions.
Each question carries ***Fifteen (15)*** marks.
Each answer should not exceed ***Six (6)*** pages.

9. Describe the various foreign travelers accounts during the period of Delhi Sultanate

OR

10. Describe the achievements of Iltutmish and how he consolidated the Delhi Sultanate

11. Describe the market reforms introduced by Alauddin Khilji and its impact on society

OR

12. Describe various measures taken by Balban to strengthen the Ilbari dynasty

13. Describe various reforms introduced by Moahamad bin Tuglaq to consolidate his empire

OR

14. Explain various measures taken by the Firoz Shah Tuglaq for the development of agriculture
15. Describe the administrative system of Delhi Sultanate period

OR

16. Describe the development of art and architecture during the period of Delhi Sultanate

PAPER –V: PRINCIPLES OF TOURISM AND TRAVEL MANAGEMENT

Unit I: Definition and Meaning of Tourism- Concepts of Tourism, Forms and types- the Changing Trend- Purpose of Tourism.

Unit II : Tourism - Historical Evolution and Development – Ancient Period -Silk Route - Pilgrimage – Grand Tour- Transition to Modern Tourism - Modern Tourism in India.

Unit III : Tourism System – Concepts – Tourism Impacts – Tourism Industry – Constituents. Tourism Organizations – Government Organizations in India – Private Sector Organizations in India – Role of Travel Agency – Tourist Operators – Guides and Escorts – tourism Information.

Unit IV: Tourism Regulations – Economic Regulations – Law and Order Regulations – Accommodation and Catering Regulations – Environment protection and conservation.

Suggested Readings

1. Suhita Chopra, *Tourism Development in India.*
2. Rob Davidson, *Tourism.*
3. Dharmarjan and Seth, *Tourism in India: Trends and Issues.*
4. Medlik, S., *Dictionary of Travel, Tourism and Hospitality.*
5. David W. Howell, *Passport: An Introduction to the Travel and Tourism.*
6. Pillai, R.N., *Tour and Pilgrimage in India.*
7. Sashi Prabha Sarma, *Tourism Education: Principles, Theories and Practices.*
8. E. SivaNagi Reddy, *Tourism and Challenges in Andhra Pradesh.*
9. P. Chenna Reddy, *Tourism in Andhra Pradesh, Hyderabad, 2014.*

***

MODEL PAPER
M. A DEGREE EXAMINATIONS
FIRST SEMESTER
HISTORY & ARCHAEOLOGY
PAPER –V: PRINCIPLES OF TOURISM AND TRAVEL MANAGEMENT

Time: 3 hours Max Marks: 75

PART–A

5x3 = 15 Marks

Answer ***any Five*** questions.
Each question carries ***Three (3)*** marks.
Each answer should not exceed ***One(1)*** page.

1. Excursion
2. Social significance of tourism
3. Silk Route
4. Public – private – partnership in tourism
5. Tourist Guide
6. Cultural motivators of tourism
7. Catering Regulations
8. Front office

PART – B

4x15 = 60 Marks

Answer the following questions.
Each question carries ***Fifteen (15)*** marks.
Each answer should not exceed ***Six (6)*** pages.

9. Write an essay on the concepts and purpose of tourism

OR

10. Explain the types of tourism.

11. Trace out the evolution of tourism in India during the ancient and medieval days.

OR

12. Write a note on tourism development in modern India.

13. Examine the economic impact of tourism industry.

OR

14. Explain the functions of a travel agency.

15. Briefly explain various tourism regulations.

OR

16. Discuss the role of planning in tourism for environmental protection.

PAPER-VI: HISTORY OF BUDDHISM IN INDIA

Unit 1

Life of Gautam Buddha¬ & His clan, King Bimbisāra and King Pasenadi, Anāthapiṇḍika and Visākhā, King Ajātasattu, The first Buddhist council.

Unit II

King Kālāsoka, The second Buddhist council, Origin¬ & Development of Buddhist sects, Schools of Theravada & Mahayana Buddhism, Features of Theravada & Mahayana Buddhism.

Unit III

Emperor Asoka's Conversion into Buddhism, The Dhamma Policy of Emperor Asoka, The third¬ Buddhist council, Emperor Asoka's Role in the Expansion of Buddhism outside India, Emperor Asoka's Royal Patronage to Buddhism.

Unit IV

King Milinda, Emperor Kanishka, The fourth Buddhist council, Expansion of Buddhism in Central¬ Asia and China and Buddhist Settlements on the Silk Route, Role of Gupta Kings and King Harshavardhan in the development of Buddhism.

Suggested Readings

Ahir. D. C., *Buddhism in India: Status Growth and Development, Delhi: Buddhist World Press, 2011.*

Ahir. D.C., *Buddhism in India, Delhi: Buddhist World Press, 2010*.

Ambedkar, Bhim Rao, *The Buddha and His Dhamma, Nagpur: Buddha Bhoomi Prakashan, 1997*

Bapat, P. V., 2500 Years of Buddhism, Delhi: Publications Division, Ministry of Information *and Broadcasting, Govt. of India, 1997*

Bauddha, Netrapala Singh, *Kapilavastu ke Shakya: ek Etihasik Addhyayan, New Delhi: Samyak Prakashan, 2011*

Bhadant Sawangi Medhankar, *The Great Buddhist Emperors of Asia, Nagpur: Buddha Bhoomi Prakashan, 1997*

Bhikshu Dharmarakshit, *Bauddha Dharma Darshan tatha Sahitya, Varanasi: Nanda-Kishore and Brothers, 1943*

II SEMESTER

21081: History of Ancient India from A.D.750 to 1206 A.D.

21082: History of South India from A.D.1323 to A.D.1670 A.D.
21083: History of Medieval India from A.D.1526 to A.D 1707.A.D.

21084: History of Modern World from A.D.1453 to 1964 A.D.

21085: Archaeological cultures.
21086: History of India up to A.D.1947 (Open Elective).

Paper – I HISTORY OF ANCIENT INDIA FROM A.D. 750 TO 1206 A.D.

Unit I: Pallava and Chalukya contribution to culture – Rastrakutas in the Deccan, Prathiharas and Palas in the Northern India – Their contribution to Administration, Society, Economy, Religion, Literature and Art & Architecture.

Unit II: The Cholas – Rajaraja I and Rajendra I – Administration: Local Government – Society – Economy, Rural Industries, Merchant Guilds – Religion conditions, Saivism, Sri Vaishnavism – Literature – Art & Architecture.

Unit III: The Chalukyas of Kalyani – The Yadavas of Devagiri – Kakatiyas of Warangal – Hoyasalas of Dwarasamudram – Socio-economic conditions – Religion – Literature and Art & Architecture.

Unit IV: Origin of the Rajputs – The Chandellas; The Kalachuris; The Paramaras; The Chalukyas of Gujarat; The Chahamans and The Tomaras – Administration – Society – Economy – Religion – Literature – Art & Architecture – Invasions of Mahmud Ghazni – Invasions of Mahmud Ghuri – Battles of Tarain – Causes for the failure of Indian rulers.

Suggested reading:

1. Basham, A.L. *The Wonder that was India.*
2. Chopra, P.N., Ravindran, T.K., & Subramanian, N., *History of South India*, Vol. I, Ancient period, New Delhi, 1979.
3. Sastry, K.A.N., *History of South India, The Cholas*, Madras, 1975.
4. Yazdani, G., *Early History of the Deccan,* Vol. 1-2, 1964.
5. Burton stein, *Peasant State and Society in Medieval South India.*
6. Y. Subbarayalu, *South India under the Cholas.*

***

PAPER –II : HISTORY OF SOUTH INDIA from A.D.1323 to A.D.1670. A.D.

Unit I: Musunuru nayakas – Prolayanayaka, Kapayanayaka; Reddy Kingdom of Addanki, Kondavedu & Rajamahendravarm : A Brief Political History – Relation with Vijayanagara rulers –Administration- Society-Economy-Religion-Literature-Art & Architecture.

Unit II : Vijyanagara Empire, Sangama – Saluva – Tuluva, Sri Krishnadevaraya– Araveti rulers - Cultural conditions – Administration, Nayankara system-Society-Economy-Religion- Literature - Art and Architecture – Foreign visitors during the period.

Unit III: Bahamani Kingdom- Relation with the Vijayanagara rulers -Administration- Society – Economy, Trade and Commerce-Religion-Literature- Art and Architecture.

Unit IV : Advent of Europeans, Portuguese, Dutch, Danes, Spanish, British and the French and their early settlements.

Suggested Readings

1.K.A.Nilakanta Sastry, *A History of South India.*

2.Yezdani, *Early History of the Deccan*.

3.Noburu Karashima, *History of South India.*

4.R.S.Sarma, *Perspectives of Social and Economic History of India.*

5.Romila Thapar, *Ancient Social Indian History*.

6.A.L.Basham, *A Cultural History of India.*

7.Bharatia Vidya Bhavan, *History and Culture of Indian People. Vol.I.*

8.R.C.Mazumdar, H.C.Rayachouduri, and K.K.Datta, *An Advanced History of India*.

9.Sastry, K.A.N., *History of South India, The Cholas*, Madras, 1975.

10.Burton stein, *Peasant State and Society in Medieval South India.*

11.Y. Subbarayalu, *South India under the Cholas.*

***

PAPER- III: HISTORY OF MEDIEVAL INDIA from A.D.1526 to A.D 1707 A.D.

Unit I : Political conditions of India on the eve of Babur invasion- Foundation of Mughal Empire- Babur-First Battle of Panipat.

Unit II: Humayun, Sher Shah of Sur, Akbar, Jahangir, Nurjahan, Shahjahan and Aurangazeb-Relations between Mughals and Rajputs- Mughal Administration and Institutions, trade and commerce.

Unit III: Social classes-ulema, nobility, artisans, labour -status of women-Religious policy of Akbar and Aurangzeb, and composite culture-literature-Art and Architecture-Decline and disintegration of the Mughal Empire.

Unit IV: Emergence of Maratha power – Relation with the Mughals -Chatrapathi Shivaji and his successors– Administration-Asthapradan System –Society-Economy-Religion-Literature-Art and Architecture.

Suggested Readings

1. Sastry, K.A.N., *History of South India*
2. Satish Chandra, *Medieval India, from Sultanate to the Mughals.*
3. Burton Stein, *Peasant State and Society in Medieval South India.*
4. Rizvi, S.A.A., *The Wonder that was India, Vol. II.*
5. Tripati, R.P., *Rise and Fall of the Mughal Empire.*
6. Kulkarni, A.R., *Medieval Maharashtra.*
7. R.Soma Reddy, *Religious Institutions in Medieval Andhra.*
8. Adapa Satyanarayana, *Early Modern Andhra, Hyderabad and Company rule A.D. 1724-1857.*

***

Paper –IV: HISTORY OF MODERN WORLD from A.D.1453 to 1964 A.D

Unit I- Geographical Discoveries-Renaissance and Reformation-Emergence of Nation States-French Revolution-Napoleon Bonaparte.

Unit II- Industrial Revolution-Rise of Democratic Movements in Italy and Germany-Imperialism in Africa and Asia.

Unit III - Russian Revolution-First World War-League of Nations-Revolutions in China and Japan.

Unit IV- World between two World Wars: Washington Conferences, Das Plan, Young Plan and Geneva Conferences-Second World War-United Nations Organisations-Cold War.

Suggested Readings

Gordon A.Craig, *Europe Since 1815,* The Dryden Press, Illinois, 1973 (1961).

Chris Harman, *A People's History of the World,* Orient Longman, 2007 (1999).

Jawaharlal Nehru, *Glimpses of World History,* Oxford University Press,1997 (1934-35).

C.D.M.Ketelbey, *A History of Modern Times From 1789,* Oxford University Press, 1992 (1929).

E.H.Carr, *International Relations between Two World Wars, 1919-1939.*

A.J.P.Taylor, *The Struggle for Mastery in Europe, 1848-1918.*

***

PAPER V: ARCHAEOLOGICAL CULTURES

Unit I : i) Lower Palaeolithic culture (Punjab Valley)- The Sohan Culture-Pre Sohan-Late Sohan-Narmada Valley- Godavari Valley-Krishna Valley-Nagarjuna Konda.

ii) Middle Palaeolithic Culture-Discovery-Distribution-Technology-The tool types and techniques- Living Pattern-Important Upper Palaeolithic Sites.

Unit II : i) Mesolithic Culture-Important Sites-The tools-Life and Subsistence Pattern- Hunting Methods-Domestication of animals-Agriculture-Structural activity- Pottery- Clothing and Ornaments-Recreation-Burial and Spiritual Aspects- Aesthetic activities-Conclusion.

ii) Neolithic Culture-North Western region-Pottery, Habitations-Burials-Animal burials-Subsistence-Stone tools-Bone tools-Ornaments-Neolithic Art and Hunting Habits-Religion.

Unit III : Megalithic Culture - Types of Megalithic monuments - Stone circles- Burrows -Dolmens-Dolmenoid cists-cist burials-oblong cists- Swastika cists-Menhis-Alignments Avenues-Topikals- Hood stone-Urn Burials- Sarcophagus-Rock-cut Chambers.

Unit IV : i) Indus Valley Civilization – Origin - Chronology – Extent - Town planning - House- Drainage system-the Granary-Town Lay-out- Political organization-Religion-Seals-Script-Material Culture- Contacts with other Countries-the end of Indus Culture.

ii) Chalcolithic Culture – Residences - Subsistence pattern – Pottery – Equipment – Ornaments – Burials - Chronology.

Suggested Readings

1. S.A. Sali, *Stone Age India.*
2. H.D. Sankalia, *The Pre-history and Proto-history of Indian and Pakistan*.
3. A. Gosh, *An Encyclopedia of Indian Archaeology.*
4. F.R. Alichin, *Birth of Indian Civilization.*
5. K.P. Rao, *Deccan Megaliths.*
6. B. Narasimhaiah, *Neolithic and Megalithic Culture's in Tamil Nadu.*
7. K.S. Ramachandran, *Archaeology of South India.*
8. H.N. Singh, *History and Archaeology of Black and Red Ware.*
9. V.V. Krishna Sastry, *The Proto and Early Historic Cultures of Andhra Pradesh.*
10. D.R. Raju, *Stone Age Hunter- Gatherers': An Ethno Archaeology of the Cuddapah Region, South East India.*
11. P. Chenna Reddy, *Exploring the Mind of Ancient Man*, Delhi, 2007.

II SEMESTER

Paper VI – History of India up to 1947 (Open Elective)

Unit I: Pre-History – Indus Valley Civilization – Vedic Culture – Jainism & Buddhism –

Brief History of Mauryan Empire – Ashoka Dhamma- Brief History of Gupta Empire- Samudra Guta

Unit II: Brief History of Delhi Sultanate- Administration- Allauddin Khilji- Mohammad bin Tuglak – Brief History of Mughal Empire- Administration- Shershah Suri Administration- Akbar religious policy – Brief History of Maratha Kingdom-Sivaji.

Unit III: Beginning of European Companies – British conquest of India – Company Rule – 1857 Revolt – Socio-Cultural Awakening- Raja Ram Mohan Roy, Jyotiba Phule

Unit IV: Freedom Struggle – INC – Vandemataram Movement – Home Rule League – Non-Cooperation Movement – Civil Disobedience Movement – Round Table Conferences and Communal Award – Cripps Mission – Quit India Movement – Indian National Army – Achievement of Freedom – Partition of India.

Suggested Reading

1. A.L. Basham, *The Wonder That Was India*.
2. Romila Thapar, *Early India*.
3. K.A. Nilakanta Sastry, *The History of South India*.
4. Satish Chandra, *Medieval Indian History*.
5. Bipan Chandra, *India's Struggle for Independence*.
6. P.R. Rao, *History of Modern Andhra.*

III SEMESTER

31081: Economic History of India from A.D.1858 to A.D1947.

31082: History of Modern India from A.D.1757 to A.D.1947.

31083: Art History of India

31084: Tourism and Museology.

31085: Rayalaseema through the Ages.

31086: History of Modern Andhra from A.D.1757 to A.D. 2014 (**Open Elective**)

PAPER I: ECONOMIC HISTORY OF INDIA from A.D.1858 to A.D. 1947

Unit I: Commercialization of Agriculture– stagnation and deterioration of agriculture -British land revenue settlements, permanent settlement, ryotwari and mahalwari – Ruin of the Old Zamindaris- Raise of the New Land Lordism.

Unit II: Condition of peasants: impoverishment of the peasantry, rural indebtedness, poverty and famines – Famine Commissions of 1880, 1898, 1901 and 1944- Famine Relief Policies 1860-1919- Growth of Agriculture during 1860-1947.

Unit III: Colonial Industrial Policy- Economic Changes -Disruption of the Traditional Economy – Ruin of Artisans, Craftsman – De Industrialization – Foreign Capital – Drain of Wealth – Land Relations – Indian Capitalist Development.

Unit IV: Rise of Modern Industry, Railways, Mining & Plantations, Colonial Tariff Policy.

Suggested Reading :

Sumit Sarkar., *Modern India 1885 – 1947.*
Bipin Chandra., *Rise and Growth of Economic Nationalism in India.*
Sharma, P.S., *Indian Feudalism.*
Das., D.R., *Economic History of India*.
Mirris D. Mirris., *Indian Economy in the 19th century.*
S. Gopal., *British Policy in India, 1851 – 1905.*
D. Subramanyam Reddy, *Agrarian Relations and Peasant in Modern Andhra.*

***

MODEL PAPER

M. A DEGREE EXAMINATIONS

THIRD SEMESTER

HISTORY & ARCHAEOLOGY

PAPER I: ECONOMIC HISTORY OF INDIA FROM A.D.1858 TO A.D.1947

Time: 3 hours Max Marks: 75

PART–A

5x3 = 15 Marks

Answer ***any Five*** questions.

Each question carries ***Three (3)*** marks.

Each answer should not exceed ***One(1)*** page.

1. Commercialisatioin
2. Capitalism
3. Zamindari
4. Traditional occupations
5. Famine commission 1880
6. Famine commission 1898
7. Indian Railway
8. Sugar industry

PART – B

4x15 = 60 Marks

Answer the following questions.

Each question carries ***Fifteen (15)*** marks.

Each answer should not exceed ***Six (6)*** pages.

9. Describe the agricultural conditions in the later half – of the 19^{th} century

OR

10. Critically examine about the drain of wealth in 19^{th} century

11. How the traditional set up of Indian industry interrupted with the advent of western commercialization

OR

12. How the zamindari system was interrupted with the British policy in the 19^{th} century

13. How that the British rule helped to develop a new lordism in india

OR

14. Describe various famine relief policies introduced by the British Raj

15. Explain the growth of various industries during the period 1857 to 1947

OR

16. Describe the tariff policy of the British during 1857 to 1947

PAPER II: HISTORY OF MODERN INDIA from A.D.1757 to A.D. 1947

Unit I : Expansion and Consolidation of British Empire – Ideologies, Mercantalism, Orientalism, Utilitarianism and Evangelicism- Tools of Expansion, Wars in : Bengal, Mysore, Maratha - Diplomacy : Subsidiary alliance and Doctrine of Lapse.

Unit II: Colonial Administration and Reforms– Central, Provincial, District and Judicial Administration: Regulating Act of 1773;Pitt's Act 1784; The Charter Act's of 1793, 1813, 1833, 1853, 1862, 1892, 1909, 1919 and 1935 Acts- Rule of Governor and Governor Generals & Viceroys.

Unit III: Resistance to Company's Rule – Peasant and Tribal Revolts-Revolt of 1857: Causes, and results-Socio-Religious Reform Movements-Arya Samaj, Brahma Samaj, Prarthana Samaj, Theosophical Movement- Dayananad Saraswati, Rajarammohan Roy, Govinda Ranade, Annie Besant-Mohammadan Reforms, Mohammad Iqbal.

UnitIV: Resistance to Company's Rule – Peasant and Tribal Revolts & Revolt of 1857:

Causes, nature and results-Rise of Nationalism, Causes, Indian National Congress, 1885-Different phases of National Movement, Moderates, Division of Bengal (1905), Vandemataram Movement (1905-1911), Extremists, Swadeshi Movement (1914-16), Revolutionary and Extremist Activities, Entry of Gandhi into Indian Politics, Gandhian Era (1920-1947), Non-co-operation Movement (1920-22), Civil Disobedience Movement (1930-34), Quit India Movement (1942-44)-Attainment of Independence (1947).

Suggested Readings

1. C.A.Bayly, *Indian Society and the Making of the British Emprie*.
2. Bipan Chandra, et.al., *India's Struggle for Independence*.
3. Paul Brass, *The Politics of India since Independence*.
4. A.R.Desai, *Social Background of Indian Nationalism*.
5. Dharma Kumar & Tapan Rayachauduri, ed., *Cambridge Economic History of India*.

***

MODEL PAPER

M. A DEGREE EXAMINATIONS

THIRD SEMESTER

HISTORY & ARCHAEOLOGY

PAPER II: HISTORY OF MODERN INDIA FROM A.D. 1757 TO A.D.1947

Time: 3 hours Max Marks: 75

PART–A

5x3 = 15 Marks

Answer ***any Five*** questions.

Each question carries ***Three (3)*** marks.

Each answer should not exceed ***One(1)*** page.

1. The First Maratha War, 1778 – 1782
2. Hyder Ali
3. 1909 Act
4. Permanent Settlement
5. Rajarammohan Roy
6. Aligarh Movement
7. Division of Bengal, 1905
8. Concept of Gandhian Era

PART – B

4x15 = 60 Marks

Answer the following questions.

Each question carries ***Fifteen (15)*** marks.

Each answer should not exceed ***Six (6)*** pages.

9. Describe how the British east India company occupied and consolidated the Indian territory
   OR
10. Write about the terms and conditions in the subsidiary alliance introduced by British east India company
11. Explain the revenue policy of east India company during 1764 to 1857

    OR
12. Describe the judiciary system during the colonial India
13. Describe about the Riotwari, Mahalwari and Zamindari revenue system during east India company period OR
14. Describe the conditions of peasant and rural indebtedness during the colonial period
15. Describe various causes for the 1857-Mutiny

    OR
16. How can you say that the policies introduced by Dalhousie were responsible for 1857 revolt? Justify

PAPER III- ART HISTORY OF INDIA

Unit I : Beginnings of Rock Art -Indus Valley Art, Maurya, Sunga & Kushana Art, Gandhara & Mathura Art.

Unit II : Art of Amaravathi & Nagarjuna konda, Gupta Art, Art of Pallava, Chola, Kakatiya & Vijayanagara.

Unit III : Paintings – Ajanta, Ellora, Tanjore, Sittanavasal, Lepakshi.

UnitIV : Fundamentals of Hindu Iconography – Vishnu Iconography – Narasimha Iconography – Saiva Iconography – Siva (Some other forms) – Devi Iconography.

Suggested Reading

Sarasvati, S.k., *Indian Sculpture*.
James Harle., *Art and Architecture of India.*
Krishnadeva., *Temples of North India.*
Srinivasan, K. R., *Temples of South India.*
Sivarama Murthy, C., *Indian Painting.*
Brown, C. J., *Indian Painting.*
Benerjee, J. N., *The Development of Hindu Iconography.*
Gopinatha Rao, T. A., *Elements of Hindu Iconography*.
Mehta, N. C., *Studies in Indian Painting.*
Niharanjan Ray., *Maurya and Sunga Art.*
E. Siva Nagi Reddy, *Evolution of Building Technology in Andhra.*
N. Chandramouli, *Rock Art of South India.*

***

MODEL PAPER

13

M. A DEGREE EXAMINATIONS

THIRD SEMESTER

HISTORY & ARCHAEOLOGY

PAPER III: ART HISTORY OF INDIA

Time: 3 hours Max Marks: 75

PART–A

5x3 = 15 Marks

Answer ***any Five*** questions.

Each question carries ***Three (3)*** marks.

Each answer should not exceed ***One(1)*** page.

1. Harappan Art
2. Asoka pillar
3. Gupta Art
4. Amaravathi stupa
5. Ajanta murals
6. Lepakshi
7. Different forms of devi
8. Different forms of siva

PART – B

4x15 = 60 Marks

Answer the following questions.

Each question carries ***Fifteen (15)*** marks.

Each answer should not exceed ***Six (6)*** pages.

9. Discuss about Mathura school of art.

OR

10. Write an essay on the salient features of Gandhara Art.

11. Give an account of Buddhist art found at Nagarjunakonda

OR

12. Explain about the contribution of Cholas and Pallavas for the development of Temple art.

13. Explain about the cave art found at Ellora

OR

14. Discuss about the salient features of art found at Tanjore

15. Explain the characteristic features of Hindu Iconography

OR

16. Write an essay on Vishnu Iconography

PAPER IV – TOURISM AND MUSEOLOGY

Unit – I- Development of Means of Transport- Road, Rail, Water & Air – New Policies on Tourism and Civil Aviation-Various types of Accommodation – Tourism Product – Product Design – Media: Meaning and Kinds – Capacity Building & Communication Skills.

Unit–II- Beach & Island Resorts: Kovalam & Lakshadweep – Hill Stations of India: The Himalayan Resorts – Manali & Darjelling; Non – Himalayan Hill Resorts – Mount Abu & Ootacamund (Ooty)– Pilgrimage: Vaishno Devi, Kamakhya & Tirupati – Dance and Music: The Khajuraho Festival – Palace on Wheels – Monuments & Museums.

Unit – III- Definition, Aim and scope of Museums – Museums Movement – Types of Museums' and Museums' Administration – Documentation.

Unit–IV- Museums-Display Techniques and Exhibitions – Conservation and Preservation – ICOM (International Council of Museums) – MAI (Museums Association of India – Study of Selected Museums – National Museum, New Delhi; Indian Museum, Kolkata; Salarjung Museum and A.P.Govt. Museum, Hyderabad, and Government Museum, Madras.

Suggested Readings:

Kaul, R.N., *Dynamics of Tourism: A Trilogy Vol. III Transportation and Marketing*, New Delhi, 1985.
Virendra kaul., *Tourism and the Economy*, New Delhi, 1994.
Shobita Chopra., *Tourism and Development in India*, New Delhi, 1992.
Bhatia, A.K., *Tourism Development Principles and Practices*, New Delhi, 1983.
Gillian Wright., *Introduction to Hill stations of India*, Hong Kong, 1991.
Shobita Punja., *Museums of India*, Hong Kong, 1990.
Nigam, M. L., *Fundamentals of Museology*.
Grace Morley., *Museums Today*, 1967.
Siva Rama Murthy, C., *Directory of Museums in India.*
Mookerji, Ajit., *Museum Studies.*
E. SivaNagi Reddy, *Tourism and Challenges in Andhra Pradesh.*
P. Chenna Reddy, *Tourism in Andhra Pradesh, Hyderabad, 2014.*

***

MODEL PAPER
M. A DEGREE EXAMINATIONS
THIRD SEMESTER
HISTORY & ARCHAEOLOGY
PAPER IV: **TOURISM AND MUSEOLOGY**

Time: 3 hours Max Marks: 75

PART–A

5x3 = 15 Marks

Answer ***any Five*** questions.
Each question carries ***Three (3)*** marks.
Each answer should not exceed ***One(1)*** page.

1. Types of Tourism product
2. Importance of communicaton skills in Tourism
3. Kovalam
4. Ootacamund
5. Purpose of Museums
6. First Museum Revolution
7. Types of Displays
8. Agents of deterioration

PART – B

4x15 = 60 Marks

Answer the following questions.
Each question carries ***Fifteen (15)*** marks.
Each answer should not exceed ***Six (6)*** pages.

9. Give details about the different types of Accommodation.

OR

10. Briefly describe various 'Aspects of Tourism'

11. Give a graphic account of the Himalayan hill resorts.

OR

12. Account for the important historical monuments of Karnataka state

13. Explain different types of Museums

OR

14. Why accurate and accessible documentation is essential in Museology

15. Trace the origin, growth and work of ICOM

OR

16. Give a detailed account of the Government Museum, Chennai

PAPER V – RAYALASEEMA THROUGH THE AGES

Unit I: Nomenclature – Geographical features : Kadapa Basin – Sources – Pre-History – The Nandas – The Mouryas – The Satavahanas – The Pallavas – The Chalukyas of Badami – The Renati Cholas – The Banas – The Vaidumbas – Telugu Chodas – The Kayasthas – Vijayanagara rule –Administration–Socio-Economic, Religious and Cultural conditions.

Unit II: Rayalaseema under the Polygars - Important Forts – Gandikota, Siddhavatam, Gutty, Penugonda, Chandragiri – The Matli chiefs – Socio-Religious reforms: Vemana, Annamayya and Pothuluri Veerabrahmam.

Unit III: Rayalaseema under the Mysore rulers: Hyderali and Tippu Sultan – Ceding of Rayalaseema to the British – Sir Thomas Munro and his reforms – Missionary Activities-Spread of Western Education – Beginning of Nationalism - Ternekallu Revolt (1801) – Revolt of Chittoor Polygars (1804-1805) – Gulam Rasool Khan (1839) – Uyyalawada Narasimha Reddy (1846-47) – Shaik Peer Shah and 1857 Revolt –Famines in Rayalaseema.

Unit IV: The National Movement – Impact of Indian National Congress – Hampanna Episode (1893) –Vandemataram; Home Rule; Non-Cooperation; Civil Disobedience and The Quit India Movements in Rayalaseema – Freedom fighters-Pappuri Ramacharyulu Gadicherla Harisarvothamarao- Koti Reddy-Anantasayanam Iyengar - Separate Andhra Question-Sri Bagh Pact – Formation of Andhra State (1953)-Loss of Ganjam and Bellary Districts – Formation of Andhra Pradesh (1956)-Gentlemen Agreement – Loss of the Capital – Movement for separate Rayalaseema – Rayalaseema Maha Sabha – Rayalaseema Vimochana Samithi – Seema Hakkula Aikya Porata Vedika – Rayalaseema Movement from 2009 –Rayalaseema Vidyavanthula Vedika (2009) and some other Student Organisations- Bifurcation of Andhra Pradesh (2014) – Movements for the Capital; High Court;-Railway Zone and Steel Factory.

Suggested Readings

1. P. Yenadi Raju, *Evolution of Indian Nationalism, Rayalaseema, 1858-1947*.
2. P. Yenadi Raju, *Rayalaseema during Colonial Times, Study of Indian Nationalism, 1858-1947*.
3. K.V. Narayana Rao, *Emergence of Andhra Pradesh*.
4. M.V. Ramana Reddy, *Rayalaseema Kanneeti Gadha* (Telugu).
5. Bhuman, *Charithralo Rayalaseema* (Telugu).
6. Bhuman, *Rayalaseema Mukha Chitram* (Telugu).
7. Imam, *Koti Gonthukala Akrandana* (Telugu).
8. Imam, *Seema Gunde Chappudu; Karuvu Seema Samalochana* (Telugu).
9. *Rayalaseema Swatanthrodhyama Charithra* (Telugu).
10. Y. Gopal Reddy, *Ghanapur Group of Temples.*

MODEL PAPER
M. A DEGREE EXAMINATIONS
THIRD SEMESTER
HISTORY & ARCHAEOLOGY
PAPER VI: RAYALASEEMA THROUGH THE AGES

Time: 3 hours Max Marks: 75

PART–A

5x3 = 15 Marks

Answer ***any Five*** questions.
Each question carries ***Three (3)*** marks.
Each answer should not exceed ***One(1)*** page.

1. Potuluri veerabrahmam
2. Yogi Vemana
3. Tallapaka annamayya
4. Thomas munro
5. Kadapa – Kurnool canal
6. Venkateswara university
7. Rayalaseema mahasabha
8. Rayalaseema vimochana samiti

PART – B

4x15 = 60 Marks

Answer the following questions.
Each question carries ***Fifteen (15)*** marks.
Each answer should not exceed ***Six (6)*** pages.

9. Narrate the political geography of Rayalaseema

OR

10. Describe the pre and proto historic cultures of Rayalaseema

11. Explain the Political conditions of Rayalaseema during the British period

OR

12. Discuss the agricultural and industrial resources of Rayalaseema

13. Explain the Emergence of Nationalist Consciousness in Rayalaseema

OR

14. Explain the social reform movements in Rayalaseema

15.Discuss the emergence of Rayalaseema region

OR

16. Explain the Demand for a Separate *Rayalaseema*

III SEMESTER (Open Elective)

Paper VI – History of Modern Andhra FORM A.D.1757 to A.D. 2014

Unit I: Advent of Europeans – Acquisition of Coastal and Rayalaseema Districts by the British – Company Rule-Reforms – 1857 Revolt in Andhra.

Unit II: Socio-Religious Reform Movements – Veeresalingam – Raghupathi Venkataratnam Naidu and Gurajada Apparao – National Movement – Vandemataram, Non-Cooperation, Civil Disobedience and Quit India Movements.

Unit III: Movement for separate Andhra State – Andhra University – Sribagh Pact – Fast of

Potti Sriramulu – Formation of Andhra State 1953 – Gentlemen Agreement-Formation of Andhra Pradesh 1956 .

Unit IV: Separatist Movements – Mulki Rules and Jai Andhra Movement 1972 – Telangana Movement – 9th December 2009 and its implications – Repercussions in Andhra Pradesh – Agitations for Separate Telangana; Separate Rayalaseema and united Andhra Pradesh – Bifurcation of Andhra Pradesh – Sabotage of the spirit of Sri Bagh Pact.

Suggested Readings

1. K.V. Narayana Rao, *Emergence of Andhra Pradesh*.
2. V. Ramakrishna, *Social Reform in Andhra*.
3. Sarojini Regani, *Highlights of Freedom Movement in Andhra Pradesh*.
4. M. Venkatarangaiah, *Freedom Movement in Andhra*.
5. P.R. Rao, *History of Modern Andhra.*
6. D. Subramanyam Reddy, *Agrarian Relations and Peasant in Modern Andhra.*

***

MODEL PAPER

M. A DEGREE EXAMINATIONS

THIRD SEMESTER

HISTORY & ARCHAEOLOGY *(Non Core)*

HISTORY OF MODERN ANDHRA 1757 TO 2014 A.D.

Time: 3 hours Max Marks: 75

PART–A

5x3 = 15 Marks

Answer ***any Five*** questions.

Each question carries ***Three (3)*** marks.

Each answer should not exceed ***One(1)*** page.

1. East India company
2. Ceded districts
3. Raghupathi venkataratnam naidu

4. Vivekavardhini
5. Formation of Andhra state
6. 1948 police action
7. UPA declaration 9th dec.2009
8. TRS

PART – B

4x15 = 60 Marks

Answer the following questions.

Each question carries ***Fifteen (15)*** marks.

Each answer should not exceed ***Six (6)*** pages.

9. Explain the administrative reforms introduced by East India Company in Andhra

OR

10. Explain the consequences of industrial revolution in Andhra

11. Discuss the socio – religious reform movement in Andhra

OR

12. Give an account of the Vandemataram Movement in Andhra

13. Explain the factors responsible for the political awakening in Andhra during 19th and 20th centuries

OR

14. Describe various incidents of the separate Andhra State

15. Describe the origin and course of Jai Andhra movement

OR

16. Write about the separate Telangana movement and its impact on Andhra

IV SEMESTER

41081: History of Indian Architecture.
41082: History of Modern Andhra from A.D.1757 to A.D.2014.
41083: Epigraphy and Numismatics.
41084: Historical Method.
41085: Women in Modern India

I SEMESTER

11081: History of Ancient India from earliest times to A.D. 750.

11082: History of Ancient Andhra from earliest times to 1323 A.D.

11083: Introduction to Archaeology.

11084: History of Medieval India from A.D. 1206 to A.D. 1526.

11085: Principles of Tourism and Travel Management.

11086: History of Buddhism in India

PAPER I-HISTORY OF INDIAN ARCHITECTURE

UNIT – I Ancient Vastu Texts – Terminology – Three styles of Temple Architecture - Nagara, Dravida and Vesara types - Mauryan Architecture -Buddhist-Architecture – Stupas of North India – Bharhut, Sanchi and Saranath – Andhradesa - cave architecture – Vijayawada, Mogalrajapuram, Undavalli, Bhairavakonda–Stupa architecture of Andhra - – Amaravati, Nagarjunakonda and Bhattiprolu.

UNIT – II Early Chalukya – Rock cut Architecture - Structural temples – Aihole, Badami and Pattadakal – Pallava – Rock-cut caves – Monolithic Rathas –Structural temples - Mahabalipuram and Kanchipuram – Rashtrakuta – Greater Kailas temple.

UNIT – III North Indian Structural Temple Architecture – Gupta Architecture – Sanchi, Bhumara, Nachanakutara and Deogarh – Orissan Architecture, Bhuvaneswar, Puri and Konark – Central Indian style – Khajuraho.

UNIT –IV South Indian Architecture – Chola architecture – Tanjore, Gangaikonda Cholapuram - Hoyasala architecture – Belur, Halebid, Somanathpur - Kakatiya - Hanumakonda, Pillalamarri, Palampeta and Warangal - Vijayanagara - Hampi.

SUGGESTED READINGS

1.Percy Brown, *Indian Architecture*, Vol. I, Bombay, 1956.

2.Debaia Mitra, *Buddhist Monuments*, Calcutta, 1971.

3.Srinivasan, K.R., *Temples of South India*, New Delhi, 1971.

4.Krishnadeva, *Temples of North lndia*, New Delhi, 1969.

5.James Harle, *Art and Architecture of India*.

6.Rajendra Prasad, B, *Art of South India, Andhra Pradesh*, Delhi, 1980.

7.Maichael Meister, *Encyclopedia of Indian Temple Architecture.*

***

PAPER II– HISTORY OF MODERN ANDHRA from A.D.1757 to A.D. 2014

Unit I: British Paramountcy in Andhra-Occupation of Coastal and *Rayalaseema* Districts Consolidation of the Power-Administrative Reforms-Impact of Industrial Revolution and 1857 Revolt on Andhra.

Unit II: Socio-Religious Reform Movements-Veeresalingam-Raghupathi Venkataratnam Naidu, Gurajada Apparao-Various Phases of National Movement in Andhra- Vandemataram, Non-Co-Operation, Salt Satyagraha and Quit India Movements.

Unit III: Salient Features of Movement for Separate Andhra State, 1953 – Various Factors leading to the Formation of Andhra Pradesh, 1956.

Unit IV: Separatist Movements in Andhra-Separate Telangana, 1969-Jai Andhra Movement,1972-Emergence of TRS-Separate Telangana Movement-Response of Political Parties-9th December 2009 Declaration of UPA Government-Repercussions in Andhra Pradesh.

Suggested Readings

K.V.Narayana Rao, *Emergence of Andhra Pradesh*, Popular Prakashan, Bombay, 1973.
K.V.Narayana Rao, *Telangana-A Study in the Regional Committee of India*, Calcutta, 1972.
V.Ramakrishna, *Social Reform in Andhra*, Delhi, 1983.
Sarojini Regani, *Highlights of Freedom Movement in Andhra Pradesh*, A.P.State Archives, Hyderabad, 1968.
B.Kesavanarayana, *Political and Social Factors in Andhra*, Vijayawada, 1976.
A.V.Raman Rao, *Economic Development of Andhra Pradesh*, 1866-1957, Bombay, 1958.
M.Venkatarangaiah, *Freedom Movement in Andhra*, four volumes, A.P.State Archives, Hyderabad, 1965, 1969, 1975.

***

PAPER III- EPIGRAPHY AND NUMISMATICS

Unit I : Epigraphy as Source for the Reconstruction of Indian History – Origin and Antiquity of writing in India – The Brahmi Script & Kharoshthi Script - its Characteristics – Types of Inscriptions – Writing materials.

Unit II : Detailed Study of the Following Inscriptions: 1. Kalamalla Inscription of Renatichola Dhananjaya (EI. Vol. XXVII) 2. Hathigumpha Inscription of Kharavela (EI. Vol. XX) 3. Allahabad Inscription of Samudragupta (CII, Vol. III) 4. Aihole Inscription of Pulakesi II (EI. Vol.VI) 5. Rameswaram Inscription of SriKrishnadevaraya .

Unit III : Origin of the Coins – Importance of the Coins – Coins of Mahajanapadas – Punch Marked Coins – Study of Symbols – Metallurgical Studies.

Unit IV : Coins of Mouryas - Sri Satavahana Coinage – Coins of Local Cheiftains _ Ikshavakus - Eastern Chalukyas – Western Chalukyas – Kakatiya – Vijayanagara Coins.

Suggested Reading:

Bhuler, G., *Indian Palaeography*.

Pandey, R.B., *Indian Palaeography*.
Sircar, D.C., *Indian Epigraphy*.
Sivarama Murthy, C., *Indian Epigraphy and South Indian Scripts*.
Ramesh, K. V., *Indian Epigraphy*.
Krishna Reddy, N., *Sasana Parichayam*.
Bandarkar, D.R., *Lectures on Ancient Indian Numismatics*.
Gupta, P.L., *Coins, National Book Trust of India,* New Delhi, 1996.
Kosambi, D.D., *Indian Numismatics*, Oriental Longman, Delhi, 1992.
Sircar, D.C., *Studies in Indian Coins*, Delhi, 1968.

***

PAPER IV – HISTORICAL METHODS

Unit I : Meaning and Definition of History–Nature and Scope of History – Uses of History – Whether History is Art or Science – History and other Social Sciences – Sources: Archival (Primary) and Literary (Secondary)-Foreign Travellers Accounts.

Unit II: Historical Methodology – a) Heuristics, b) Criticism (External and Internal), c) Synthesis and d) Exposition. – Causation; Objectivity and Subjectivity in History. **–** Stages in the preparation of Thesis: Choice of Topic for research – Collection of Data (Source material) – Hypothesis – Footnotes – References – Bibliography – Appendixes.

Unit III: Historical perspective of Historiography – Contributions by the Western Historiographers – Herodotus and Thucidides (Greece) – Livy; Tacitus and St. Agustin (Roman) – Edward Gibbon and Arnold Toynbee (England) – Leopald Von Ranke; Karl Marx and Oswald Spengler (Germany) – Arab historiography-Ibn Khaldun.

Unit IV: Historical tradition in ancient and medieval India – Bana and Kalhana – Zia-Ud-Din-Barani – Modern Indian Historiography – Orientalist-Imperialistic Historiographers: William Jones, James Stuart Mill, and V.A. Smith – Nationalistic Historiographers – Jadunath Sarkar, R.C. Majumdar, R.G. Bhandarkar and K.A. Nilakanta Sastry – Marxist Historiographers – D.D. Kosambi, Romila Thapar, Irfan Habib – Subaltern School – Ranajit Guha and A.R. Desai.

Suggested readings

1. E.H. Carr, *What is History*?
2. B. Sheik Ali, *History: Its Theory and Method*.
3. K. Rajayyan, *History: Theory and Method*.

4. N. Subramanian, *Historiography*.
5. E. Sreedharan, *A Textbook of Historiography, 500 B.C. to A.D. 2000*.
6. K.A.N. Sastry and Ramana, *Historical Method with Special Reference to India*.
7. S.P. Sen, *Historiography*.
8. Romila Thapar, *Past and Prejudice*.

PAPER – V -WOMEN IN MODERN INDIA

Unit- I

Gender- Patriarchy-Position of Women in Pre-colonial India-Infanticide- Seclusion of Women- Child Marriage- Sati- Celibacy of Widows- Polygamy- Devadasi system- Reforms in Nineteenth Century- Male Social reformers and the state- Abolition of Sati- Measures against Infanticide- Widow Remarriage Act- Age of Consent Bill

Unit- II

Women and Education in Pre- colonial period- Early efforts during the Colonial rule- Christian Missionaries- Savitribai Phule- Pandita Ramabai- Maharani Tapaswini- D.K Karve- Subbalakshmi

Unit- III

Women Organizations- Early Efforts- Women's Indian Association- National Council of Women in India- All India Women Conference- Child Marriage and Sarda Act- Campaigns for Female Franchise- Muthu Lakshmi Reddy

Unit- IV

Women in the National Movement- Madam Cama- Annie Besant- Gandhi and Women- Role of Women in Non-Cooperation Movement, Civil Disobedience Movement and Quit India Movement- Sarojini Naidu- Kamala Devi Chattopadhyaya- Durgabhai Deshmukh, Rajkumari Amrutha Kaur, Usha Mehta and Aruna Asaf Ali- INA and Lakshmi Sehgal.

Suggested Readings

Chandra, Bipin. *India's Struggle for Independence*, Delhi, 1989
Desai Neera and Usha Thakkar, *Women in Indian Society,* New Delhi, 2001
Desai, Neera. *Woman in Modern India*, Bombay, 1977
Forbes, Geraldine, *Women in Modern India*, Cambridge, 1996.
Jones, Kenneth W., *Socio-religious reform movements in British India,* Cambridge, 1989
Kumkum Sangari and Sudesh Vaid, eds., *Recasting Women: Essays in Colonial History,* New Delhi, 1990
Nair, Janaki, *Women and Law in India: A Social History,* Delhi, 1996
Raman, Sita Anantha, *Women in India: A social and cultural history,* Vols. I & II, California, 2009
Ray, Bharati and Aparna Basu, eds., *From Freedom to Independence: Women and Fifty years of Independence,* Delhi, 1999
Ray, Bharati, ed., *Women of India: Colonial and Post-Colonial Periods,* New Delhi, 2005
Taru Susie and K, Lalitha, *Women Writing in India,* Vols. I & II, New York, 1990&1991

***

YOGI VEMANA UNIVERSITY

Vemanapuram, Kadapa-516005, A.P., India

(A State University, Accredited with "B" Grade by NAAC)

(*for the students admitted during the academic year 2021-22 onwards***)Semester-I**

Semester	Components of Study	Course Code	Title of the Course	No. Of Credits	No. Of Hr per Week	Practical/ Project	Internal Assessment	Semester End Exams	Total
Semester-I	Core	GEO 15041	Geomorphology & Atmospheric Sciences	4	4		25	75	100
		GEO 15042	Mineralogy& Optical Mineralogy	4	4		25	75	100
		GEO 15043	Paleontology & Stratigraphy	4	4		25	75	100
	Internal Elective	GEO 15044	A. Indian Geology	4	4		25	75	100
			B. Crystallography		4				
			C. Fundamentals of Geophysics		4				
			Tutorial and seminar	00	4				
	Practical	GEO 15045	Practical-I Mineralogy& Optical Mineralogy	4		16		100	100
	Practical	GEO 15046	Practical-II Paleontology, Stratigraphy & Field Work Report	4		16		100	100
	Sub-total			24	28	32	100	500	600

Semester-II

Semester	Components of Study	Course Code	Title of the Course	No. Of Credits	No. Of Hr per Week	Practical/ Project	Internal Assessment	Semester End Exams	Total
Semester-II	Core	GEO 25041	Structural Geology & Geotectonics	4	4		25	75	100
		GEO 25042	Igneous and Metamorphic Petrology	4	4		25	75	100
		GEO 25043	Sedimentology and Marine Geology	4	4		25	75	100
	Open Elective	GEO 25044	A. Field Geology	4	4		25	75	100
			B. Geostatistics and Computer Applications		4				
			C.SWAYAM/MOOC/NPTEL		4				
			Tutorial and seminar	00	4				
	Practical	GEO 25045	Practical-III. Structural Geology	4		16		100	100
	Practical	GEO 25046	Practical-IV. Petrology (Igneous, Metamorphic & Sedimentology)	4		16		100	100
	Sub-total			24	28	32	100	500	600

Note: 1) MOOC online courses will be available in the SWAYAM and SWAYAM PRABHA MHRD web portal. Interested students may register for MOOC with the approval of the DDC but it will be considered for the award of the grade as open elective only giving extra credits.

Semester III

Semester	Components of Study	Course Code	Title of the Course	No. Of Credits	No. Of Hr per Week	Practical/ Project	Internal Assessment	Semester End Exams	Total
Semester-III	Core	GEO 35041	Economic Geology & Mineral Economics	4	4		25	75	100
		GEO 35042	Geochemistry	4	4		25	75	100
		GEO 35043	Remote Sensing & GIS	4	4		25	75	100
	Open Elective	GEO 35044	A. Energy Resources	4	4		25	75	100
			B. Natural Hazards & Disaster Management		4				
			C. Earth Resources		4				
			Tutorial and seminar	00	4				
	Practical	GEO 35045	Practical-V Economic Minerals & Geochemistry	4		16		100	100
	Practical	GEO 35046	Practical-VI Remote Sensing & GIS	4		16		100	100
	Sub-total			24	28	32	100	500	600

Note: 1) MOOC online courses will be available in the SWAYAM and SWAYAM PRABHA MHRD web portal. Interested students may register for MOOC with the approval of the DDC but it will be considered for the award ofthe grade as open elective only giving extra credits.

Semester IV

Semester	Components of Study	Course Code	Title of the Course	No. Of Credits	No. Of Hr per Week	Practical/ Project	Internal Assessment	Semester End Exams	Total
Semester-IV	Core	GEO 45041	Mineral Exploration & Ore beneficiation	4	4		25	75	100
		GEO 45042	Hydrogeology	4	4		25	75	100
		GEO 45043	Engineering Geology	4	4		25	75	100
	Internal Elective	GEO 45044	A. Environmental Geology	4	4		25	75	100
			B. Watershed management		4				
			C. Mining Geology		4				
	Practical	GEO 45045	Practical-VII Mineral Exploration, Hydrogeology & Engineering Geology	4		16		100	100
	Practical	GEO 45046	Practical-VIII Project Work	4		16		100	100
	Sub-total			24	28	32	100	500	600

Note: First and Fourth semester students choose Internal Elective.

- Weekend Field Trips for both Previous and Final year Students
- Study Tour for 10 to 14 days for both Previous and Final Year Students

M.Sc. Geology Revised Syllabus Academic year 2021-22 onwards

I Semester

Code	Paper	Title
GEO15041	Paper I	Geomorphology & Atmospheric Sciences
GEO15042	Paper II	Mineralogy & Optical Mineralogy
GEO15043	Paper III	Paleontology & Stratigraphy
GEO15044	Paper IV	**Internal Elective**; A. Indian Geology B. Crystallography. C. Fundamentals of Geophysics.
GEO15045	Practical I	Mineralogy & Optical Mineralogy
GEO15046	Practical II	Paleontology, Stratigraphy and Field Work Report

II Semester

GEO25041	Paper I	Structural Geology & Geotectonics
GEO25042	Paper II	Igneous & Metamorphic Petrology
GEO25043	Paper III	Sedimentology & Marine Geology
GEO25044	Paper IV	**Open Electives**; A. Field Geology B. Geostatistics & Computer Applications C. SWAYAM/MOOCS/NPTEL
GEO25045	Practical III	Structural Geology
GEO25046	Practical IV	Petrology(Igneous, Metamorphic and Sedimentology)

III Semester

GEO35041	Paper I	Economic Geology & Mineral Economics
GEO35042	Paper II	Geochemistry
GEO35043	Paper III	Remote Sensing & GIS
GEO35044	Paper IV	**Open Electives**: A. Energy resources B. Natural hazards & Disaster management C. Earth Resources
GEO35045	Practical V	Economic Minerals & Geochemistry
GEO35046	Practical VI	Remote Sensing & GIS

IV Semester

GEO45041	Paper I	Mineral Exploration & Ore beneficiation
GEO45042	Paper II	Hydrogeology
GEO45043	Paper III	Engineering Geology
GEO45044	Paper IV	**Internal Elective**: A. Environmental Geology B Watershed Management C. Mining Geology
GEO45045	Practical VII	Mineral Exploration, Hydrogeology & Engineering Geology
GEO45046	Practical VIII	Project Work

- Weekend Field Trips for both Previous and Final year Students
- Study Tour for 10 to 14 days for both Previous and Final Year Students

I SEMESTER

GEO15041 Paper I – Geomorphology & Atmospheric Sciences

Unit I

Scope of Geomorphology, Fundamental concepts of Geomorphology. Volcanoes & Volcanism – Nature and Origin of Volcanoes – Products of Volcanism, eruptive styles and associated landforms. Earthquakes and Earth‟s Interior. Causes, occurrence and effects of Earthquakes. Earth‟s Interior according to seismic theory. Nature and origin of Oceans and shaping of continents **15 hours**

Unit II

Geological action and resulting land forms of Oceans, Lakes, Glaciers and Wind.

15 hours

Unit III

Geological action and resulting land forms of River. Drainage patterns and systems, Morphometric analysis – Morphometric characteristics, stream orders, stream length, stream frequency, elongation ratio, bifurcation ratio, drainage density, texture and interpretations.

15 hours

Unit IV

Atmosphere – Circulation – Clouds, Precipitation, Acid rains – The Air – Masses - Cyclones and Anticyclones – Tropical cyclones – Tornadoes. Natural regions of the world – Tropical regions - Warm Temperate regions – Cold temperate regions – Polar regions. . Weather forecasting. Economic importance of weather – Agriculture and Industry.

15 hou

rs

Reference Books

1. Essentials of Geology by Stanley Chermicoff, Hayden A. Chip Fox. Ramesh Venkatakrishansn.
2. Physical Geology by A.Holmes.
3. Principles of Geomorphology by William D.Thornbury.
4. Principles of Geomorphology by Carls W.Montgomery.
5. Text book of Geomorphology by A.L.Bloom
6. Text book of Geomorphology by P.Dayal
7. Indian Geomorphology by H.S.Sarma.
8. An Introduction to Earth and Environment by A.K.Sinha

GEO15042 Paper II –Mineralogy & Optical Mineralogy

Unit I

Structures of Silicates, Isomorphism and Polymorphism. Physical, Chemical and Optical properties, Mode of occurrence of the following mineral groups: Quartz, Feldspars, Feldspathoids and Zeolites.

15 hours

Unit II

Physical, Chemical and Optical Characters and Mode of occurrence of the following MineralGroups -- Olivine, Pyroxene, Amphibole, Mica, Garnet And Aluminum Silicates.

15 hours

Unit - III

Nature of Light-Reflection and Refraction, Index of Refraction. Total Reflection and critical angle. Snell‟s Law, Isotropic and anisotropic crystals. Polarized light- The Petrological or polarizing microscope, microscopic examination of Minerals and Rocks.

15 hours

Unit - IV

Pleochroism, Extinction, Determination of retardation with Berek compensator, optic axial angle. Nicol prism and its construction. Uniaxial crystals, Uniaxial crystals between crossed Polars accessory plates. Study of optical properties of the Biaxial minerals.

Reference Books

1. A Text Book of Mineralogy by E.S.Dana
2. Elements of Crystallography by F.A.Wade and R.B.Matrox.
3. Elements of Mineralogy by Rutleys
4. Optical mineralogy by Paul F.F. Kerr
5. Mineral Optics by Philips W.R.
6. Elements of Optical Mineralogy by Winchell A.N.

GEO 15043 Paper III – Paleontology & Stratigraphy

Unit I

Introduction to Paleontology – Evolution of Life through Geological Time Scale – Taphonomy – Definition of Fossil – Modes of preservation of Fossils – Index fossil –Proliferation and Extinction of Life through Time

15 hours

Unit II

Morphology, classification and evolutionary history of Mollusks (Lamellibranches, Gastropods and Cephalopods), Echinoderms. Morphology and Evolutionary history of Graptolites, Trilobites, Brachiopods and Corals

15 hours

Unit III

.

Scope of Micropaleontology – Detailed morphology of Foraminifera, Ostracoda – Utility of Microfossils in Hydrocarbon Exploration – Palaeoecology, Palynology – Plant fossils.

15 hours

Unit IV

Stratigraphy: Definition, Importance - History and Evolution. Stratigraphic terminology, nomenclature and classification – Concept of Lithofacies and Biofacies - Historical evolution of Geological Time Scale. Principles of Palaeogeography - Sequence Stratigraphy.

15 hours

Reference Books

1. Fundamentals of Historical Geology and Stratigraphy of India – Ravindra Kumar
2. Geology of India and Burma by M.S. Krishnan.
3. Geology of India by D.N. Wadia
4. Geology of India by M. Ramakrishna & R.Vidyanadhan.
5. Manual of Field Geology by Robert R.Compton
6. Guide to Field Geology by S.M.Mathur
7. Invertebrate Paleonotlogy : Henny Woods
8. Micropaleontology : P.K .Kathal
9. Elements of Micropaleontology: G. Bignot

Internal Elective- Paper-IV GEO15044- –A. Indian Geology

Unit I

Major stratigraphic divisions and their equivalents in India. Brief account of classification, lithology, structure and economic importance of Archaean, Cuddapah and Vindhyan Supergroups and their equivalents. **15 hours**

Unit II

Gondwana Supergroup – Classification, Structure, Nomenclature and Divisions and Sub- divisions of Gondwana formations and their distribution in India. Gondwana flora and coal deposition.

15 hours

Unit III

Short account of Sivaliks, Origin, Distribution and age of Deccan traps, Intra and Inter trapeans –Origin, composition, distribution. .

15 hours

UNIT-IV

Stratigraphic successions, fossil content of Triassic of spiti and Jurassic of kutch, Cretaceous formations and Tirichinapally, Tertiary and Quaternary rocks of India, Marine transgression. Pleistocene galciation.

15 hours

Reference Books

1. Fundamentals of Historical Geology and Stratigraphy of India – Ravindra Kumar
2. Geology of India and Burma by M.S.Krishnan.
3. Geology of India by D.N.Waldia
4. Geology of India by M.Ramakrishna & R.Vidyanadhan.

GEO15044- –B. Crystallography

UNIT I

Definition of Crystal –Amorphous and Crystalline states-Morphology of Crystals- Face,Edge, Solid angle, Interfacial angle – Forms of crystals- Symmetry- Parameters – Crystallographic notation – Miller Index.

15 hours

UNIT II

Classification of Crystals into 7 systems- Morphological characters of 7 crystal systems-Twin Laws - Twinning in Crystals.

15 hours

Unit III

Elements of Crystallography –Derivation of 32 Crystal classes and Herman-Maughn Symbols, Irregularities in crystals, Etch figures.

15 hours

Unit IV

Space lattice theory, Crystal projections, Napiers rule, and X-ray crystallography,

15 hours

Reference Books

1. A Text Book of Mineralogy - E.S.Dana
2. Elements of Crystallography - F.A.Wade and R.B.Mattrox
3. Elements of Mineralogy - Rutleys

GEO15044 - C. Fundamentals of Geophysics

UNIT –I

Gravity methods: Gravity potential and field due to different simple bodies and structures - Field procedure - Bouguer gravity anomalies, interpretations & field-cases - Applications of the gravity method. **15 hours**

UNIT - II

Magnetic methods: Magnetic properties of rocks, geomagnetic field, field procedure, measurement of magnetic anomalies, interpretation - Applications of the magnetic method - Seismic method: Seismic waves and wave propagation, Wave attenuation and amplitude - Seismic refraction surveying, layered earth refraction studies - Seismic reflection surveying

15 hours

UNIT – III

Electrical method: Self potential, earth resistivity, different arrays, profiling & soundingtechniques, interpretation & field cases - Induced polarization - Telluric & electromagneticmethods - Ground Penetrating Radar (GPR). **15 hours UNIT – IV**

Subsurface geophysical methods, Borehole logging: Drilling and its effects on the formations - The measurement of strata dip, borehole inclination and diameter - The self-potential log, Resistivity logs, Radioactivity logs, The sonic log, The temperature log. **15 hours**

Reference Books:

1. El Arabi H. Shendi, 2007; Introduction of Geophysics
2. Lowri,W., 2007: Fundamentals of Geophysics, Cambridge University Press.
3. Dobrin, M.B and Savit,C.H.,1988. Introduction to Geophysical Prospecting, McGraw-Hill.
4. Grant, F.S.and West,G.F.,1965. Interpretation Theory in Applied Geophysics, McGraw Hill, New York.
5. Murthy, L.Y.R. and Mishra, D.C., 1989. Interpretation of Gravity Magnetic Anomalies in Space and Frequency Domain, AEG publication, Hyderabad, India
6. Nettleton, L.L., 1976. Gravity and Magnetics in Oil Prospecting, McGraw Hill.
7. Parasnis, D.S., 1966. Mining Geophysics, Elsevier.
8. Patra, H.P. and Mallick, K., 1980. Geosounding Principles Vol. I Time layering Geoelectric Soundings. Amsterdam: Elsevier.
9. Telford, W.M., Geldart, L.P.and Sheriff, R.E.,1990.Applied Geophysics Cambridge
10. Alan, E. Mussett, Khan, M.A. 2000. Looking in to the earth: An introduction to geological geophysics, Cambridge University Press.
11. Telford, W.M., Geldart, L.P. and Sheriff, R.E., 1990. Applied geophysics. Cambridge University Press.

Practical I

GEO15045 Mineralogy & Optical Mineralogy

Mineralogy : Megascopic identification of minerals

Optical Mineralogy : Microscopic identification of minerals in thin sections.

Practical II

GEO15046- Paleontology, Stratigraphy & Field work Report

Palaeontology : Megascopic identification of fossils, Microscopic identification of microfossils.
Stratigraphy : Stratigraphy Problems.
Submision : Field Report

II SEMESTER

GEO25041 Paper I - Structural Geology & Geotectonics

Unit – I

Mechanical principles and properties of rocks and their controlling factors – Concept of stress and strain – two dimensional stress and strain analyses – Concept of Dip and Strike - Geometric classification of Folds- Mechanics of folding and buckling and recognition of folds.

15 hours

Unit – II

Joints Classification and their importance in Construction projects. Mechanics of faulting. Classification and recognition of faults. Strike slip faults, normal faults. Unconformities – types of unconformities, criteria for recognition and significance of unconformities.

15 hours

Unit – III

Tectonic aspects of Igneous rocks. Geometric classification of plutonic igneous rocks, tectonic setting of plutons. Structures in metamorphic rocks, Foliation, Axial plane foliation, transported foliation, other metamorphic foliation. Lineation – problem of lineation indicating extension parallel to fold axis, small scale folds. Structural association, salt domes, diapers, nappe, tectonic melanges

15 hours

Unit – IV

Plate tectonics – Sea floor spreading, island arcs, orogeny and epiorogeny. Geo-dynamics ofIndian plate, evolution of Himalayas, Isostasy and Neotectonics.

15 hours

Reference Books

1. Structural and Tectonic principles - Badgley, P.C.
2. Mechanics in Structural geology, Bayly, B.
3. Structural geology – Billings M.P.
4. Structural geology of rocks and region – Davis G.R.
5. Understanding the Earth – Gass I.B., Peter J.Smith and Smith PGL
6. An outline of Structural geology
7. Global tectonics – Keary. P., and Vine F.J.
8. Modres. E., and Twiss., R.J.
9. Folding and fracturing of rocks : Ramsy, J.G.

GEO 25042 Paper II - Igneous & Metamorphic Petrology

Unit I

Introduction to Igneous Petrology – Formation of igneous rocks – Crystallization of unicomponent, Bicomponent and ternary magmas. Origin, composition and constitution of magmas – Bowen‟s reaction principle – Magmatic Differentiation – Fractional crystallization and assimilation.

15 hours

Unit II

Forms, structures and textures of igneous rocks. Classification of Igneous rocks. Petrography and petrogenesis of the following rock types: Lamprophyres, Carbonatites, Anorthosites, Granites, Granodiorites, Pegmatites, Syenites and Nepheline syenites. Gabbro, Dolerite, Basalt, and Picrite basalts.

15 hours

Unit III

Metamorphism, metamorphic processes, Agents of metamorphism, kinds of metamorphism, classification and nomenclature of metamorphic rocks, structures and textures of metamorphic rocks. **15 hours**

Unit IV

Grades and zones of metamorphism – Concept and types of metamorphic facies. Classification and description of Schist, Gneiss, Amphibolite, Quartzite, Marble, Slate, Phyllite – Origin and types of granulites -Charnockites and Khondalites. **15 hours**

Reference Books

1. Igneous and Metamorphic Petrology – Turner and Verhoogen
2. Petrology of Igneous and Metamorphic rocks – Hyndman
3. The petrography of Igneous and Metamorphic rocks in India – S.C.Chatterjee.
4. Metamorphic petrology- B. Bhaskara Rao

GEO 25043 Paper III – Sedimentology & Marine Geology

Unit I

Sedimentology – Origin of Sedimentary of rocks. Structures and textures of Sedimentary rocks.Rock cycle, lithification and digenesis of Sedimentary rocks. **15 hours**

Unit II

Classification of sedimentary environments – Non-marine environments – Glacial, Aeolian,Lacustrine and Fluvial environments – Marine environments – Shelf and Deep sea sediments..

15 hours

Unit III

Classification and origin of Clastic and Non-clastic rocks. Clastic – Rudaceous , Arenaceous and argillaceous rocks. Non-Clastic – Chemical and Organic deposits. Descriptive study of Sedimentary rocks (Breccia, Conglomerate, Lime Stone, Sand Stone, Shale, Silt, Shell Lime Stone,etc.,) . **15 hours**

Unit IV

Introduction and scope of Marine Geology, Morphologic and paleocurrents, Heavy minerals. Oceanic profile, origin of oceanic crust, ocean sediments, classification, Near shore Geological Processes, Beach placers, Carbon Compensation Depth (CCD) , Shelf deposit, deep ocean Poly Metallic Nodules (PMN) , Hydrocarbon deposits. Concept and causes of Sea level changes and measurements. Physical and chemical properties of sea water. Coral reefs. Coastal Pollution , Mitigation and Management- Coastal Erosion and Protection measures

15 hours

Reference Books

1. Sedimentary Rocks – Pettijohn, F.J.
2. Origin of Sedimentary Rocks – Blottt, H., Middleton, G. and Murray, R.
3. Introduction to Sedimentology – Sengupta, S.M.
4. An Introduction to Sedimentology – Shelly, R.C.
5. Shepard, Submarine geology
6. Krunen, Marine geology
7. King, Introduction to marine geology and geomorphology
8. Keen, Introduction to marine geology
9. James Kennet, Marine geology, 1982, prentice hall
10. Riley and Chester, Introduction to marine chemistry
11. James Drever, The geochemistry of natural waters

Open Elective- Paper-IV
GEO25044 – A. Field Geology

Unit I

Introduction; Physiography; Topographic expression; Relief; Inliers and Outliers; soils and vegetation; Basic Field Equipment – Compass & Clinometer, Geological hammers, pocket lens and hand lens, Streak plaete, pocket magnet, pocket knife, measuring tape, scale, haversack, HCL, chisel, protractors, note book; Basic Field Observations.

15 hours

Unit II

Compass & Clinometer – The compass and its uses, Dip of the compass needle, Magnetic Declination, Clinometer, Bearing and Reading directions, Measuring Dip & Strike, Back bearings using Brunton compass. Topographic Maps – Survey of India Maps, Scale of Maps, Depiction of Relief, Latitude & Longitude, Map Grid, Measurement of Mapped Areas. Basic Field Procedure – Location, Measure Distance, Compass and Tape Traversing, Determination of Slopes and Gradients, Measure Difference in Elevation.

15 hours

Unit III

Geological Mapping – General Considerations, Reconnaissance, Surface Features, Systematic Mapping, Strike and Dip, Contacts and Boundaries, Correlation, Geologic Cross Sections, Location using Brunton Compass, Marking the Map; Profile of an area using Toposheet.

15 hours

Unit IV

Global Positioning System (GPS) – What is GPS, History of GPS, How GPS use in Surveying,Methods of GPS measurement – Static GPS baseline, Real Time Kinematic (RTK), Continuously Operation Reference Station (CORS), Surveying with GPS (Case Study).

15 hours

References:

1. Field Geology by F.H. Lahee
2. Guide to Field Geology by S.M.Mathur
3. https://www.jurovichsurveying.com.au/faq/what-is-gps

GEO25044- B. Geostatistics & Computer Applications

Unit I

Data in Earth Sciences – Classification – Tabulation
Quantitative techniques – Central tendency and dispersion, Correlation and regression, Analysisof one way variance. **15 hours**

Unit II

Introductions to computers – History and generations – Definition and brief description of operating systems, languages and packages, Introduction to Internet

15 hours

Unit III

MS Office – MS Word, MS Excell, MS Power Point - Description

15 hours

Unit IV

Basic concepts of data and database management system – RDBMS, SQL. Oracle - Introduction to RDBMS, Data definition languages, data control languages, data control language, creating and managing objects like Tables and Views. RDBMS Query execution, transactions – Physical database design and performance tuning. **15 hours**

Reference Books

1. Computer and Commonsense – Hunt and Sheily
2. The Internet – Dauger and Comer
3. MS Office 2000 – Hand Book
4. Introduction to Data Base Management Systems – Ramakrishna
5. Oracle 8i complete reference – Kevin Loney, George Kochu
6. Fundamentals of Mathematical stastics – Gupta S.C. and Kapoor, V.K.
7. Statistical methods – Snedeca G.W. and Loncron, W.G.

GEO25044- C. SWAYAM/MOOCS/NPTEL

Practical-III GEO25045
- Structural Geology

Structural geology problems: Dip & Strike, 3 point problems, thickness problem and fault problems, Geological maps, Section drawing, contour mapping, suitability of structural area for engineering projects.

Practical-IV
GEO25046- Petrology (Igneous, Metamorphic and Sedimentaology)

Petrology: Megascopic identification of Igneous, Metamorphic and Sedimentary Rocks.
Microscopic examination of Rock thin sections.
Norm Calculations.

III **SEMESTER**

GEO35041 Paper I – Economic Geology & Mineral Economics

Unit I

Process of formation of mineral deposits – magmatic concentration, metasomatism, hydrothermal process, sedimentation, residual and mechanical concentration, oxidation supergene enrichment, sublimation, evaporation. Ore deposition – Physical and chemical controls of ore fluids and their migration.

15 hours

Unit II

Origin, occurrence and distribution of the Gold, Iron, Manganese, Chromite, Copper, Lead andZinc, Aluminium and Magnesite deposits of India.

15 hours

Unit III

Metallogenic epochs and provinces with special reference to India. Origin, occurrence and distribution of refractory, abrasive, glass, ceramic, cement and fertilizer minerals. Mineralwealth of Andhra Pradesh.

15 hours

Unit IV

Classification of Mineral deposits – Strategic, critical and essential minerals. National Mineral Policy. Mineral Concession Rules, Mineral conservation and substitution. Status of mineral production in India. Marine Mineral Resources, Law of Sea. **15 hours**

Reference Books

1. Economic mineral deposits – Bateman, A.M. and Jenson, M.C.
2. Indian Mineral resources-Krishna Swamy
3. Ore deposits of India-Gokhale and Rao
4. Mineral economics-R.K.Sinha &N.L.Sharma
5. Ore deposits-ParkJr.C.F.and Mac Diamid

GEO35042 Paper II – Geochemistry

Unit I

Introduction to geochemistry – its scope. The earth in relation to the solar system and the Universe. Cosmic abundance of elements, composition of planets and meteorites. Structure composition and distribution of elements in the Earth. Geochemical classification of elements. Geochemistry of hydrosphere, biosphere and atmosphere. **15 hours**

Unit II

Elementary crystal chemistry and thermodynamics. Lattice energy of crystals, principles of ionic substitution in minerals. Ionization potential, electro negativity, Pauling's rule, Periodic Table with special reference to Rare Earth Elements (REE). Geochemistry of Uranium & Lithium**.**

15 hours

Unit III

Introduction to isotope geochemistry, stable isotopes, geochemistry of carbon, oxygen, sulfur Isotopes, Radiogenic Isotopes, Decay scheme of K-Ar, U-Pb and Rb-Sr, Carbon dating and its applications to Geology. **15 hours**

Unit IV

Geochemical prospecting; Fundamental concepts, pathfinder elements. Threshold values, geochemical anomaly. Primary and secondary dispersion Halos sampling. Geochemical cycles and geochemical methods for prospecting of metallic minerals, petroleum and natural gas. Techniques in Geobotanical survey. **15 hours**

Reference books

1. Introduction to Geochemistry – Mason, B. and Mooro
2. Introduction to Geochemistry – Krankopf, K.B.
3. Principles of Isotope Geology – Faure, G.
4. Introduction to Crystal Chemistry - Evans, R.C.
5. Geochemistry- Arthur H. Brownlow.

GEO35043 Paper III – Remote Sensing and GIS

Unit I

Satellite Remote Sensing – Basic concepts – Electro Magnetic Radiation, Electromagnetic spectrum – Interaction of electromagnetic radiation with atmosphere, Interaction of electromagnetic radiation with Earth surface – Atmospheric widows – Spectral regions useful forRemote Sensing. **15 hours**

Unit II

Satellite data acquisition systems – Platforms – Airborne and Space borne – Sensors – Passive sensors – Multispectral scanners – Thermal infrared scanner – Microwave, radiowave scanners - Active sensors – Laser scanner, Radar altimeter and image Radar

Multispectral Remote Sensing – Resolutions – Spectral, Spatial, Radiometric and temporal – Remote Sensing in Thermal Infra Red regions – Basic concepts and characteristics – Geological interpretations and Advantages of thermal imagery – Remote Sensing in Microwave region – Basic concepts, characteristics, advantages and disadvantages.

15 hours

Unit III

Digital Image Processing – Introduction, Basic concepts – Image formats and its characteristics – Image pre processing – Introduction, radiometric errors, geometric errors – Map projections – Geometric rectification, georeferencing and image to image registration.

Image enhancement – Radiometric enhancement – Spatial enhancement – Spectral enhancement – Image classification – Supervised classification, Unsupervised classification – Pattern of recognition and feature extraction – Image mosaiking and change detection.

15 hours

Unit IV

Geographical Information System (GIS) – Introduction – Components of GIS – Data structures in GIS – Raster and Vector Data Structures – Types of data – Points, lines and polygons – Data conversion – Raster to vector and vector to raster.

Data input, verification, storage and output – Data Input process and devises – Spatial and non- spatial data entering – Data verification – Storage – Data output processes and devices – Digital elevation modeling – Products and usefulness of DEM/DTM – Introduction to GPS

15 hours

Reference Books

1. Remote Sensing Principles and interpretations – Sabins, F.F.Jr.
2. Remote Sensing and Image Interpretation - Lillisand, T.., and Kiefer, P.W.
3. Remote Sensing Geology – R.P. Gupta.
4. Principles of Geographical Information Systems for Land Resources – Borough, P.A.
5. Geographical Information Systems – Kang Tsung Chang.

Open Electives Paper-IV

GEO35044 A. Energy Resources

Unit I

Petroleum – Origin- inorganic and organic theories – migration and accumulation of oil and gas – Geological age of reservoir rocks – Classification of traps. Petroliferous basins of India. Geology of the productive oil fields of India. Status of Oil and Natural Gas in India- Gas Hydrates

15 hours

Unit II

Coal – Origin and classification – Chemical characterization — Gelogical and Geographical distribution of coal deposits in India. Detailed Geology for important coal fields of India. Hazards of Coal Mining and Safety Measures.

15 hours

Unit III

Atomic minerals – Mode of occurrence and association with other radioactive minerals. Methods of prospecting and productive geological horizons in India. Detailed Geology and Distribution of Uranium deposits in India. Atomic fuels and environment.

15 hours

Unit IV

Renewable Energy resources – Wind, Solar, Hydral and Geothermal

15 hours

Reference Books

1. All you wanted to know about Disasters – (Brig) H.K.Kanna
2. Petroleum formations and occurrences – Tissort, B.P. and Welte D.H.,
3. Text book of coal – Chandra, D.
4. Uranium ore deposits – Dahlkamp F.J.
5. Petroleum Geology – Laverson, P.
6. Renewable Energy Resources and Emerging Technologies – Kothari, D.P., Singal, K.C. and Rakesh Ranjan

7. Renewable Energy Resources – John Twidell and Tony Weir

GEO35044 –B. Natural Hazards & Disaster Management

Unit I

Hazards Natural, Man Made, Study of Earthquakes and its types, magnitude and intensity, seismic zones of India, major fault systems of India plate, flood types and its management, drought types and its management, Cyclone Prediction and hazard assessment, Tsunami: Generation and Movement. **15 hours**

Unit II

Classification, causes of landslides, controls of landslides subsidence and its importance, Volcanic hazards, volcanic belt girdiling in India sub-continent, origin and types of volcanic activity, Prediction of volcanic eruptions, Mitigation of volcanic hazards. **15 hours**

Unit III

Fundamental concepts of disaster management – Hazard, Disaster, Risk, Vulnerability management, Disaster management policy, National Disaster Framework, Definition and types of disasters. **15 hours**

Unit IV

Elements of hazard mapping, Risk Analysis, Damage assessment, Loss analysis, hazard mitigation, Social Economics and Environmental impact of disasters. Disaster Management Policy, National Disaster Framework, Disaster Preparedness and Response, Recovery rehabilitation and reconstruction, Role of Remote Sensing and GIS in disaster mitigation measures **15 hours**

References Books:

1. Geoff L.Wells,1997, Major Hazards and Their Management,Gulf Publishing Company, 305 p. 2. Environmental Geology- Keller. E.A (1976).
2. Environmental Geology- Indian Context K.S Valdiya (1987)
3. Environmental Geology- C.W Montgomery (1989).
4. Simon Ross, 1998, Natural Hazards,Nelson Thornes Ltd, USA, 96 p.4.
5. 6.David R. Godschalk, 1998, Natural Hazard Mitigation: Recasting Disaster Policy and Planning,Island Press, 591 p.
6. Disaster Management,Dr. Mrinalini Pandey, Wiley India Pvt. Ltd.
7. Disaster Science and Management, Tushar Bhattacharya, McGraw Hill Education (India) Pvt. Ltd.
8. Future Challenges and Opportunities, Jagbir Singh Disaster Management: K W Publishers Pvt. Ltd
9. Disaster Management, Laxmi Publications
10. All you wanted to know about Disasters- (Brig), B.K Kanna (2003).
11. Environmental Geology- Keller. E.A (1976).
12. Environmental Geology- Indian Context K.S Valdiya (1987).

GEO35044 C. Earth Resources

Unit I

Introduction to Igneous Petrology – Formation of igneous rocks-Forms, structures and textures of igneous rocks. Classification of Igneous rocks. Petrography and petrogenesis of the following rock types: Lamprophyres, Carbonatites, Anorthosites, Granites, Granodiorites, Pegmatites, Syenites and Nepheline syenites. Gabbro, Dolerite, Basalt, and Picrite basalts - Metamorphism, metamorphic processes, Agents of metamorphism, kinds of metamorphism, Grades and zones of metamorphism – Description of Schist, Gneiss, Amphibolite, Quartzite, Marble, Slate, Phyllite – Charnockites and Khondalites.

15 hours

Unit II

Sedimentology – Origin of Sedimentary of rocks-Classification of sedimentary environments –Non-marine environments – Glacial, Aeolian, Lacustrine and Fluvial environments – Marine environments – Shelf and Deep sea sediments-Descriptive study of Sedimentary rocks-Breccia,Conglomerate, Lime Stone, Sand Stone, Shale, Silt, Shell Lime Stone,etc.

15 hours

Unit III

Process of formation of mineral deposits – magmatic, metasomatism, hydrothermal process, sedimentation, residual and mechanical concentration, oxidation supergene enrichment, sublimation, evaporation. Water resources – Hydrological cycle – precipitation, runoff, infiltration and evapotranspiration.

15 hours

Unit IV

Origin, occurrence and distribution of the Gold, Iron, Manganese, Chromite, Copper, Lead andZinc, Aluminium and Magnesium deposits of India - Industrial minerals – Cement industry, Glass industry, Ceramic industry, Fertilizer industry, Steel Industry- Fuel Minerals – Coal- origin-classification – Petroleum and Natural gas – Origin – Reservoir rocks – Atomic minerals – Association, occurrence of Atomic minerals.

15 hours

Reference books

1. Text book of Petrology by GW Terryl
2. Economic Minerals by Allen Bateman

Practical V

GEO35045 Economic Minerals & Geochemistry

Economic Minerals: Study of origin, occurrence and distribution of important Economic Minerals.
Geochemistry: Chemicals, Reagents and solutions, Expressing the concentration of solution, percent concentration. Calculation of Equivalent Weight, Diluting Solutions, Standardization of common standard solutions, Common Laboratory Techniques for Environmental sampling analysis. Distillation, Gravimetric, Titrimetric, Potentiometry & Ion selective electrode, Calculation of Oxidation Number, Balancing weathering equations, checking the accuracy of Analytical results, Diagrammatic representation of geochemical date.

Practical VI

GEO35046 Remote Sensing & GIS

Remote Sensing: Visual Interpretation of Satellite Image

Digital Image Processing

Geographical Information System (GIS): Spatial data creation and spatial data conversion, scanning and screen digitization. Geo-referencing, Projection systems, Projection and transformation

IV SEMESTER

GEO45041 Paper I –Mineral Exploration, and Ore Beneficiation

Unit I

Stages of Mineral exploration – Methods of choosing target area – Criteria for accepting or rejecting the target area – Guides to ore search – Stratigraphic, Lithological, Geomorphological and Structural. Rock alteration and Geo-botanical .Sampling and Drilling Methods. Detailed study of Geophysical methods of Exploration and Geochemical prospecting. **15 hours**

Unit II

Remote Sensing Applications in various stages of mineral exploration – Spectral characteristics of alteration minerals – Hydroxyl bearing minerals, Carbon and tectosilicates and colour ratio images using digital image processing. Application of Remote Sensing in exploration of Gold, Base metals (Copper, Lead, Zinc), Diamond, Bauxite, Iron ore and barite. **15 hours**

Unit-III

Principles of mineral processing- methods of treatment- sequence of operations and its importance, Ore dressing with importance. Properties of minerals and rocks and their considerations in ore beneficiation techniques. Primary crushers-. Secondary crusher. Grinding mills. Sizing by screening and sub- sieve sizing. Definition of sieve, screen, mesh. Advantages of wet and dry sieving. **15 hours**

Unit-IV

Gravity Separation : Separation in Vertical currents – Jigging –Theory and principles, different types of jigs. Dense Medium separation : Principles, media preparation and stability of media, regeneration of media, Classification of DMS. Flotation fundamentals : Introduction, History. Physical aspects of Flotation. Magnetic Separation: Principles, types of magnetic separators, wet and dry, low and high intensity, high gradient magnetic separators. Flocculation and Dispersion. Dewatering: Introduction and importance. Dressing of following Ores, Sulphide ores „Tin, Lead and Zink", Native metal "Gold", Non Sulphide Ores, Urenium and Baryte.

15 hours

Reference Books

1. Mining Geology – Arogyaswamy
2. Mining Geology – McKinstry
3. Ore Deposits of India – G.K.Gokhale.
4. Introduction to Geophysical prospecting – Dobrin, M.B.
5. Introduction to Exploration Geochemistry – Levinson, A.S.
6. Image Interpretation in Geology – Drury, S.A.
7. Remote Sensing Principles and Interpretation – Sabins, F.F.

GEO45042 Paper II – Hydrogeology

Unit I

Origin of water – Meteoric Juvenile, magmatic and sea waters – Hydrologic cycle – Precipitation, Runoff, infiltration and evapotranspiration, Subsurface movement and vertical distribution of groundwater, Springs, Classification of aquifers. Occurrence of groundwater, Rocks affecting groundwater occurrence ,Hydrological properties of rocks – Specific Yield, Specific Retention, Porosity, Hydraulic conductivity, transmissivity, Storage Coefficient, Hydrographs.

15 hours

Unit – II

Groundwater movement, Darcy‟s law and its applications, Determination of Permeability in laboratory and in field: Well hydraulics: Confined, Unconfined, Steady, Unsteady and radial flow, water level fluctuations, Types of wells, drilling methods.

15 hours

Unit – III

Groundwater Quality: Physical, Chemical and bacteriological parameters; Quality criteria for groundwater use, graphical presentation of water quality data, Saline Water intrusion in coastal aquifers. Problem of arsenic and fluoride, case studies. **15 hours**

Unit – IV

Groundwater Exploration: Geophysical and geological methods of groundwater exploration. Artificial recharge of groundwater, conjunctive use of surface and groundwater; Groundwater budgeting and basin management. Ground water provinces of India. Application of Remote Sensing Data in selection of groundwater in hard rock terrain and unconsolidated sediments. Groundwater indicators **15 hours**

Reference Books

1. Groundwater Hydrology – Todd, D.K.
2. Applied Hydrogeology – Fetter C.W.
3. Groundwater Assessment and Development and Management – Karanth, K.R.
4. Remote Sensingg and Interpretation – Lives and Kaifer
5. Remote Sensing in Hydrology – Enggmann
6. Remote Sensing Geology – Gupta, R.P.,
7. Hydrology and watershed Management,J NTU by B.Venkateswara Rao,G.Jagan Mohan Das,C..Sarala and M.V.S.S.Giridhar

GEO45043 Paper III –Engineering Geology

Unit I

Engineering properties of rocks, soils - specific gravity, porosity, permeability, compressive strength, hardness, toughness, percentage of wear, tensile strength, modules of elasticity, modules of compression and residual stress and their importance in construction of civil engineering structures. Quarrying.

15 hours

Unit II

Definition and parts of dam, types of dams, geotechnical consideration in selection of dam sites, case histories – Nagarjuna Sagar Dam and Srisailam Dam, Characters for investigating relative suitability, geological consideration for reservoir sites.

15 hours

Unit III

Types of tunnels, objects for geological investigations, methods of investigation, geological considerations in tunnels types of bridges, Geology for bridge sites, problems of constructing civil engineering structures in areas prone to landslides, faulting, earthquake and coastal erosion.

15 hours

Unit IV

Application of Remote Sensing and GIS in river valley projects – Dams and reservoirs, site suitability evaluation (lithological, structural, geomorphoogical considerations) – Application of Remote Sensing and GIS in seismic hazards, landslides, ghat roads, bridges, culverts, route locations (highway and railroads) canal and pipeline alignment, tunnels constructions. Site suitability evaluation (lithological, structural, geomorphological, slope, gradient, economic considerations. **15 hours**

Reference Books

1. Engineering materials – S.C. Rangwala
2. Text Book of Engineering Geology – N.Chennakesavulu.
3. Principles of Engineering Geology and Geotectonics – D.P.
4. Engineering Geology – B.S.Satyanarayana Swamy
5. Principles of Engineering Geology – K.V.G.K.Gokhele
6. Remote Sensing and Image Interpretation – Lillisand, T.M., Keifer, R.W.
7. Remote Sensing Principles and Interpretations – Sabins, F.F.

Internal Electives- Paper-IV
GEO45044-A.Environmental Geology

–

Unit I

Scope and Development of environmental geology- Renewable and non-renewable resources- land desertification and land degradation and land management, Deforestation, Afforestation. Soil Profile, origin of soils, Classification of Soils, Soil types of India, Soil conservation. **15 hours**

Unit II

Environmental degradation due to irrigation, use of fertilizers and pesticides - Urbanization and associated impact on environment. Consumption of fossil fuels and its effect on environment. Green house effect and Global warming and related problems.

15 hours

Unit III

Environmental management in mining – Impact of mining activities on the environment, erosion, causes and control. Man made hazards like multipurpose dams, power projects, heavy engineering constructions and its impacts. Water contamination- Waste disposal. **15 hours**

Unit IV

Spectral characteristics of soil. Impact assessment of anthropogenic activities such as urbanization,open cast mining and quarrying, river-valley projects, disposal of industrial and radio-active waste,dumping of ores, mine waste and fly-ash. Environmental abatement - legislative measures in India. **15 hours**

Reference Books

1. Environmental Geology – Indian context – K.S.Valdiya

2. Environmental Geology – Flawn, P.T.
3. Environmental Geology – Keller, E.A.
4. Application of Remote Sensing in Agriculture – Steven, M.D., and Clark, J.A.
5. Environmental Science and Technology – Stanley E. Manahan.

GEO45044 - B. Watershed Management

Unit- I

Watershed: Definition, scope, characteristics and classification. Topography, Channel Networks, Geomorphology and Soils, Vegetation and Land use Land Cover. Aquifers and derivation of aquifer parameters. Evaluation of aquifer characteristics.

15 hours

Unit- II

Hydrologic Processes: Hydrological Cycle, Precipitation, Interception, Evaporation and Transpiration, Infiltration and Runoff. Groundwater recharge and its estimation.

15 hours

Unit-III

Soil and Water conservation: Soil and soil erosion controlling measures on waste lands and agricultural lands and forests. soil moisture conservation, Rain Water Harvesting Structures. Artificial Recharge structures. Socio-economic impact of watershed

15 hours

Unit- IV

Integrated approach for sustainable development. Watershed management, Geospatial techniques for ground water studies and land form analysis. Participatory Rural Appraisal (PRA): Basic principles, assumptions, important types and benefits. Case studies - Ralegaon Siddhi.

15 hours

Reference Books:

1. Ground water flow and mass transport modeling for Assessment and Management of Aquifers by K.Palanisami, M.Thangarajan, and A.K.Sinha
2. Hydrology and watershed management, JNTU, by B.Venkateswara Rao, G.Jaganmohan Das, C.Sarala and M.V.S.S.Girdhar
3. Engineering Hydrology by K.Subramanyam, Tata McGraw Hill, New Delhi.

GEO45044-C.Mining Geology

Unit I

Introduction to Mining- Types of mining methods – Alluvial mining – Pan and Batea – Long tom – Sluicing (Ground Sluicing) – Derrick and cable way – Hydraulicking –Drift mining – Fore poling and Dredging Mine supports, Subsidence, Methods of breaking of rocks, Mine atmosphere, Ventilation, Drainage, Pumping,. Mining hazards and safety measures.

15 hours

Unit II

Open cast mining or quarrying – Bench mining , Glory Hole mining, Kaolin mining ; Strip mining – Rippling , Drilling and blasting , Power shovels, Dumpers, Scrapers , land dredges bucket wheel excavators, conveyor belt , Impact on Environment-Health issues –Remedies

15 hours

Unit III

Underground Coal Mining – Classification of underground Coal mining methods – Panel system , Board and pillar method, Long wall advancing, Long wall retreating , Horizon mining , Strip mining , mine supports , Lighting, Ventilation. **Underground metal mining** – Shaft Sinking methods , Gophering , Breast stopping, Open over hand Stopping , Open underhand Stopping , Underground Glory hole mining , Pillar and Chamber method, Sublevel Stopping method, Drifting .

15 hours

Unit IV

Deep Sea Mining- Operations and mining of the minerals from ocean (On the beach – placer deposits, From the Shelf – Sand and Gravel-Poly Metallic Nodules(PMN)-Methane- International Sea Bed Authority-Ecological Imbalance

15 hours

Reference Books

1) Surface and underground excavations – R. R. Tatiya
2) Principles and practices of modern coal mine-R. D. Singh
3) Mineral Deposit Evaluation: A practical approach by Alwyn E. Anne
4. Courses in Mining- Arogya Swamy
5. Mining the Ocean – T.K.S.Murthy

GEO45045 Practical -VII

Mineral Exploration-Mineral Exploration Practical Syllabus

Digital Image Processing for the study of geomorphology, structure and lineaments – Geomorphic mapping – Lineament mapping – Structural Mapping – Digital Terrain Modeling.

Hydrogeology - Calculate the Sodium Absorption Ratio (SAR), Potential Salinity (PS), Residual Sodium Carbonate (RSC), Non-Carbonate Hardness (NCH),USSL, Permeability Index (PI), Kelly‟s Ratio (KR), and Percent Sodium (PS). Trilinear and piper diagram

Engineering geology:

Determining the weathering, quality of rock by acid test, determination of soluble matter in the given rock sample; To determine the water absorption density/specific gravity of the given rock sample; To find out the percentage of wear for the given rock sample, to find out the compressive strength of a given rock sample; to find out toughness index of given rock sample, Determination of hardness of a given rock sample.

GEO45046 Practical VIII

Project work

Department of

MATERIALS SCIENCE AND NANOTECHNOLOGY

M.Sc. Materials Science and Nanotechnology (2 Year Course)

Approved Syllabus by Board of Studies for the year 2021-2022

National Education Policy - 2020

YOGI VEMANA UNIVERSITY,

KADAPA – 516 005,

ANDHRA PRADESH, INDIA

YOGI VEMANA UNIVERSITY

Department of

MATERIALS SCIENCE AND NANOTECHNOLOGY

M.Sc. Materials Science and Nanotechnology (2 Year Course)

Approved Syllabus by Board of Studies

NATIONAL EDUCATION POLICY - 2020

(Effective from the Academic Year 2021-2022)

DEPARTMENT OF MATERIALS SCIENCE AND NANOTECHNOLOGY

YOGIVEMANA UNIVERSITY, KADAPA – 516 005, ANDHRA PRADESH, INDIA

April - 2022

Members of Board of Studies

M.Sc., Materials Science and Nanotechnology

1	**Prof. M.V. Shankar** Dept of Materials Science and Nanotechnology Yogi Vemana University, Kadapa – 516 005	- Member
2	**Dr. B. Vijaya Kumar Naidu** **Associate Professor** Dept of Materials Science and Nanotechnology Yogi Vemana University, Kadapa – 516 005	- Chairman & Convener
3	**Dr. N. Ramamanohar Reddy** **Associate Professor** Dept of Materials Science and Nanotechnology Yogi Vemana University, Kadapa – 516 005	- Member
4	**Dr. S. Adi Narayana Reddy** **Associate Professor** Dept of Materials Science and Nanotechnology Yogi Vemana University, Kadapa – 516 005	- Member
5	**Dr.(Mrs.) M. Mamatha Kumari** **Assistant Professor** Dept of Materials Science and Nanotechnology Yogi Vemana University, Kadapa – 516 005	- Member
6	**Prof. S. Bala Kumar** National Center for Nanoscience and Nanotechnology Madras University, Chennai-600 025	- External Member
7	**Prof A. Subramania** Center for Nanoscience and Technology Pondicherry University, Puducherry- 605 014	- External Member
8	**Dr. K. Raghunatha Reddy** Senior Scientist, SABIC, SABIC Research & Technology Pvt Ltd. Plot No.: 81-85, Chikadaunnasandra Sarjapura, Bengalulure- 562 125	- Industry Management/ Institute
9	**Miss. Dummala Kanakamma**	- PG Meritorious Student

YOGI VEMANA UNIVERSITY
Vemanapuram, Kadapa-516 005, A.P., INDIA
(A State University, Accredited with "B" Grade by NAAC)
M.Sc. Materials Science and Nanotechnology Syllabus

(For the students admitted during the academic year 2021 – 22 onwards)

Semester	Components of Study	Course Code	Title of the Course	No. of credits	No. of hours per week	Practical/ Project	Internal Assessment	Semester End Exams	Total
SEMESTER-I	Core	MSNT 101	Concepts in Materials Science	04	04		25	75	100
		MSNT 102	Chemistry of Materials	04	04		25	75	100
		MSNT 103	Fundamentals of Polymers	04	04		25	75	100
	Internal Elective	MSNT 104	(A) Classical and Statistical Mechanics	04	04		25	75	100
			(B) Polymer Processing and Testing Methods		04				
			(C) Enhancing Soft Skills and Personality		04				
			Tutorial and Seminar	00	04		00	00	000
	Practical	MSNT 105	Practical-I Polymeric Materials Lab	04		16		100	100
	Practical	MSNT 106	Practical-II Materials Synthesis Lab	04		16		100	100
	Sub-total			24	28	32	100	500	600
SEMESTER-II	Core	MSNT 201	Quantum Mechanics	04	04		25	75	100
		MSNT 202	Properties of Bulk and Nanomaterials	04	04		25	75	100
		MSNT 203	Nanoscience and Nanocatalysis for Sustainable Future	04	04		25	75	100
	Open Elective	MSNT 204	(A) Introduction to Nanoscience and Technology	04	04		25	75	100
			(B) Fundamentals in Materials Science		04				
			(C) SWAYAM /MOOCs/ NPTEL		04				
			Tutorial and Seminar	00	04	00	00	00	000
	Practical	MSNT 205	Practical-III Study of Properties of Materials	04		16		100	100
	Practical	MSNT 206	Practical-IV Nanocatalysis Lab	04		16		100	100
	Sub-total			24	28	32	100	500	600
SEMESTER-III	Core	MSNT 301	Characterization Techniques	04	04		25	75	100
		MSNT 302	Semiconductor Physics	04	04		25	75	100
		MSNT 303	Alloys and Composites	04	04		25	75	100
	Open Electives	MSNT 304	(A) Intellectual Property Rights	04	04		25	75	100
			(B) Scientific writing in English		04				
			(C) SWAYAM /MOOCs/ NPTEL		04				
	Practical	MSNT 305	Practical-V Semiconductors Lab	04		16		100	100
	Skill Oriented Course Practical	MSNT 306	Characterization of Materials	04	04		10	40	100
						08		50	
			Tutorial and Seminar	00	04	00	00	00	000
	Sub-total			24	32	24	110	490	600

SEMESTER-IV	Core	MSNT 401	Optical, Electrical, Diffusive and Superconductivity of Bulk and Nanomaterials	04	04		25	75	100
		MSNT 402	Industrial Applications of Nanomaterials	04	04		25	75	100
		MSNT 403	Nanomaterials and Food and Agriculture	04	04		25	75	100
	Internal Elective	MSNT 404	(A) Scientific Writing Skills in English & Intellectual Property Rights	04	04		25	75	100
			(B) Energy Conversion Technologies		04				
			(C) Advanced Characterization Techniques		04				
	Practical	MSNT 405	Practical-VI Applications of Nanomaterials Lab	04		16		100	100
	Multi-Disci-plinary/ Project	MSNT 406	Project Work	04		16		100	100
	Sub-total			24	28	32	100	500	600
Grand Total				**96**	**116**	**120**	**400**	**2000**	**2400**

- All core papers are Mandatory
- Compulsory Foundation choose one paper.
- Internal/Open Elective – Choose one paper each.Open Electives are for the students of other Departments in the varsity.
- Skill Oriented course is mandatory. Relevant society along with practical (10 marks internal, 40 final theory and 50 for practical's).
- Interested students may register for SWAYAM /MOOCs/ NPTEL with the approval of the concerned DDC for the award of the grade as 'open elective'.
- Choose one from Multi-Disciplinary (Circle formation with other subjects/Dept. of Arts/ Commerce) Course or Project (Collaboration with various firms/companies/societies) work.

M.Sc., Materials Science & Nanotechnology CBCS syllabus for 2021-2024 Approved by Board of Studies

Programme : M.Sc., Materials Science & Nanotechnology
Course Title : Concepts in Materials Science

Type of Course : Core
Course No 101

Semester I

Course Objectives:

- Give basic knowledge of science behind different materials
- Introduce the concept of structure property relations.
- Lay the groundwork for studies in fields such as solid-state physics and mechanical behavior of materials,

Expected Course Outcome:

- Analyze the Structure of materials at different levels, basic concepts of crystalline materials like unit cell, FCC, BCC, HCP, APF (Atomic Packing Factor), Co-ordination Number etc.
- Describe different modes of lattice vibrations
- Explain the two methods for determining an electron's energy levels in a crystal.
- Explain how the energy structure of a crystal has energy bands and gaps.
- What makes some materials good conductors and others good insulators?
- Define the terms insulator and semiconductor.

Unit-I: Crystal Systems 15 h

Translational vectors; Lattice and Basis; Unit cell; Bravais lattices; Lattice constants, Crystal planes; Miller indices; Symmetric operations; Packing fraction; Simple cubic structures; Body centered cubic structure, Face centered cubic structure; Hexagonal close packed structure; NaCl, CsCl, Diamond and ZnS structures

Unit-II: Imperfections in Crystals 15 h

Point defects: Impurities; Vacancies - Frenkel and Schottky intrinsic vacancies; Equilibrium concentration of defects; Ionic conductivity in alkali halides; Color centers: Classification-F,F', V centers-Production of color centers

Line defects: Edge and Screw dislocations; Burger vector; Stress field around dislocations; Dislocation energy - Estimation of dislocation densities, Expression for strain energy of dislocation; Role of dislocations in crystal growth;

Plane defects: Stacking faults; Grain boundaries – Low angle grain boundaries

Unit-III: Lattice Vibrations 15 h

Lattice vibrations: Elastic vibrations of one dimensional homogeneous line; One dimensional line of atoms; Normal modes of vibrations in a finite length of lattice; The linear diatomic lattice; Phonons; Scattering of phonons by neutrons & photons

Unit IV: Band Theory of Solids 15 h

Motion of electron in periodic potential – Bloch function – Kroning – penny model- formation of energy bands in solids, Concept of effective mass, Brillouin zones- different schemes of representation of E vs K curves, Distinction between metals, insulators and semiconductors.

Text Books:

1. R. L. Singhal, Solid State Physics, Kedarnath Ramnath - Publisher
2. M.A.Wahab, Solid State Physics: Structure and Properties of Materials, Alpha Science International Ltd., (2005)
3. S.O. Pillai, Solid State Physics, Wiley Easter Ltd.(1994)
4. C.Kittle, Introduction to Solid State Physics, Wiley, 7th Edition (1995)
5. Gupta, Kumar, Sharma, Solid State Physics
6. Stephen Elliott and S.R. Elliot, The Physics and Chemistry of Solids, Wiley, 1st Edn (1998)

Malik Wahid U. Et. Al, Selected topics in inorganic chemistry, S. Chand & Co., Ltd. (2009

Programme : M.Sc., Materials Science & Nanotechnology Course Title : Chemistry of Materials

Type of Course : Core
Course No 102

Semester I

Course Objectives:

To provide the understanding of the basic concepts in

- Atoms, Molecules, Ions, electrons and periodic trends
- Chemical Bonds, Molecular Structure and Bond Theories
- To learn different preparation methods for materials
- To understand the chemical and physical methods of materials synthesis.

Expected Course Outcome:

After successful completion of this course student will be able to

- Understand the concept of atom , molecule, various type s of bonding and its theories
- Synthesize materials using chemical and physical methods
- Advantages and limitations of material synthesis suitable for diverse applications

Unit-I: Atoms, Molecules, Ions, Electrons & Periodic trends 15 h

Dalton's Atomic theory as foundation for chemistry, Structure of atoms, Ionic compounds and Chemical Nomenclature. Nature of light, Line spectra & Bohr Atom, Matter of Waves, Quantum number in Hydrogen atom, Energy level of multi-electron atom, Electrons in multi-electron atoms. Periodic table and electronic structures, Sizes of atoms & ions, Ionization Energy, Electron affinity, Trends in Chemistry of groups, IIA and VIIA

Unit-II: Chemical Bonds, Molecular structure and Bonding Theories 15 h

Lewis symbols, Ionic bonding, Covalent bonding, Formal charges & resonance in Lewis structure, Molecules that do not satisfy the octet rule, Bond energies. Valence –orbitals shell Electron-Pair repulsion Model, Polarity of molecules,Valence bond theory, Multiple bonds, Molecular orbitals: Homonuclear Diatomic Molecules, Heteronulear Diatomic Molecules & Delocalized Molecular orbitals.

Unit-III Materials Synthesis by Chemical Methods15 h

Nanomaterials synthesis by Top-down-intermediate-bottom-up approaches. Bulk and nanomaterials synthesis by using Sol-gel process, Co-precipitation method, Colloidal synthesis, Hydro/solvothermal method, Chemical reduction method, Bio-synthesis using bacteria and fungi, plant mediated bio-synthesis of nanoparticle, Template synthesis, Solution combustion method, Electrochemical method.

UNIT-IV: Materials Synthesis by Physical Methods 15 h

Bulk and nanomaterials synthesis by using Inert gas condensation, Arc discharge method, Chemical Vapor Deposition (CVD), Physical Vapour Deposition (PVD), laser ablation, DC-diode sputtering, RF-magnetron sputtering, Solid state reaction route, Ball milling.

Test Books

1. M.H.Willard, Instrumental Methods of Analysis, CBS publishers, (1986)
2. M. Bersohn and J.C. Baird, An Introduction to Electron Paramagnetic Resonance, Benjamin Inc., London (1967)
3. Sivasankar, Instrumental Methods of Chemical Analysis, Oxford University Press, New Delhi (2012)
4. R. Haynes, Optical Microscopy of Materials, International Textbook Company, Glascow, 1984.
5. John J. Bozzola and Lonnie D. Russel, "Electron Microscopy", Jones and Bartlett Publishers Inc., USA, 1999.
6. H. W. Willard, L. L. Merritt and J. A. Dean, Instrumental Methods of Analysis, (Affiliated East-West)
7. D. A. Skoog and D. M. West (Holt, Rinehart and Wilson) Principles of Instrumental Analysis.
8. Nanomaterials, Nanotechnologies and Design - M.F.Ashby, P.J.Ferreira, D.L.Schodek, Elsevier (2009).
9. NANO: The Essentials – T.Pradeep, TATA McGraw Hill (2007)
10. Essentials of Nanoscience and Nanotechnology – Narasimha Reddy Katta, Prowess Publishing (2021)
11. Text book of Nanoscience and Nanotechnology - B S Murthy, P Shankar, Baldev Raj, B BRath and James Murday, Universities Press (2012).

Programme : M.Sc., Materials Science & Nanotechnology Course Title : Fundamentals of Polymers

Type of Course : Core
Course No 103

Semester I

Course Objectives:

To provide the understanding of the concepts in

- Polymers, Classification and Polymerization techniques
- Polymer molecular weight and its determination
- Physical properties of polymer and Polymer solutions

Expected Course Outcome:

After successful completion of this course student will be able to

- Define the monomer, polymer and polymerization process and the significance in each of: initiation, propagation, termination, branching; copolymerisation and blends
- Explain methods for determining molecular weight of polymers and describe the significance of melting point and glass transition temperature and rheology of polymers
- Describe the significance of polymer solubility

Unit-I: Basic Concepts in Polymers 15 h

Definition of monomer & polymer; Classification of polymers; Mechanism of polymerization - Addition (Free radical) and Condensation polymerization; Polymerization techniques - Bulk, Solution, Suspension and Emulsion; Definition of Copolymer (Random, Alternate, Block and Graft) and blends

Unit-II: Molecular Weight and its Determination 15 h

Concept of average molecular weight, Number, weight, viscosity and Z-average molecular weights; Molecular weight and degree of polymerization; Polydispersity and molecular weight distribution in polymers; Significance of molecular weight; Determination of molecular weight by membrane osmometry, viscosity and end group analysis.

Unit-III: Physical Properties 15 h

Glass transition temperature: Definition, determination of t_g and factors influencing t_g, relation between t_g and t_m and t_g of blends and copolymers

Crystallinity: Degree of crystallinity and polymer crystallization behaviour

Rheology of polymer materials: Hooke's equation; Newton's equation; Maxwell and Voigt models for visco-eleasticity; Deformation behaviour of polymer

Unit IV: Polymer Solutions 15 h

Process of dissolution; Thermodynamics of polymer dissolution; Flory-Huggins theory of polymer solutions; Nature of polymer molecules in solution; Size and shape of macromolecules in solution; viscosity of dilute polymer solutions

Test Books

1. Text Book of polymer science by Gowarikar, Sreedhar and Viswanathan, Wiley-Eastern Publications. India
2. Introduction to polymers – by R.J.Young, Chapman and Hall, U.K.
3. Organic polymer chemistry by K.J.saunders, 2nd Ed., Chapmann Hall Publications, U.K.,1988
4. Plastic materials by J. Brydson, 7th ed., Butterworth-Heineman, Elsevier (2005)
5. Industrial Polymers – by Ulrich

Programme : M.Sc., Materials Science & NanotechnologyCourse Title : Classical and Statistical Mechanics

Type of Course : Internal Elective
Course No : 104 (A)

Semester I

Course Objectives:

To provide understanding of the fundamental concepts in

- Newtonian Mechanics-Conservation Laws
- Dynamics of system of particles
- Lagrangian and Hamiltonian formulation of mechanics
- To understand the basics of statistical methods

Expected Course Outcome

After successfully completion of the course, student will be able to

- Define and understand the basic concepts in classical mechanics
- Solve problems using conservation laws, Lagrangian and Hamiltonian formulation
- Analyze the appropriateness of statistical methods

Unit-I: Basics of Newtonian, Lagrangian and Hamiltonian Mechanics 15 h

Newtonian Mechanics of one and many particle systems-Conservation laws- conservation of linear momentum, conservation of Angular Momentum and conservation of Energy. Concept of degrees of freedom, Constraints and their classification- Holonomic constraints, nonholonomic constraints-Rheonomic and Sclerlonomiccontaints, Conservative and dissipative constraints. Principle of virtual work, D'Alembert's principle, Hamilton's principle, Generalized coordinates. Derivation of Lagrange's equations of motion from Hamilton's principle, some applications of Lagrange's equations of motion-Newton's equations of motion, Simple pendulum.Generalized momentum and cyclic coordinates. Hamilton's canonical equation of motion, and application of Hamiltonian's formulation- Harmonic oscillator.

Unit-II: Canonical Transformations and Hamilton – Jacobi Theory 15 h

Canonical transformations, Legendre transformations, generating functions- four types of generating functions, Condition for transformation to be canonical, Illustration of canonical transformation. Poisson brackets, properties of poisson brackets and fundamental poisson brackets. Lagrangian brackets, Relation between Lagrangian and poisson brackets. Hamilton-Jacobi equation- Solution of one dimensional harmonic oscillator by Hamilton-Jacobi equation.

Unit-III: Ensembles & Partition functions 15 h

Foundations of statistical mechanics, specification of states of systems, relation between statistics and thermodynamics, phase space, concept of ensembles, ensemble average, Liouville's theorem.

Canonical, molecular, translational, rotational, vibrational, electronic and nuclear partition function, applications of rotational and vibrational partition functions to solids.

Unit-IV: Maxwell-Boltzman, Bose-Einestein and Fermi-Dirac Statistics 15 h

Maxwell-Boltzman statistics: Distribution of velocities, calculation of mean values, equipartition of energy, Bose-Einestein distribution; Bose-Einestein condensation, thermodynamic properties of an idea Bose-Einestein gas; Ideal Fermi-Dirac Gas, Fermi-Dirac Distribution, degeneracy.

Text Books:

1. Classical Mechanics by N.C. Rana and P.S. Joag (Tata Mc;graw Hill) 1991
2. Classical Mechanics by H. Goldstein (Addi Wesly) 1980
3. Introduction to Classical Mechanics by R. G. Takwale and P.S. Puranic
4. Classical Mechanics by J.C. Upadhyaya, Himalaya Pub.house, Mumbai
5. Introduction to IR & Raman Spectroscopy, N.B. Calthrup, L.N. Daly & S.E. Wiberlay, Academic Press, New York 1964.
6. B.K. Agarwal, Statistical Mechanics, Melvin Einser
7. ESR Gopal, Statistical Mechanics and Properties of Matter
8. F. Reif, Statistical and thermal physicsC. Kittel, Elementary Statistical Mechanics

Programme : M.Sc., Materials Science & Nanotechnology Course Title : Polymer Processing and Testing Methods Type of Course : Internal Elective

Course No : 104 (B)

Semester I

Course Objectives:

To provide the understanding of the concepts in

- Plastic additives
- Polymer processing techniques
- Polymer Testing Methods

Expected Course Outcome:

After successful completion of this course student will be able to

- Understand the significance of additives in polymer processing
- Explain the various polymer processing techniques and Understand the importance of polymer testing

Unit-I: Plastic Additives 15 h

Additives: Type of plastic additives - fillers, plasticizers and softeners, lubricants and flow promoters' anti aging additives, flame retardants, colourants, blowing agents' cross linking agents, photo stabilizers, Nucleating agents; Equipment used for compounding-the fabricator, raw material forms and mixing.

Unit–II: Extrusion and Fibre Spinning 15 h

Extrusion: Extrusion line; Extruder screw-single and twin screw; Mixing zones

Fibre spinning: Spinning process; Spinnerets; Melt, dry and wet spinning

Unit-III: Injection and Blow moulding of Plastics

Injection moulding: Process details of plunger and reciprocating screw type injection moulding,

Components of a basic mould

Blow moulding: Basics of extrusion and injection blow moulding.

Unit-IV: Testing of Polymers 15 h

Mechanical Properties: Short term strength - Tensile properties, compression properties, flexural properties, shear properties, impact resistance, toughness, tear resistance, abrasion resistance and hardness. Long term strength - Dynamic stress and strain properties and their measurement, creep, stress relaxation, fatigue properties, flexing, resilience.

Electrical Properties: Insulation resistance, volume resistivity, surface resistivity, breakdown voltage, dielectric strength, arc resistance, dielectric constant, power factor

Text Books:

1. Text Book of polymer science by Gowarikar, Sreedhar and Viswanathan, Wiley-Eastern Publications. India
2. Organic polymer chemistry by K.J.saunders, 2nd Ed., Chapmann Hall Publications, U.K.,1988
3. Plastic materials by J. Brydson, 7th ed., Butterworth-Heineman, Elsevier (2005)
4. Polymer processing by D.H. Morton Jones, Chapman and Hall, UK.
5. Polymer mixing Technology: George Mathews,applied science Publishers.
6. Hand book of plastics testing technology – by Vishu Shah, Wiley-Inter science Publications.
7. Polymer Science & Technology by Joel R.Fried, 2nd edition, Prentice-Hall of India, New Delhi.

M.Sc., Materials Science & Nanotechnology CBCS syllabus for 2021-2024 Approved by Board of Studies

Programme : M.Sc., Materials Science & Nanotechnology
Course Title : Enhancing Soft Skills and Personality

Type of Course : Internal Elective
Course No : 104 (C)

Semester I

Course Objectives:

- To provide basic understanding on planning and goal setting of a concept
- To enable them to formulate good habit making skills
- To empower them with e-mail etiquettes

Expected Course Outcome:

After successful completion of this course student will be able to
- Make a plan to achieve a target of their choice
- Practice the e-mail protocol while sending e-mails
- Efficiently utilize the presentation skills

Unit-I: Introduction 15 h

Understanding Human Perceptions: An Introduction to a Revolutionary New Approach to Learning, Planning, and Goal-Setting Human Perceptions: An Introduction to a Revolutionary New Approach to Learning, Planning, and Goal-Setting Types of soft skills include: understanding people, recognising patterns, and problem solving. The development of self-management skills, the pursuit of excellence: the development of potential and self-actualization, the achievement of goals, and the development of spiritual intelligence

Unit-II: Habits 15 h

Good and Bad Habits, the Habit Cycle, Breaking Bad Habits, Using the Zeigarnik E ect For Productivity and Personal Growth, and Forming Habits of Success

Unit-III: Technology And Communication 15 h

Technology And Communication: Techno Personality, Mobile Personality, E-mail rules, how not to send emails! Manners and etiquette and E-Mail Protocol

Unit-IV: Presentation Skills 15 h

Presentation Skills: overcoming challenges, being an expert, analyzing body language, incorporating multimedia, and so on. Reading Comprehension, Human Relations: Building Faith and Integrity.

References:

1. Butterfield, Jeff. Soft Skills for Everyone. New Delhi: Cengage Learning. 2010.
2. Chauhan, G.S. and Sangeeta Sharma. Soft Skills. New Delhi: Wiley. 2016.
3. Kumar, Sanajy and PushpLata. Communication Skills. New Delhi: OUP. 2011.
4. Thorpe, Edgar and Showick Thorpe. Winning at Interviews. Pearson Education. 2004.

M.Sc., Materials Science & Nanotechnology CBCS syllabus for 2021-2024 Approved by Board of Studies

Programme : **M.Sc., Materials Science & Nanotechnology**
Course Title : **Polymer Materials Lab**

Type of Course : Practical -I
Course No 105
Semester I

1. Estimation of carboxylic functional group
2. Estimation of monomer
3. Identification of plastics by simple tests
4. Synthesis of polymers (PS and PMMA) by bulk Polymerization
5. Synthesis of polymers (PS and PMMA) by solution polymerization
6. Synthesis of PAN by precipitation Polymerization
7. Determination molecular weight of a polymer by viscometer and end group analysis methods
8. To study the effect of solvents on viscosity of polymer using viscometer.
9. Size of the molecule: To determine the intrinsic viscosity, Huggins and Kramer's constants, viscosity average molecular weight and hence root mean square end to end length and expansion coefficient of the given polymer using viscometer
10. Study the miscibility of the polymer blend using refractometer and viscometry

Programme : M.Sc., Materials Science & Nanotechnology

Course Title : Material Synthesis Lab

Type of Course : Practical - II

Course No 106

Semester I

1. Synthesis of SnO_2 nanoparticles by co-precipitation method
2. Synthesis of ZnO_2 nanoparticles by sol-gel method
3. Solid state synthesis of ZnO nanorods
4. **Synthesis of Fe^0 nanoparticles by chemical reduction method using $NaBH_4$ solution**
5. **Nanocomposite (TiO_2/Fe_2O_3) preparation by wet-chemical method.**
6. Synthesis Of Silver Nanoparticles By Chemical Reduction Method.
7. Synthesis of MgO_2nanoparticle by hydrothermal method.
8. **Synthesis of Nickel ferrite nanoparticles by co-precipitation method.**
9. **Synthesis of CdSe nanoparticles by simple wet chemical method.**
10. Synthesis of Bimetallic nanoparticles by wet chemical method.

M.Sc., Materials Science & Nanotechnology CBCS syllabus for 2021-2024 Approved by Board of Studies

Programme : M.Sc., Materials Science & Nanotechnology
Course Title : Quantum Mechanics

Type of Course : Core
Course No 201

Semester II

Course Objectives:

- To provide understanding of the basic concepts in the quantum mechanics
- To provide basic knowledge on various approximation methods on perturbation for solving modern physics problems
- To understand the formulation of relativistic quantum mechanics

Expected Course Outcome:

After successfully completion of the course, student will be able to

- Define and derive various operators in quantum mechanics
- Grasp the concepts in angular momentum, spin and their quantization and addition rules
- Solve problems on oscillators, planetary motion and atomic models using various approximation methods

Unit-I: Postulates of Quantum Mechanics 15 h

Postulates of quantum mechanics, Eigen values and Eigen functions for finite well and barrier, Simple harmonic oscillator byoperator method.

Liner vector space-Ket and Bra notations, Observables as Hermitian operators, Properties of Hermitian operators, Matrix representation of and operator, Unitary transformation.

Unit-II: Angular Momentum 15 h

Orbital angular momentum – L_x, L_y, L_z, L^2, L_+, L_-operators; Commutation of operators, Eigen functions and Eigen values of J^2 and J_z, Spin angular momentum, Eigen functions and Eigen values of Spin angular momentum and matrices, Addition of angular momenta, Clebsch-Gordon coefficients for $J_1=J_2 = ½$.

UNIT-III: Approximate Methods 15 h

Time independent nondegenerate perturbation- Anhormonic oscillator, Variation method-He atom, Harmonic perturbation, WKB approximation- Connecting formulae- Application to potential well and potential barrier, Quantization and tunnelling, Time dependent perturbation, Transition - Harmonic

perturbation and Fermi Golden rule.

UNIT-IV: Relativistic Quantum Theory 15 h

Klein – Gorden equation, Probability current density, Inadequacy of K. G. equation, Dirac's linear equation-plane wave solution; Negative energy states and spin of electrons.

Text Books:

1. Arul Das, Quatntum Mechanics
2. S.L. Kakani and H.M. Chandalia, Quantum Mechanics
3. B.S. Rajput and Pragatiprakasan, Advanced quantum Mechanics
4. V.K. Thankappan, Quantum Mechanic, Wiley Eastern Limited
5. P.M. Methews and K. Venkatesan, A Textbook of Quantum Mechanics, Tata McGraw Hill Publishing Company.
6. S. L. Gupta, V. Kumar, H.V. Sharma and R. C. Sharma Jai, Quantum Mechanics, Rakash Nath and Company.
7. P.T. Mathews, An Introduction to Quantum Mechanics, McGraw Hill Publishing Company

Programme : M.Sc., Materials Science & NanotechnologyCourse Title : Properties of Bulk and Nanomaterials

Type of Course : Core
Course No 202

Semester II

Course Objectives:

The goal of this course is to educate students with a fundamental grasp of the electrical, magnetic, and optical properties of materials, as well as to use those fundamentals in the selection and development of materials for various applications.

Expected Course Outcome:

- Understand the conductivity, semiconductivity, superconductivity, dielectricity, ferroelectricity, and piezoelectricity of materials.
- Distinguish between diamagnetic, paramagnetic, ferromagnetic, ferromagnetic, and antiferromagnetic material behaviour.
- Semiconductor synthesis and processing for engineering applications
- Investigate the effect of material qualities on composition, structure, and temperature.
- Explain how light interacts with materials and what happens at the interface.
- Understand the principles of operation of solid-state devices, for example.

Unit-I: Dielectric and Ferroelectric Properties 15 h

Dielectric properties: Dielectric polarization; Dielectric constant and displacement vector; Atomic or molecular polarizability; ClausiusMossotti relation; Types of polarizability - Dipolar polarizability, Frequency dependence of dipolar polarizability; Ionic polarizability; Electronic polarizability

Ferroelectric properties: Classification and properties of ferroelectrics; Ferroelectric domains; Dipole theory of ferroelectricity; Theory of $BaTiO_3$; Dielectric behaviour of $BaTiO_3$ and determination of transition constants; Titanium and oxygen ion displacement theories; Anti-ferroelectricity and piezoelectricity; Effect of particle size on ferroelectrics

Unit-II: Magnetic Properties 15 h

Classification; Weiss filed theory; Temperature dependence of spontaneous magnetization; Heisenberg model; Exchange; Exchange interaction; Exchange integral; Concept of ferromagnetic domains;

Antiferromagnetism: Molecular field theory of Antiferromagnetism; Ferrimagnetism – Introduction; Structure of ferrites; Curie temperature and susceptibility of ferromagnets; Garnets; Occurrence of super paramagnetism; Effect of nano size particles on domain structures and other magnetic properties

Unit-III: Mechanical Properties 15 h

Concept of stress and strain; Hook's law; Stress strain behaviour; Anelasticity; Elastic properties of materials -Young's modulus, bulk modulus, shear modulus and Poissson's ratio; Plastic deformation -

Yielding and yield strength, tensile strength, ductility, resilience, toughness, true stress and strain and hardness; Creep of soft materials;

Effect of nanodimensions on mechanical properties- Elastic properties, hardness and strength, tensile ductility and strain hardness, creep and super-plastic behaviour, fracture and toughness

Unit-IV: Thermal Properties 15 h

Specific heat of solids – The classical model, the Einstein model, the Density of states; The Debye's model; Thermal conductivity of solids; Conductivity due to electrons and phonons; Thermal expansion of solids; Thermal properties of nonmaterials

Text Books:

1. R. L. Singhal, Solid State Physics, KedarNath Ram Nath& Co.;, India
2. Material science and engineering An introduction by W.D. Callister, Jr, John wiley and Sons
3. Wahab, Solid State Physics
4. Kittle, Introduction to Solid State Physics
5. Gupta, Kumar, Sharma, Solid State Physics
6. S.O.Pillai, Solid-State-Physics
7. Nanostructures and Nanomaterials by Guozhong Cao, Imperial college Press
8. Textbook of Nanoscience and Nanotechnology by B.s. Murthy, P. Shankar, Baldev Raj, B.B. Rath and J. Murday, Universities Press InidaPvt Ltd.

M.Sc., Materials Science & Nanotechnology CBCS syllabus for 2021-2024 Approved by Boardof Studies

Programme : M.Sc., Materials Science & Nanotechnology

Course Title : Nanoscience and Nanocatalysis for sustainable future

Type of Course : Core

Course No203

Semester II

Course Objectives:

To provide the understanding of the basic concepts in

- Familiarize the students with basics of nanoscience, basics and synthesis of nanocatalysts.
- Enhancing the knowledge of the students in the area of Nanophotocatalysis and its process.
- Study on the development of efficient photocatalysts for cleaner hydrogen fuel production.
- Gain broad knowledge on carbon nanostructures for detoxification of pollutants

Expected Course Outcome:

After successful completion of this course student will be able to

- Describe the importance of nanosciene, nanomaterials in catalysis and synthesis of microporous and mesoporous materials.
- Explain the principles and process involved in photocatalysis, role of nanoscience to improve photocatalytic performance.
- Different mechanisms involved in photoexcitons generations and surface interactions for photocatalytic hydrogen generation and its evidences.
- Describe the photocatalytic experimental procedure and quantification of hydrogen generation, parametric effects and different types of nanocomposites used for this application.
- Elaborate various carbon nanostructures used as sensitizer and co-catalysts for photocatalytic degradation of major and emerging pollutants.

Unit-I: Basic Concepts in Nanoscience and catalysis 15 h

Scientific Revolution - Feynman's Vision – Nanoscience – Nanotechnology – Nanomaterials - Classification of Nanomaterials - dimensions, confinement - Surface to volume ratio - Energy at bulk and nanoscale - Nature Nanophenomena – Size dependent variation in Physical and Chemical properties; Nanomaterials synthesis by Top-down-intermediate-bottom-up approaches (with one example each); Homogeneous and Heterogeneous Catalysis – Characteristics of Catalytic Reactions - Promotors – Catalytic Poisoning – Activation Energy and Catalysis – Intermediate compound formation theory – Adsorption theory – Acid-base Catalysis and its mechanism – Synthesis of zeolite via dry gel method and mesoporous SBA-15.

Unit-II: Nanophotocatalysts and its process 15 h

Photocatalysis – definition and principle – Requirements for efficient photocatalysts and energy band potential diagram - Benefits of nanoscience in photocatalytic process–particle size, morphology, surface area, catalytic active sites, surface-interface properties. Photocatalytic Water Splitting – photon absorption, excitons separation, carrier diffusion, carrier transport, catalytic efficiency and mass transfer.

Mechanism for overall water splitting and alcoholic aqueous solution – Role and choice of co-catalyst, factors influencing hydrogen generation performance-Opportunities and challenges. Excitons transfer mechanisms: type I, type II, type III heterojunctions - surface plasmonic resonance - Z scheme, schottky, p-n and S-type heterojunctions. Experimental evidence for photo-excitons recombination, band gap and band structure.

Unit-III: Nanocomposite photocatalysts for sustainable hydrogen production 15 h

Solar photocatalytic hydrogen generation experimental protocol and hydrogen gas quantification. Parametric studies-organic and inorganic sacrificial agents-co-catalyst loading-light source (UV, visible, UV-visible and solar light) and light intensity-catalyst stability-recyclability-reusability – Types of photoreactors. Efficiency calculation-Quantum yield-solar energy conversion efficiency-apparent quantum efficiency-turn over frequency. Single material photocatalyst-nanostructured titania-doping-metal deposition-defect engineering-dye sensitization; binary/ternary nanocomposites-semiconductor/semiconductor, semiconductor/metal and alloy-Future directions for green hydrogen production.

Unit-IV: Carbon nanostructures and photocatalytic detoxification of pollutants 15 h

Carbon nanostructures in photocatalysis – carbon nanotubes - graphene – graphene oxide – graphitic carbon nitride - carbon quantum dots as visible light harvester and co-catalyst. Hierarchical core/shell photocatalysts - parameters affecting efficiency. Photocatalytic mechanism for environmental remediation - Application for pollutants removal - pesticides, plastics, heavy metals, pathogens and carbon dioxide. Parameters affecting photocatalytic degradation - initial concentration of dye, solution pH, catalyst amount, nature of oxidizing agent and temperature. Future perspectives in photocatalyst design - decontamination of micro pollutants in air/water.

Text books:

1. Textbook of Nanoscience and Nanotechnology, B S Murthy, P Shankar, Baldev Raj, B B Rath and James Murday, Universities Press (2012)
2. M.F.Ashby, P.J.Ferreira, D.L.Schodek, Nanomaterials, Nanotechnologies and Design- An Introduction for Engineers and Architects, Elsevier (2009).
3. Essentials of Nanoscience and Nanotechnology – Narasimha Reddy Katta, Prowess Publishing (2021)
4. Essentials of Physical Chemistry, Arun Bahl, B.S. Bahl, G.D. Tuli, S.Chand, Revised Edition 2012.
5. Nanoporous Materials: Synthesis and Applications, Edited by Qiang Xu, CRC Press, 2013
6. Photocatalysis, Edited by Masao Kaneko, Ichiro Okura, Springer, 2003.
7. Photocatalysis and Water Purification - From Fundamentals to Recent Applications, Pierre Pichat (Editor), Wiley-VCH Verlag GmbH &Co. K Ga A, Boschstr. 12, 69469 Weinheim, Germany 2013.
8. Testing Novel Water Oxidation Catalysts for Solar Fuels Production, Ed. By CarminnaOttone, Simelys Hernández, Marco Armandi, Barbara Bonelii, Springer, 2019.

Programme : M.Sc., Materials Science & Nanotechnology Course Title : Introduction to Nanoscience and Technology Type of Course : Open Elective

Course No : 204 (A)

Semester II

Course Objectives:

To provide the understanding of the basic concepts in

- Nanoscience and size-dependent properties.
- Different methods for preparation of nanomaterials.
- Selective characterization methods for nanomaterials and nanostructures
- Applications in energy, environment and agricultural sectors.

Expected Course Outcome:

After successful completion of this course student will be able to

- Explain classification of materials and understand the improvement in physico-chemical properties of nanomaterials.
- Describe the nanomaterials synthesis via solid-state, solution-based, gas-phase and biological methods.
- Demonstrate the properties of nanomaterials through spectroscopy, microscopy and surface- area measurements.
- Understand the important applications of nanomaterials in energy generation and storage, precision agriculture, industrial wastewater treatment and gas phase pollutants removal.

UNIT-I: Concepts in Nanoscience 15 h

Scientific Revolution - Feynman's Vision – Nanoscience – Nanotechnology – Nanomaterials - Classification of Nanomaterials - dimensions, confinement - Surface to volume ratio - Energy at bulk and nanoscale - Nature Nanophenomena – Size dependent variation in Physical- Chemical- Catalytic properties.

UNIT-II: Synthesis of Nanomaterials 15 h

Nanomaterials synthesis by Top-down-intermediate-bottom-up approaches (with one example each) Sol-gel technique, Hydrothermal method, Solid state combustion route, Arc discharge method, Chemical Vapor Deposition, High Energy Ball milling, Bio-Nanoparticles using bacteria, fungi and algae.

UNIT-III: Characterization of Nanomaterials and nanostructures 15 h

UV-Visible spectroscopy (DRS) - Scanning Electron Microscopy – Tunneling Electron Microscopy – Particle Size measurement – surface area and pore size analysis.

Unit-IV: Applications of Nanotechnology 15 h

Energy generation and storage: hydrogen fuel generation via photocatalysis and energy storage in supercapacitors; Nanotechnology in agriculture-Precision farming, Smart delivery system-

Nanofertilizers: Nanourea and mixed fertilizers; Applications of nanotechnology in the remediation of Pollution in industrial and wastewater treatment-Drinking water and Air/Gas purifications.

Text books:

1. M.F.Ashby, P.J.Ferreira, D.L.Schodek, Nanomaterials, Nanotechnologies and Design- An Introduction for Engineers and Architects, Elsevier (2009).
2. Introduction to Nanotechnology, Charles P. Poole, Jr. Frank J. Owens, A John Wiley 81Sons, Inc., Publication, (2003).
3. Nanotechnology: Applications in Energy, Shafiquzzaman Siddiquee, Gan Jet Hong Melvin, and Md. Mizanur Rahman, Drug and Food, Springer, Cham, (2019).
4. C. Kumar, Nanomaterials for Medical Diagnosis and Therapy, Wiley –VCH, USA, (2007).
5. Wiesner M R and Bottero JY, Environmental Nanotechnology: Applications and Impacts of Nanomaterials, McGraw-Hill New York,(2007).
6. NANO: The Essentials – T.Pradeep, TATA McGraw Hill (2007).
7. Essentials of Nanoscience and Nanotechnology – Narasimha Reddy Katta, Prowess Publishing (2021)

M.Sc., Materials Science & Nanotechnology CBCS syllabus for 2021-2024 Approved by Boardof Studies

Programme : M.Sc., Materials Science & NanotechnologyCourse Title : Fundamentals in Materials Science

Type of Course : Open Elective
Course No : 204 (B)

SemesterII

Course Objectives:

- Give basic knowledge of science behind different materials
- Introduce the concept of structure property relations.
- Lay the groundwork for studies in fields such as solid-state physics and mechanical behavior of materials,

Expected Course Outcome:

- Analyze the Structure of materials at different levels, basic concepts of crystalline materials like unit cell, FCC, BCC, HCP, APF (Atomic Packing Factor), Co-ordination Number etc.
- Describe different modes of lattice vibrations
- Explain the two methods for determining an electron's energy levels in a crystal.
- Explain how the energy structure of a crystal has energy bands and gaps.
- What makes some materials good conductors and others good insulators?
- Define the terms insulator and semiconductor.

Unit-I: Crystal Systems 15 h

Translational vectors; Lattice and Basis; Unit cell; Bravais lattices; Lattice constants, Crystal planes; Miller indices; Symmetric operations; Packing fraction; Simple cubic structures; Body centered cubic structure, Face centered cubic structure; Hexagonal close packed structure; NaCl, CsCl, Diamond and ZnS structures

Unit-II: Imperfections in Crystals 15 h

Point defects: Impurities; Vacancies - Frenkel and Schottky intrinsic vacancies; Equilibrium concentration of defects; Ionic conductivity in alkali halides; Color centers: Classification-F,F', V centers-Production of color centers

Line defects: Edge and Screw dislocations; Burger vector; Stress field around dislocations; Dislocation energy - Estimation of dislocation densities, Expression for strain energy of dislocation; Role of dislocations in crystal growth;

Plane defects: Stacking faults; Grain boundaries – Low angle grain boundaries

Unit-III: Lattice Vibrations 15 h

Lattice vibrations: Elastic vibrations of one dimensional homogeneous line; One dimensional line of atoms; Normal modes of vibrations in a finite length of lattice; The linear diatomic lattice; Phonons; Scattering of phonons by neutrons & photons

Unit IV: Band Theory of Solids 15 h

Motion of electron in periodic potential – Bloch function – Kroning – penny model- formation of energy bands in solids, Concept of effective mass, Brillouin zones- different schemes of representation of E vs K curves, Distinction between metals, insulators and semiconductors.

Text Books:

1. R. L. Singhal, Solid State Physics, Kedarnath Ramnath - Publisher
2. M.A.Wahab, Solid State Physics: Structure and Properties of Materials, Alpha Science International Ltd., (2005)
3. S.O. Pillai, Solid State Physics, Wiley Easter Ltd.(1994)
4. C.Kittle, Introduction to Solid State Physics, Wiley, 7th Edition (1995)
5. Gupta, Kumar, Sharma, Solid State Physics
6. Stephen Elliott and S.R. Elliot, The Physics and Chemistry of Solids, Wiley, 1st Edn (1998)
7. Malik Wahid U. Et. Al, Selected topics in inorganic chemistry, S. Chand & Co., Ltd. (2009)

M.Sc., Materials Science & Nanotechnology CBCS syllabus for 2021-2024 Approved by Boardof Studies

Programme : M.Sc., Materials Science & Nanotechnology
Course Title : SWAYAM /MOOCs/ NPTEL

Type of Course : Open ElectiveCourse No : 204 (C)
Semester II

The following course can be opted by students from open platforms of NPTEL

1. Materials Science and Engineering
2. Advanced Condensed Matter Physics

M.Sc., Materials Science & Nanotechnology CBCS syllabus for 2021-2024 Approved by Boardof Studies

1. **Programme : M.Sc., Materials Science & Nanotechnology**
2. **Course Title : Study of Properties of Materials**
3. **Type of Course: Practical - III**
4. **Course No 205**
5. **Semester II**

1. Determination of lattice constant of a mono-atomic lattices
2. Determination of lattice constant of di-atomic lattices
3. Creep behavior of materials
4. Hysteresis behavior of magnetic materials
5. Di-electric behavior of ferroelectric materials
6. Thermal expansion of materials
7. Initial permeability of magnetic materials
8. Determination of specific heat of materials
9. Determination of specific heat of a graphite with a change in temperature
10. Thermal conductivity of materials

Programme : M.Sc., Materials Science & Nanotechnology Course Title : Nanocatalysis Lab

Type of Course : Practical -IV
Course No 206

Semester II

1. Study on Adsorption Properties of porous and non-porous materials
2. Solar Photocatalytic degradation of Methyl Orange dye in aqueous solution using ZnO or CdS photocatalyst
3. Solar hydrogen generation using Cu/TiO_2 photocatalyst
4. Semiconductor Band Gap Engineering – Synthesis of N-doped ZnO
5. Photochemical deposition of copper nanoparticles on anatase TiO_2 photocatalyst under solar light irradiation.
6. Hydrothermal Synthesis of Zeolite.
7. Synthesis of Mesoporous material by template assisted method.
8. Synthesis of $H_2Ti_3O_7$ nanotubes using alkaline hydrothermal.
9. Synthesis of ternary nanocomposite heterojunction photocatalyst.
10. Preparation of semiconductor-alloy bimetallic photocatalyst.

Programme : M.Sc., Materials Science & NanotechnologyCourse Title : Characterization Techniques

Type of Course : Core
Course No 301

Semester III

Course Objectives:

Students will master the fundamentals of thermal and electron microscopy, other spectroscopic techniques

Expected Course Outcome:

- to explore the microstructure of materials at high resolution using appropriate electron microscopy techniques.
- determine the specimen's thermal stability and thermodynamic changes using thermal analysis techniques

Unit-I: Microscopic Techniques 15 h

Surface topography, Principle, Instrumentation and applications of Electron microscopy, Scanning electron microscopy (SEM),Transmission electron microscopy (TEM), Scanning Probe Microscopy (SPM), Scanning tunnelling electron microscopy (STM), Atomic force microscopy (AFM).

UNIT-II: Thermal Analysis 15 h

Principles, Instrumentation and applications of ThermogravimetricAnalalysis (TGA), Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC), Thermo-mechanical Analysis (TMA); Understanding of curing kinetics and thermal decomposition reactionto ceramics and polymers.

Unit-III: Chromatographic Techniques 15 h

Chromatographic Parameters - Paper Chromatography (PC), Thin Layer Chromatography (TLC), Column Chromatography (CC), Ion Exchange Chromatography (IEC). High Performance Liquid Chromatography (HPLC): Principle, Instrumentation, pumps, columns, Detectors and Applications of HPLC. Gas Chromatography (GC): Principle, Instrumentation, columns, Detectors and Applications of GC.

UNIT-IV: Raman Spectroscopy 15 h

Classical and quantum theory of Raman effect. Stokes and anti-Stokes Raman lines, Pure rotational Raman spectra, Linear symmetric, top and spherical top molecules, vibrational Raman spectra, Complementary nature of IR and Raman spectra. Structure determination using Raman spectra, Experimental techniques and instrumentation.

Text Books:

1. M.H.Willard, Instrumental Methods of Analysis, CBS publishers, (1986)
2. M. Bersohn and J.C. Baird, An Introduction to Electron Paramagnetic Resonance, Benjamin Inc., London (1967)
3. Sivasankar, Instrumental Methods of Chemical Analysis, Oxford University Press, New Delhi (2012)
4. R. Haynes, Optical Microscopy of Materials, International Textbook Company, Glascow, 1984.
5. John J. Bozzola and Lonnie D. Russel, "Electron Microscopy", Jones and Bartlett Publishers Inc., USA, 1999.
6. H. W. Willard, L. L. Merritt and J. A. Dean, Instrumental Methods of Analysis, (Affiliated East-West)
7. D. A. Skoog and D. M. West (Holt, Rinehart and Wilson) Principles of Instrumental Analysis.
8. Nature (2000) Microscopy Techniques(2004)

Programme : M.Sc., Materials Science & Nanotechnology Course Title : Semiconductor Physics

Type of Course : Core
Course No 302

Semester III

Course Objectives:

- To provide basic understanding on the basic concepts in semiconductors
- To explain different scattering mechanism leading to resistivity in materials
- To understand the concept of p-n junction diode and various parameters affecting the I-V characteristics
- To understand the two junction devices and its applications.

Expected Course Outcome:

After successfully completion of the course, student will be able to

- Depict the energy variation in Fermi level with respect to temperature
- Explain as to why conductivity increases or decreases in a material
- Distinguish between real and ideal diode with a practical aspect

UNIT-I: Basic Aspects of Semiconductors 15 h

Intrinsic and extrinsic semiconductors, Expression for position of Fermi levels and carrier concentrations,Variation of Fermi levels with temperature,np product,Carrier mobility, Conductivity and their variation with temperature, Direct and indirect band gap semiconductor, Hall effect, Drift and Diffusion, Einstein relation.

Unit-II: Transport Phenomenon 15 h

Concept of electrical resistivity, thermal resistivity, Different scattering mechanisms contributing to thermal resistivity, Matheissens rule, Formulation of Boltzmann transport equation, Distribution function, Expression for thermal and electrical conductivities for metals, Lorenz number.
Somerfield model: its consequences, Electron-Lattice interaction (Quantitative only),

Unit-III: Junctions and ideal diode 15 h

p-n Junctions: Description of p-n Junction action, Junction in equilibrium,Application of bias- energy band diagrams, The abrupt junction- Calculation of the built-in voltage, Electric field and potential distributions, Expression for Depletion layer capacitance. Static-I-V characteristics of p-n junction diodes: The ideal diode model, Derivation of ideal diode equation.

Unit-IV: Real diode and types of breakdown 15 h

Real diodes- Carrier generation, recombination in the junction depletion region, I-V characteristics of Real Diodes.

Electrical breakdown in p-n junctions: Zener and Avalanche breakdown in p-n junctions, Distinction between the Zener and avalanche breakdown, Applications of breakdown diodes.

Text Books:

1. M.H.Wahab, Solid State Physics
2. S.O Pillai, Solid State Physics
3. M. S. Tyagi, Introduction to Semiconductor Materials and Devices, John Wiley & Sons, 2004.
4. S. M. Sze, Semiconductor Devices Physics and Technology, 2nd Edition, John Wiley & Sons, 2005.
5. Kannan Kano, Semiconductor Devices, PHI, 2005.
6. Robert F Pierret, Semiconductor Device Fundamentals, Pearson Education, 2006.
7. J. L. Moll, Physics of Semiconductors**,** McGraw-Hill.
8. Ben G. Streetman and Sanjay Banerjee, Solid State Electronic Devices, VI ed, Pearson Ed, 2007.

Programme : M.Sc., Materials Science & Nanotechnology Course Title : Alloys and Composites

Type of Course : Core
Course No 303

Semester III

Course Objectives:

To gain a basic understanding of alloy production, ceramics structure, composites and their applications.

Expected Course Outcome:

- Understand the key terms involved with metallurgy and explain the notion of phase and phase diagram.
- Phase diagrams and reactions are constructed and identified.
- Understand and recommend heat treatment kinds and processes. The importance of characteristics in comparison to microstructure. Surface hardening and its various forms.
- Understand the concnept of ceramics structure and their applications.
- Recognize the significance of composites and its fabrication with special emphasis on FRPs

.

Unit-I: Alloys

15 h

Introduction to Alloys; Solid solution - substitutional and interstitial; Hume Rother's rules for primary substitution sold solubility; Intermediate phase – interstitial compounds, defect phase and electro valence compounds;

Shape memory alloys: General Characteristics; Nickel-titanium shape memory alloy, Cu-Zn-Al; Cu-Al-Ni alloy systems; Applications of shape memory alloys

Unit-II: Phase diagrams

15 h

Introduction; Phase rules; Unary phase diagrams – pure iron phase diagrams; Binary Phase diagrams – Ni-Cu system; Lever rule; Bi-Cd; Fe-C; Pb-Sn system; Uses of Phase diagrams; Limitations of phase diagrams

Unit-III: Ceramics

15 h

Types and Applications – Glasses, Glasss-cermaics, Clay products, Refractories, Abrasives, Cements, Advanced ceramics, Ceramic Phase diagrams; Fabrication and Processing of Glasses and Glass-Ceramics, Fabrication and Processing of Clay Products, Powder Pressing, Tape Casting

Unit-IV Composites and its fabrication

15 h

Need of composites; Classification; Components of composites; Matrix Materials – Preparation and properties of epoxy, polyesters; Reinforcements - glass, carbon and Kevlar; Fabrication methods (Emphasis on FRPs) – Hand layup, Spry dry, reaction injection moulding, compression moulding and Pultrusion

Test Books:

1. Physical Metallurgy by Vijendra Singh, Standard Publishing distributors
2. Material Science & Engineering by V. Raghavan, Prentice Hall of India
3. Physical Metallurgy- Principles, Practise by V. Raghavan, Prentice Hall of India
4. Material Science and Engineering by Callistar
5. Text Book of polymer science by Gowarikar, Sreedhar and Viswanathan, Wiley-Eastern Publications. India
6. An introduction to composite materials by Derek Hull, Cambridge University Press, Cambridge, U.K. ((1981)

Programme : M.Sc., Materials Science & Nanotechnology Course Title : Intellectual Property Rights

Type of Course : Open Elective
Course No : 304 (A)

Semester III

Course Objectives:

- To provide basic knowledge of types of intellectual property
- To educate about the application procedure of patents
- To elucidate the conflicts in patients with suitable examples

Expected Course Outcome:

After successful completion of this course student will be able to
- Understand the types of intellectual property
- Apply the knowledge of the patent filing

Unit-I: 15 h

Introduction- Invention and Creativity- Intellectual Property (IP)- importance- protection of IPR- Basic types of property (i. Movable Property, ii. Immovable Property and iii Intellectual Property.

Unit-II: 15 h

IPs- Patents- copyrights and related rights- Trade Marks and rights arising from Trademark registration- Definition- Industrial Designs and Integrated Circuits- Protection of Geographical indication at national and International levels- Application Procedures

Unit-III: 15 h

International convention relating to Intellectual Property-establishment of WIPO- Mission and activities- History -General Agreement on trade and Tarif (GATT)

UniT-IV: 15 h

Indian Positions Vs WTO and Strategies-Indian IPR legislations-commitments to WTO - Patent Ordinance and the Bill-Draft of a national Intellectual Property Policy- Present against unfair competition Case Studies- Patents (Basmati rice, aureveda)- copyright related -Trademarks- Industrial Design and Integrated Circuits-Geographic Indications- Protection against unfair competition.

References:

1. Halbert, ―Resisting Intellectual Property‖, Taylor & Francis Ltd ,2007
2. Mayall , ―Industrial Design‖, McGraw Hill, 1992.
3. Niebel , ―Product Design‖, McGraw Hill, 1974.
4. Asimov , ―Introduction to Design‖, Prentice Hall, 1962.

5. Robert P. Merges, Peter S. Menell, Mark A. Lemley, ― Intellectual Property in New
6. Technological Age‖, 2016.
7. T. Ramappa, ―Intellectual Property Rights Under WTO‖, S. Chand, 2008

Programme : M.Sc., Materials Science & Nanotechnology Course Title : Scientific Writing

Type of Course : Open Elective
Course No : 304 (B)

Semester III

Course Objectives:

- To provide basic knowledge of scientific communication
- To educate about the writing skills for methodology
- To illuminate different representations of data through figures, tables and flow charts

Expected Course Outcome:

After successful completion of this course student will be able to
- Understand the methods of scientific communication
- Apply the knowledge of scientific writing of an experiment
- Successfully depict the results with suitable forms such as diagrams, tables etc.

Unit-I: Introduction 15 h

Introduction to professional scientific communication, Discussion of creativity, research ideas and where to find them, Vocabulary.

Unit-II: Methodology 15 h

Writing Methodology: Grammar and writing skills- Build a model-Vocabulary- Writing a methodology section.

Unit-III: Results and Discussion 15 h

Writing about Results, Schematic diagrams, Figures, Tables, flow charts, Hypothesis, reasoning and testing the hypothesis, peer review.

Unit-IV: Conclusions and Abstract 15 h

Writing conclusion/Abstract: Grammar and writing skills- Build a model-Vocabulary

References:

1. Science research writing for non-native speakers of English by Hilary Glasman-Deal, Imperial college, London (2010).
2. Writing Science: How to Write Papers That Get Cited and Proposals That Get funded Illustrated Edition by Joshua Schimel
3. Writing Your Journal Article in Twelve Weeks, Second Edition: A Guide to Academic Publishing Success (Chicago Guides to Writing, Editing, and Publishing) Second Edition
   by Wendy Laura Belcher

M.Sc., Materials Science & Nanotechnology CBCS syllabus for 2018-21 Approved by Boardof Studies

Programme : **M.Sc., Materials Science & Nanotechnology**
Course Title : **SWAYAM /MOOCs/ NPTEL**

Type of Course : Open ElectiveCourse No : 304 (C)

Semester **III**

The following course can be opted by students from open platforms of NPTEL

1. Nanotechnology In Agriculture
2. Soft Nano Technology

M.Sc., Materials Science & Nanotechnology CBCS syllabus for 2021-2024 Approved by Boardof Studies

Programme : M.Sc., Materials Science & Nanotechnology
Course Title : Semiconductor Lab

Type of Course : Practical-V
Course No 305

Semester III

1. Determination of energy gap of semiconductors
2. Hall effect
3. Field emission transmitter characteristics
4. Bipolar junction transistor
5. MOSFET characteristics
6. Characteristics of zenaer-diode
7. Analysis of powder diffraction pattern
8. Lave diffraction pattern
9. Silicon solar cells
10. Solar Cell Fabrication and Characterization

Programme : M.Sc., Materials Science & Nanotechnology Course Title : Characterization of Materials

Type of Course : Skill Development Course and Practical
Course No 306

Semester III

Course Objectives:

- To provide the knowledge and hands on experience of material characterization by X-rays, UV-Vis and IR spectroscopic techniques

Expected Course Outcome:

After completion of this course students able

- to understand the fundamentals of x-ray diffraction technique and also able to elucidate crystal structure
- to understand and elucidate UV and IR techniques in identifying the chemical structure of the compounds

UNIT-I: X-ray Diffraction 15 h

Bragg's law, Laue transmission and back reflection methods, Powder Methods: Principle of powder diffraction, Interpretation of powder photographs by analytical and graphical methods, Rotating crystal Methods: Oscillation and rotation methods, Weisenberg and Burger's precession methods, Reciprocal Lattice: Geometrical construction, relation between direct- reciprocal Lattice, Reciprocal of simple cubic, BCC, FCC lattices

Unit-II: UV-Visible and IR Spectroscopy 15 h

UV-Visible spectroscopy: Introduction, Types of electronic transisitons, Effect of conjugation, Concept of chromophore and Auxochrome, Bathochromic, Hyperchromic and Hypsochromic shifts, Theory, Instrumentation, Double beam spectroscopy; Sources of radiation, Detectors, Monochromators, Applications to organic compounds and Chemical kinetics and disadvantages.

IR Spectroscopy: Vibrational energies of diatomic molecule, Infrared selection rules, Asymmetry of rotation, Hydrogen bonding, Rotational vibration spectra of polyatomic molecules, Interpretation

of vibrational spectra, Instrumentation, Fourier transform infrared spectroscopy.

Practical:

1. Indexing of planes and calculation of lattice parameter and lattice volume from XRD pattern
2. Riveted analysis of XRD
3. Calculation of crystallite size by Debye Sherrer and modified Debye Sherrer method

4. Identification of chemical structure using IR spectra
5. Estimation of lambda max of UV active substances using UV- Vis spectroscopy
6. Estimation of band gap of material using UV- Visible & DRS spectroscopy

Text Books:

1. BK Sharma, Spectroscopy, Goel Publishers House, Meerut (2007)
2. B.D. Cullity, Elements of X-ray Diffraction,
3. L.V. Azarkoff, Elements of X-ray Crystallography,
4. G.R. Chatwal and S. Anand, Spectroscopy Atomic and Molecular, Himalaya Pub. House (2004)
5. M. Bersohn and J.C. Baird, An Introduction to Electron Paramagnetic Resonance, Benjamin Inc., London (1967)
6. L.V. azarkoff and M.J. Buerger, The Powder Method in X- ray Crystallography

M.Sc., Materials Science & Nanotechnology CBCS syllabus for 2021-2024 Approved by Board of Studies

Programme : M.Sc., Materials Science & Nanotechnology

Course Title : Optical, Electrical, Diffusive and Superconductivity of Bulk and Nanomaterials

Type of Course : CoreCourse No 401

Semester IV

Course Objectives:

The goal of this course is to educate students with a fundamental grasp of the electrical, magnetic, and optical properties of materials, as well as to use those fundamentals in the selection and development of materials for various applications.

Expected Course Outcome:

- Understand the conductivity, semiconductivity, superconductivity, dielectricity, ferroelectricity, and piezoelectricity of materials.
- Distinguish between diamagnetic, paramagnetic, ferromagnetic, ferromagnetic, and antiferromagnetic material behaviour.
- Semiconductor synthesis and processing for engineering applications
- Investigate the effect of material qualities on composition, structure, and temperature.
- Explain how light interacts with materials and what happens at the interface.
- Understand the principles of operation of solid-state devices, for example.

Unit-I: Optical Properties: 15 h

Electromagnetic radiation; Light interaction with solids and Atomic and electron interactions; Optical properties of metal; Optical properties of non metals-refraction, refelction, absorption, transmission, color, opacity and translucency in insulators; Basic concepts of luminescence, photoconductivity, lasers, and optical fibers in communication;
Optical properties of nanomaterials –Surface Plasmon resonance and quantum size effects

Unit-II: Superconductivity 15 h

Concept of zero resistance, Magnetic behaviour, Distinction between a perfect conductor and superconductor,Meissner effect,Isotope effect, Specific heat behaviour, Thermal conductivity, Infrared absorption- First and second order transitions in superconductors, Londons equations,Penetration depth,

BCS theory(Qualitative aspects only), Applications of superconductors, High T_c superconductors.

Unit-III: Diffusion in Solids 15 h

Fick's laws; Diffusion mechanism; Study state diffusion; Non study state diffusion; Factors that influence diffusion; The Kirkendal effect; Diffusion in alkali halides; Ionic conductivity

Unit-IV: Electrical Properties 15 h

Ohm's law; Electrical conductivity; Electronic and ionic conduction; conduction in terms of band and atomic bonding model; electron mobility; electrical resistivity of metals; conduction in ionic materials; Electrical conductivity of semiconductors with temperature; Electrical properties of polymers
Effect of particle size on electrical properties – surface scattering, change of electronic structure, quantum transport, effect of microstructure

Text Books:

1. R. L. Singhal, Solid State Physics, KedarNath Ram Nath& Co.;, India
2. Material science and enginerring An introduction by W.D. Callister, Jr, John wiley and Sons
3. Wahab, Solid State Physics
4. Gupta, Kumar, Sharma, Solid State Physics
5. S.O.Pillai, solid-state-physics
6. Nanostructures and Nanomaterials by Guozhong Cao, Imperial college Press
7. Textbook of Nanoscience and Nanotechnology by B.s. Murthy, P. Shankar, Baldev Raj, B.B. Rath and J. Murday, Universities Press InidaPvt Ltd.

Programme : M.Sc., Materials Science & Nanotechnology Course Title : Nanotechnology for Food and Agriculture Type of Course : Core

Course No 402

Semester IV

Course Objectives:

To provide the understanding of the basic concepts in

- Sensors and benefits of nanosensors for agricultural applications.
- Precision agricultural farming.
- Encapsulation for controlled release of nutrients.
- Nanocomposites based food-packing materials.

Expected Course Outcome:

After successful completion of this course student will be able to

- Explain chemical and biological sensors, its role in soil, seed and food monitoring.
- Describe the different types of nanomaterial used for smart delivery of pesticides and fertilizers formulations.
- Demonstrate the principles and technologies involved in encapsulation of fertilizer and pesticides in micro and nanoporous materials.
- Elucidate the importance of packing in food industry to preserve the solid and liquid food.

UNIT-I: Sensors for soil, seed and food monitoring **15 h**

Introduction and importance – Various sensing methods – Chemical and biosensors. Sensors for monitoring soil, seed and food. Nanomaterials for Intelligent sensors.

UNIT-II: Functional materials and Nanofertilizers **15 h**

Functional materials for food and agriculture use - Super absorbent polymers, coatings, aerosols. Zeolites, Nano-clays, Nano emulsion–Nanofertilizer- Synthesis and Characterization. Fungicides, herbicides – pesticides. Types of nano-formulations – encapsulation of pesticides. Release studies, smart delivery - bio- efficacy and bio-safety.

Unit-III: Micro-nano encapsulation 15 h

Encapsulation – Principles – micro and nano-encapsulation – Release mechanism –Encapsulation versus traditional delivery method - Sorption and release of nutrients. Encapsulation technologies – extrusion –

spray chilling – spray coating – spray drying – emulsion – gel particles.

Unit-IV: Nanocomposites and food packaging **15 h**

Food packaging- Introduction and scope. Polymer films and Nano composites – bio-nano composites - Fabrication process – equipments used - testing standards - Nano material in food packaging - solid and liquid food - Safety issues of nano food systems

References

1. Nanotechnologies in Food and Agriculture Mahendra Rai, Caue Ribeiro, Luiz Mattoso, Nelson Duran, Springer, 2015 ISBN- 978-3-319-14023-0

2. Nanotechnology Applications in Food, Alexandru Grumezescu, Alexandra Oprea, ISBN – 9780128119426, Academic Press 2017.
3. Nano- and Microencapsulation for Foods, Hae-Soo Kwak, ISBN - 978-1-118-29233-4, John Wiley & Sons, 2014.

Programme : M.Sc., Materials Science & Nanotechnology Course Title : Industrial Applications of Nanomaterials Type of Course : Core

Course No 403

Semester IV

Course Objectives:

- To provide the understanding of Biomedical, water treatment and surface coating applications of materials and nanomaterials

Expected Course Outcome:

- After successful completion of this course student will be able to understand the application of nanomateials for biomedical, water treatment and surface coating of nanomateirals and their importance in improving the quality of the products

Unit-I: Biomedical Applications 15 h

Nanomaterials – Metallic, Non-metalic and Biodegradable; Nanoformualtions –Nanogels, Nanoemulsions, Nanocapsules, Nanosponges, Solid Lipid Nanoparticles and Dendrimers; Applications- Implantation, Drug, Gene and Protein Delivery, Photodynamic Therapy, Diagnosis & Medical Imaging, Biosensors, Blood Purification and Tissue Engineering and Regenerative Medicine

Unit-II: Water treatment 15 h

Zero valent metal nanoparticles – Silver, Iron and Zinc; Metal Oxide nanoparticles- TiO2, ZnO and Iron oxide; Carbon Nanotubes; Nanocomposites; Membranes – Definition and Classification; Membrane Based Separation Methods: Principle and applications of Reverse Osmosis, Micro and Ultra Filtration and Elecrtodialysis

Unit-III: Surface Coatings 15 h

Definition; Ingredients of surface coatings –binders, pigments, additives, solvent and plasticizers; Classification of paints by curing mechanism (air dried and baked), solvent (aqueous and non-aqueous), functions of system ingredients (primers, sealers, under coats and finishing/top coats), solid content (high

and low) and resin components; Film formers – synthetic resins (alkyd, acrylic and urethane coatings); Methods of film formation; Fundamentals of film formation; Factors affecting coating properties – film thickness (mechanical and optical methods), film density and pigment volume concentration

Unit-IV: Properties and Evaluations of Coating films 15 h

Barrier properties of coating films; Optical properties of coatings (basics of color, gloss and hiding power); Ageing properties (accelerated outdoor and laboratory tests); Adhesion properties of coatings (factors affecting the establishment of adhesion bond, measurement sof surface coating adhesion (Destructive methods film detachment by normal (direct pull off and topple method), by lateral stress (scratch and peel test) Non-destructive tests; Scratch, mar and wear resistance test; Anti-condensation

paint test; Water and chemical resistance of paint films; Tautening test; Fire resistance; Resistance to yellowing; Bleeding.

References:

1. Text Book of Nanotechnology in Modern Biotechnology, Ch 8 & 10, Elsevier, science by Gowarikar, Sreedhar and Viswanathan, Wiley-Eastern Publications. India
2. An overview of Nanomaterials for water and waste water treatment, Advances in Material Science and Engineering, (2016)
3. Synthetic Polymer Membrane- by Robert E.Kesting, McGraw-Hill, New York (1972)
4. Surface coatings by Swaraj Paul, John Wiley & Sons (1985)
5. Testing of paints by CJA Taylor and S. Mark)

Programme : M.Sc., Materials Science & Nanotechnology
Course Title : Scientific Writing and Intellectual Property Rights
Type of Course : Internal Elective

Course No : 404 (A)

Semester IV

Course Objectives:

- To provide basic knowledge of scientific communication
- To educate about the writing skills for methodology
- To illuminate different representations of data through figures, tables and flow charts
- To provide basic knowledge of types of intellectual property
- To elucidate the conflicts in patents with suitable examples

Expected Course Outcomes:

After successful completion of this course student will be able to

- Understand the methods of scientific communication
- Apply the knowledge of scientific writing of an experiment
- Successfully depict the results with suitable forms such as diagrams, tables etc.
- Understand the types and nature of intellectual property rights

Unit-I: Introduction and Methodology 15 h

Introduction to professional scientific communication, Discussion of creativity, research ideas and where to find them, Writing Methodology: Grammar and writing skills- Build a model-Vocabulary- Writing a methodology section.

Unit-II: Results and Discussion 15 h

Writing about Results, Schematic diagrams, Figures, Tables, flow charts, Hypothesis, reasoning and testing the hypothesis, peer review.

Unit-III: Conclusions and Abstract 15 h

Writing conclusion/Abstract: Grammar and writing skills- Build a model-Vocabulary

Unit-IV: Intellectual Property Rights 15 h

Introduction- Invention and Creativity- Intellectual Property (IP)- importance- protection of IPR- Basic types of property (i. Movable Property, ii. Immovable Property and iii Intellectual Property.IPs- Patents- copyrights and related rights- Trade Marks and rights arising from Trademark registration-Case Studies- Patents (Basmati rice, aureveda).

References:

1. Halbert, ―Resisting Intellectual Property‖, Taylor & Francis Ltd ,2007
2. Mayall , ―Industrial Design‖, McGraw Hill, 1992.
3. Niebel , ―Product Design‖, McGraw Hill, 1974.
4. Asimov , ―Introduction to Design‖, Prentice Hall, 1962.
5. Robert P. Merges, Peter S. Menell, Mark A. Lemley, ― Intellectual Property in New
6. Technological Age‖, 2016.
7. T. Ramappa, ―Intellectual Property Rights Under WTO‖, S. Chand, 2008

Programme : M.Sc., Materials Science & Nanotechnology Course Title : Energy Conversion Technologies

Type of Course : Internal Elective
Course No : 404 (B)

Semester IV

Course Objectives:

To provide the understanding of the basic concepts in

- Renewable energy and role of nanomaterials in energy sector.
- Energy conversion using fuel cells
- Solar energy conversion technologies

Expected Course Outcome:

After successful completion of this course student will be able to

- Demonstrate importance of energy generation or conversion suing renewable process.
- Explain principles, components and importance of different types of batteries.
- Illustrate the importance of fuel cells and different types of fuel cells.
- Distinguish the importance of different types of solar cells, principles and its functions.

UNIT - I Introduction 15 h

Principles of renewable energy – Introduction, Energy and sustainable development, Fundamentals, Scientific principles of renewable energy, Societal implications; Nanotechnology for sustainable energy - Energy conversion process; indirect and direct energy conversion; Nanotechnology enabled renewable energy technologies -Energy transport, conversion and storage.

Unit-II: Batteries 15 h

Principles of battery operation; Battery components; Types of batteries – Primary and secondary batteries; Lead acid, Nickel-cadmium and Lithium ion batteries

Unit-III: Fuel Cells 15 h

Fuel Cell principles; Types of fuel cells - Alkaline Electrolyte, Phosphoric acid, Molten Carbonate, solid oxide and direct methanol fuel cells; Principle and operation of Proton Exchange Membrane (PEM) fuel cell -Construction of PEM fuel cell stack, efficiency characteristics of PEM fuel cells; Direct methanol

fuel cells

Unit-IV: Solar Cells 15 h

Importance of solar cells; Principle of operation; Current-voltage characteristics,; Comparison of inorganic and organic solar cells, silicone solar cells - manufacture of polycrystalline and nanocrystalline silicon; Conjugated polymer solar cells - Concept of heterojunction (dispersed and molecular heterojunctions); Function of dye sensitized solar cells (DSSC); Perovskite solar cells.

Reference Books:

1. J. Twidell and T. Weir, *Renewable Energy Resources*, Routledge, Taylor & Francis group, New York, Third Edition (2015).
2. Vielstich, Hand Book of Fuel Cells: Fuel Cell Technology and applications, Wiley CRC Press
3. C.Rayment, S.Sherwin. Introduction to fuel cell technology (2003)
4. D.M.Roundhil, John P.Facker, Optoelectronic properties of inorganic compounds, Plenum press, New York (2009).
5. A brief history of the development of organic and polymeric photovoltoics, H.Spanggaard and F.C. Krebs, Solar Energy Materials & Solar Cells 83 (2004) 125-146.

Programme : M.Sc., Materials Science & NanotechnologyCourse Title : Advanced Characterization Techniques Type of Course: Internal Elective

Course No : 404 (C)

Semester IV

Course Objectives:

- Students will master the fundamentals of thermal and electron microscopy, other spectroscopic techniques

Expected Course Outcome:

- to explore the microstructure of materials at high resolution using appropriate electron microscopy techniques.
- determine the specimen's thermal stability and thermodynamic changes using thermal analysis techniques

Unit-I: Microscopic Techniques 15 h

Surface topography, Principle, Instrumentation and applications of Electron microscopy, Scanning electron microscopy (SEM),Transmission electron microscopy (TEM), Scanning Probe Microscopy (SPM), Scanning tunnelling electron microscopy (STM), Atomic force microscopy (AFM).

UNIT-II: Thermal Analysis 15 h

Principles, Instrumentation and applications of ThermogravimetricAnalalysis (TGA), Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC), Thermo-mechanical Analysis (TMA); Understanding of curing kinetics and thermal decomposition reactionto ceramics and polymers.

Unit-III: Chromatographic Techniques 15 h

Chromatographic Parameters - Paper Chromatography (PC), Thin Layer Chromatography (TLC), Column

Chromatography (CC), Ion Exchange Chromatography (IEC). High Performance Liquid Chromatography (HPLC): Principle, Instrumentation, pumps, columns, Detectors and Applications of HPLC. Gas Chromatography (GC): Principle, Instrumentation, columns, Detectors and Applications of GC.

UNIT-IV: Chemical and Particle size Analysis Techniques 15 h

Basic concepts – Energy dispersion Analysis of X-rays (EDAX) – X-ray photoelectron spectroscopy (XPS) – Auger Electron Spectroscopy (AES) – Dynamic Light Scattering (DLS).

Text Books:

1. M.H.Willard, Instrumental Methods of Analysis, CBS publishers, (1986)
2. M. Bersohn and J.C. Baird, An Introduction to Electron Paramagnetic Resonance, Benjamin Inc., London (1967)
3. Sivasankar, Instrumental Methods of Chemical Analysis, Oxford University Press, New Delhi (2012)
4. R. Haynes, Optical Microscopy of Materials, International Textbook Company, Glascow, 1984.
5. John J. Bozzola and Lonnie D. Russel, "Electron Microscopy", Jones and Bartlett Publishers Inc., USA, 1999.
6. H. W. Willard, L. L. Merritt and J. A. Dean, Instrumental Methods of Analysis, (Affiliated East-West)
7. D. A. Skoog and D. M. West (Holt, Rinehart and Wilson) Principles of Instrumental Analysis.
8. Nature (2000) Microscopy Techniques

Programme : M.Sc., Materials Science & Nanotechnology Course Title : Applications of Nanomaterials Lab

Type of Course : Practical-VI
Course No 405

Semester IV

1. Adhesion testing of surface coating films
2. Testing of hardness of coating films
3. Study of surface roughness of surface coatings
4. Impact test of paint films

5. Preparation of polymer micro / nano particles by water in oil emulsion technique6. Preparation of polymer carriers by nanoprecipitation method

7. Drug loading and efficiency studies
8. Water purification by Electrodialysis
9. Water treatment by Ultrafiltration

10. Drug release studies of drug loaded polymer particles

M.Sc., Materials Science & Nanotechnology CBCS syllabus for 2021-2024 Approved by Board of Studies

Programme : M.Sc., Materials Science & Nanotechnology
Course Title : Project Work

Type of Course : Project work
Course No 406
Semester IV

Student has to carryout project work under any one the faculty members of the department and should submit dissertation and should defend his/her work in viva-voce examinations in front of examiners.

M.Sc. Microbiology

Syllabus

Programme Code: MB

Academic year 2021-22 onwards

YOGI VEMANA UNIVERSITY

Vemanapuram, Kadapa-516 005
Andhra Pradesh, INDIA

(AP State University, Accredited with "B" Grade by NAAC)

(With effect from Academic year 2021-22 for first semesters)

Structure of M.Sc. Microbiology course

A two years M.Sc. programme is formulated for developing competent microbiologists. The course is based on choice based credit system (CBCS) with National Education Policy (NEP) and interdisciplinary nature of Microbiology, Biochemistry, Molecular biology, Genetics, and immunology. The programme obliges students to read original publications and envisages significant inputs in Laboratory work, communication skills, creativity, planning, execution and critical evaluation of the scientific data. The course titles have been carefully chosen to represent the core courses and the specialization introduced in the two years course of Microbiology are:- Bacteriology and Virology Molecular Biology, Biotechnology, Clinical microbiology, Food Microbiology, Industrial microbiology and Immunology inconsonance with the objectives of the University. The courses formulated have a microbiological slant than biological and are up to date. The course is fine tuned in order to enhance the job opportunities of the students.

Program Outcomes (POs)

Microbiology, a science of tiny living organisms provides Knowledge on diversity and benefits of microbes. The students on successful completion of M. Sc. Microbiology programme should gain-

PO1: Ability to apply and acquire the dee knowledge in the core and applied fields of Microbiology.

PO2: Ability to perform practicals competently in a laboratory setting, design and conduct experiments and simulations, operating and calibrating technical equipment as well as critical analysis.

PO3: Able to identify problems in specific areas of Microbiology.

PO4: Able to understand the pivotal role of the microorganism in science

PO5: Maintains professional ethics and follows ethical principles.

PO6: Ability to engage in life-long learning

PO7: The student is able to genetically modify the microorganism to suit the human needs

PO8: Able to emphasis the precautions to be taken at various levels of handling microbes

PO9: Capability of linking interdisciplinary research areas.

PO10: Ability to create awareness on biochemical applications among the populations along with providing understanding on global environmental and societal contents.

Program Specific Outcomes (PSOs)

Upon successful completion of M.Sc. Microbiology program, the graduates are expected to

PSO1: Recognize, demonstrate and understand of structure, chemical properties and reactions of the biomolecules and their biopolymer structure to predict chemical properties and reactivity.

PSO2: Apply the knowledge of metabolism and know the role of microorganisms in human life

PSO3: Diagnose the pathogenic microbes in the laboratory by applying the knowledge of microbial culture techniques.

PSO4: Expertise on cell and molecular biology as well as on capable of constructing a recombinant strain for commercial purpose

PSO5: Obtain the knowledge about the qualitative and quantitative analysis of different molecules using different types of microscopes, centrifuges, radio isotopes, chromatographic and electrophoresis techniques and

Program Educational Objectives (PEOs)

The graduated students of M.Sc. Microbiology are expected to accomplish-

PEO1: Skill to communicate the Microbial/molecular concepts and results of their laboratory experiments through effective writing and oral communication using discipline standards for reporting and citation.

PEO2: Summer training and project work helps them to know the practical aspects about various fields of Biochemistry.

PEO3: Critical thinking and scientific inquiry in the performance, design, interpretation and documentation of laboratory experiments to the level suitable to succeed at an entry level position in Industrial/Biotech /Food and Beverage/ Pharmaceutical industries.

PEO4: Recognize and demonstrate the structure, chemical properties and reactions of the biomolecules and their derivatives to predict chemical properties and reactivity.

PEO5: Understanding the areas that are widely used with advanced scientific methods to identify and culture the microbes through lectures, classes, seminars, debates and a problem-based learning exercise.

PEO6: Become an entrepreneur commercializing his own microbial product.

PEO7: Understand the theoretical concepts of analytics and perform basic and critical reactions of biological importance of microbes, and instruments that are commonly used in most Microbiology and its applied fields for excel them relevant fields of microbes in human welfare.

PEO8: Participate and report the team work-based investigations of problem-based assignments.

PEO9: Able to establish a clinical diagnostic laboratory.

PEO10: Contribute their knowledge and experiences gained during the course to professional and/or public activities in developing the community.

YOGI VEMANA UNIVERSITY

Vemanapuram, Kadapa-516 005, A.P., INDIA

(AP State University, Accredited with "B" Grade by NAAC)

M.Sc. Microbiology Syllabus

(For the students admitted during the academic year 2021-22 onwards)

Semester	Components of Study	Course Code	Title of the Course	No. of credits	No. of hours per week	Practical/ Project	Internal Assessment	Semester End Exams	Total
SEMESTER-I	Core	MB15061	General Microbiology	04	04		25	75	100
		MB 15062	Bacteriology and Virology	04	04		25	75	100
		MB 15063	Biological Chemistry	04	04		25	75	100
	Internal Elective	MB 15064	(A) Biophysical and Analytical Techniques	04	04		25	75	100
			(B) Enzymology		04				
			(C) Cell Biology		04				
			Tutorial and Seminar	00	04		00	00	000
	Practical	MB15061P	General Microbiology and Bacteriology and Virology (Practical-1) **[>15 students 2-batches]**	04		16		100	100
	Practical	MB15062P	Biological Chemistry and Internal Elective Paper (Practical-2) **[>15 students 2-batches]**	04		16		100	100
	Sub-total			24	28	32	100	500	600
SEMESTER-II	Core	MB 25061	Microbial Physiology and Metabolism	04	04		25	75	100
		MB 25062	Molecular Biology	04	04		25	75	100
		MB 25063	Microbial Genetics and rDNA Technology	04	04		25	75	100
	Open Elective	MB 25064	(A) Fundamentals of Microbiology	04	04		25	75	100
			(B) Microbes in Human Welfare		04				
			(C)SWAYAM /MOOCs/ NPTEL		04				
			Tutorial and Seminar	00	04	00	00	00	000
	Practical	MB25061P	Microbial Physiology and Metabolism, Molecular Biology (Practical-1) **[>15 students 2-batches]**	04		16		100	100
	Practical	MB25062P	Microbial Genetics, rDNA Technology (Practical – 2) **[>15 students 2-batches]**	04		16		100	100
	Sub-total			24	28	32	100	500	600
SEMESTER-III	Core	MB 35061	Bio-Processing Technology	04	04		25	75	100
		MB 35062	Immunology	04	04		25	75	100
		MB 35063	Medical Microbiology	04	04		25	75	100
	Open Electives	MB 35064	(A) Microbial Technology and Entrepreneurship	04	04		25	75	100
			(B) Food Safety and Quality Management		04				
			(C) SWAYAM /MOOCs/ NPTEL		04				
	Practical	MB35061P	Bio-Processing Technology and Immunology& Medical Microbiology(Practical-1) **[>15 students 2-batches]**	04		16		100	100
	Skill Oriented Course Practical	MB35065 &P	Diagnostic Microbiology	04	04		10	40	100
						08		50	
			Tutorial and Seminar	00	04	00	00	00	000
	Sub-total			24	32	24	110	490	600
SEMEST	Core	MB 45061	Agricultural Microbiology	04	04		25	75	100
		MB 45062	Environmental Microbiology	04	04		25	75	100
		MB 45063	Food Microbiology	04	04		25	75	100
			(A) Industrial Microbiology		04				

	Internal Elective	MB 45064	(B) Biostatistics, Research methodology and Bioinformatics	04	04		25 5	75	100
			(C) Public Health Microbiology		04				

	Practical	MB 45061P	Agricultural, Environmental, Food and Industrial microbiology (Practical-1) **[>15 students 2-batches]**	04		16	6	100	100
	Multi-Disci-plinary/ Project	MB 45061	Project	04		16		100	100
	Sub-total			24	28	32	100	500	600
Grand Total				**96**	**116**	**120**	**400**	**2000**	**2400**

- All core papers are Mandatory
- Compulsory Foundation choose one paper.
- Internal/Open Elective – Choose one paper each.Open Electives are for the students of other Departments in the varsity.
- Skill Oriented course is mandatory. Relevant society along with practical (10 marks internal, 40 final theory and 50 for practical's).Interested students may register for SWAYAM /MOOCs/ NPTEL with the approval of the concerned DDC for the award of the grade as 'open elective'.
- Choose one from Multi-Disciplinary (Circle formation with other subjects/Dept. of Arts/ Commerce) Course or Project (Collaboration with various firms/companies/societies) work.

Prof. Ch. Paramageetham, S. V. University,

Prof. V. Uma Maheshwara Rao, ANU,

Dr. B. Chitra, Member (Industry)

Dr. L. Veeranjaneya Reddy, Chairman BoS

MB 15061: GENERAL MICROBIOLOGY

Objectives:

- To import information on the historical developments in microbiology
- An in-depth study on structure and function of prokaryotic and eukaryotic cells.
- To expose the students on the basic understanding of various microbiological techniques.

UNIT - I (16 hrs)

History and scope of Microbiology: Theory of spontaneous generation, germ theory of diseases; Major contributions in the field of microbiology, importance of microbes in human welfare.

Study of microorganisms: Microscopy – principles and applications of light, scanning and transmission electron microscopes. Confocal microscopy. Preparation of microbiological samples for microscopy.

Systematic position of the microorganisms- taxonomy, nomenclature and classification (Five kingdom classification and Carl Woes classification), taxonomic ranks, major characteristics used for identification: morphological, physiological, ecological, genetic and molecular. Comparison between prokaryotic and eukaryotic cells.

UNIT - II **(**14 hrs)

Physical and chemical approaches for sterilization and disinfection -control of microorganisms by heat, radiation, pH, pressure, filters, chemical agents and safety precautions. Concepts of containment facility.

Microbiological media: Types of media – natural and synthetic media (basal, defined, complex, enrichment, selective, deferential) and transport media. Preservation.

UNIT - III (16 hrs)

Isolation, cultivation and enumeration of microorganism: pure culture techniques (enrichment, dilution plate, streak plate, spread plate and micromanipulator), cultivation of aerobic and anaerobic microorganisms - continuous, batch, synchronous and stock cultures, enumeration and measurement of growth of microorganisms.

Identification and characterization of microorganisms - staining techniques (simple, negative differential, capsular, spore, flagellar staining. Giemsa staining and AFB (Acid Fast Bacilli), lactophenol mounts for fungi. Preparation of tissue for thin sectioning (fixation, dehydration, infiltration, embedding and sectioning). Preservation of microbial cultures: (sub culturing technique, sterile soil or sand preservation, glycerol, deep freezing, liquid paraffin oil, drying and freeze drying).

UNIT – IV (14 hrs)

Introduction to Mycology: systematic position and classification of fungi. General characters, structure, reproduction, life cycles and economic importance: Myxomycotina (*Physarium*, and *Plasmodiophora)* Mastigomycotina (*Synchytrium*, *Phytophthora* and *Albugo)* Zygomycotina (Mucor, Rhizopus and Pilobolus). Ascomycotina (Yeast, *Aspergillus*, *Penicillium* and *Neurospora)* Basidiomycotina (*Punccinia*, *Ustilago* and *Agaricus).* Deoteromycotina (*Alternaria*, *Fusarium*, *Colletotrichum* and *Trichoderma).*

General account, classification, structure, reproduction and economic importance of algae (*Chlorella, Senedesmus*, *Gracellaria*, Nostoc and Anabena).

Learning outcomes:

On the completion of the course, students should be able to:

UNIT-I: Students are able to understand in depth knowledge on historical developments in thefield of microbiology.

UNIT-II: Must be able to know structure and function of prokaryotic and eukaryotic cells.

UNIT-III: Understand the various microbiological techniques like isolation and identification etc.

UNIT-IV: Understand the detailed characteristics and economical importance of fungi and algae.

References:

1. Alexopoulus CJ and C W. Mims.(2007).Introductory Mycology(4th edition).Wiley Eastern Ltd, NewDelhi.
2. Jefreery C Pommerville, 2017, Fundamentals of Microbiology(11th edition), Barlett Series
3. Bergy's Manual of Determinative Bacteriology(9th Edition) 1993, Williams and Wilkins, Baltimore
4. Black, J.G. (015). Microbiology: Principles and Explorations(9th edition), John Wiley, USA
5. Dube R C and Maheswari D. K (2013) General Microbiology. S. Chand (4th edition), New Delhi Mc Graw-Hill Publishing company Ltd, New Delhi.
6. K. Talaro and A. Talaro (2021) Foundations in Microbiology 11th ed. Wm. C. Brown Publ.
7. Madigan MT Martinkl. J.M and Parker J (2010). Brock Biology of Microorganisms. (13th edition). MacMillan Press, England.
8. Pelczar Jr, M.J. Chan, E.C.S. and Kreig, N.R. (1993).Inc, New York
9. Prescott LM Harley JP and Klein DA (2007). Microbiology (11th edition) McGraw Hill, New York.
10. S.B. Sullia, Oxford (1999) General Microbiology, IBH Publishers
11. R.M. Atlas Wm. C. Brown (1997). Principles of Microbiology. 2nd ed. Publ.
12. Sullia, S.B. and Leaderberg J (1998). General Microbiology, Oxford & IBH Publishing Pvt. Ltd., New Delhi.
13. Schaechter M and Leaderberg J (2004). The Desk encyclopedia of Microbiology. Elseiver Academic press, California
14. Rami Reddy and SM Reddy (2005). A text book of Microbiology. Vol I and II.

MB 15062: BACTERIOLOGY AND VIROLOGY

Objectives:

- To study complete structure of Bacteria and its components
- To understand the bacterial classification.
- To study the basic concept of virous structure chemical composition and replication.

UNIT – I (16 hrs)

Bacterial cell structure- Cell walls of Gram positive, Gram negative bacteria and archaebacteria. L- forms, Cell membrane- structure, composition and functions.

extracellular appendages- Structure and function of capsule, flagella, pili. Intracellular appendages- chlorosomes, nucleoids, carboxysomes, phycobilisomes. Reserve food materials- poly-β- hydroxybuterate, polyphosphate granules, gas vesicles, cyanophycin granules, sulfur inclusions and magnetosomes. Spores and cell division.

UNIT - II (12 hrs)

Salient features and classification of bacteria as per the second edition of Bergey's Manual of Systematic Bacteriology.

Characteristics, classification and economic importance of major bacterial groups- *Enterobacteriae*, *Rickettsiae*, *Mycoplasma*, *Mycobacteria*, *actinomycetes,* oxygenic and anoxygenic photosynthetic bacteria.

UNIT- III (16 hrs)

History and general characteristics of viruses, chemical composition, morphology and symmetry.

Taxonomy of viruses- classification and nomenclature of viruses as per ICTV. Baltimore system of classification. General methods of detection, isolation, cultivation, characterization and assay of plant, animal and bacterial viruses. Sub viral particles- satellite viruses, viroids, DI particles andprions.

UNIT - IV (16 hrs)

Life cycles of bacterial viruses; one step growth curve, lytic and lysogenic cycles with reference to T4, λ and ϕ X 174. Biological significance of Phages.

Multiplication strategies of plant viruses (TMV, CaMV) and animal viruses (Adeno, Influenza, Herpes, SV40, and HIV). Transmission and management of plant and animal viral diseases. Interferons, antiviral drugs and vaccines.

Learning outcomes:

On the completion of the course, students should be able to:
UNIT-I: Understand in depth knowledge on morphology, structure and functions of bacterial cellcomponents
UNIT-II: Understand the classification of bacterial species as per Bergey's manual.

UNIT-III: Get knowledge on history, taxonomy and assay of viruses

UNIT-IV: Understand the concepts of replication process of bacteriophages, plant and animal viruses and antiviral drugs.

References:

1. Alan J. Cann (2015). Principles of Molecular virology. (6th edition).Academic press, California.
2. Bergey's Manual 2nd Ed. "Systemic Bacteriology" 2001-2005
3. Dimmock NJ, Primrose SB. (2006) Introduction to Modern Virology 6th edition. Blackwell Scientific Publications, Oxford.
4. Flint, S.J., Enquist, L.W., Krung, R. Racaniello, VR. and Skalka, A.M. (2000). Principles of Virology ASM Press.
5. Ram Reddy S and Reddy SM (2007) essentials of Virology Scientific Publishers (India) Jodhpur.
6. W.D. Frost and E.F. Mc Camp Bell (2010). Text book of general Bacteriology, Bibliobazaars Publications.
7. William Henarl 2000. Bergey's Manual of Determinative Bacteriology. 9th Edition Lippincott Publications.
8. S.H. Gillespie and P.M. Hawkey 2006. Principles and practice of Clinical Bacteriology. John Wiley.
9. A Text - Book of Bacteriology 4th Edition **Authors:** R. W. Fairbrother **ISBN:** 9781483225340 (2018)
10. A Text-Book of General Bacteriology Paperback– Import, 15 Feb 2018 by William Dodge Frost & Eugene Franklin Campbell).

MB 15063: BIOLOGICAL CHEMISTRY

Objectives:

- To make the students knowledgeable on the various biological molecules and their importance
- To study the classification and structural properties of various biological molecules
- To acquire an overall knowledge on enzymes and their kinetics
- To provide knowledge on metabolic pathways and their biochemical importance.

UNIT – I (15 hours)

Carbohydrates- Classification, physico chemical properties, separation. Structure, identification and analysis. Biological significance of polysaccharides (starch, cellulose, chitin, peptidoglycons) and glycoproteins.

Lipids- Classification, separation, distribution, safonification and iodine number. Nomenclature, structure and functions of glycerides, neutral lipids (waxes, fats and oils) phospholipids, spingophospholipids and glycolipids. Steroids- plantsterol, ergosterol, stigmosterol and cholesterol. Lipoproteins- classification, composition and importance of bacterial lipids.

UNIT –II (15 hours)

Amino acids – Essential and non essential amino acids. Peptide bond, peptides of non protein origin (glutathione and gramicidin), Acid – base properties of peptides, chemical properties and synthesis of peptides. Proteins- classification, physico-chemical properties, structure (primary, secondary, tertiary and quaternary) and biological functions. Ramachandran plot and amino acid sequencing.

Nucleic acids: Types and composition, structure, properties and biological functions. Denaturation and renaturation of nucleic acids, cot curves, nucleic acid hybridization and sequencing.

UNIT –III (15 hrs)

Enzymes- Classification and nomenclature. Kinetics of enzyme catalyzed reactions– Michalis – Menten equation, Line weaver-Burk plot. Gibbs free energy concept. Factors effecting enzyme activity (concentration, pH, temperature, enzyme and substrate concentration).

Enzyme functional groups, mechanism of action of lysozyme, chymotripsin and RNase. Regulatory enzymes and mechanisms of enzyme regulation, isozymes, ribozymes and abzymes. Enzyme inhibition and Coenzymes.

UNIT -IV (15 hrs)

Bioenergetics- Principles, laws of thermo dynamics, enthalpy, entropy, concept of free energy, chemical equilibrium. Energetics of ATP and other high energy compounds. Oxidation and reduction reactions.

Measurement of redox potentials, electron carriers. Chemi–osmotic theory,s biological energy transducers, respiration limited proton translocation, photorespiration and bioluminescence.

Learning outcomes:

Unit I : The students will learn the classification and structural properties of protein, carbohydratesand lipids.
Unit II: The students will become knowledgeable on classification of enzymes and are able tounderstand the characteristics of enzyme reactions.
Unit III: The students will be able to understand the structure and the biological activities ofNucleic acid and Vitamins.
Unit IV: The students will be able to understand the concepts of bioenergetics.

References:

1. David L. Nelson, Michael Cox. (2021) Lehninger. Principles of Biochemistry International Edition (8th edition) by W.H.Freeman & Co Ltd.
2. U. Satyanarayana and U. Chakrapani (2020) Biochemistry. (5th Edition), Books and allied Publications, India.
3. Lubert Stryer, Jeremy Berg, John Tymoczko and Gregory Gatto (2019). Biochemistry. (9th edition). W.H. Freeman and company, New York
4. Conn EE, Stump PK, Bruening and Doi RH. (2006). Outlines of Biochemistry (5th edition). Wiley India Pvt. Ltd.
5. Donald Voet and Judith G. Voet (2006). Fundamentals of Biochemistry: life at molecular level – (5th Edition). John Willey and Sons, Inc.
6. Martin, Mayer and Roadwell Harper's Review of Biochemistry (2006).
7. Thomas M. Devlin. (2002). Textbook of Biochemistry with clinical correlations. (5th Edition). A John Wiley and sons, Inc., publication, New York.

MB 15064: (A). BIOPHYSICAL AND ANALYTICAL TECHNIQUES

Objectives:

- To understand the working principles, construction and applications of the instruments used in the studies related to various disciplines of biological sciences.
- To appreciate the importance, concept of research and learn the art of thesis, paper writing and publication.

UNIT – I (14 hrs)

pH and Buffers: Measurement of pH, concept and preparation of Buffers, ionization, Pka, Henderson-Hasselbalch equation. Types of electrodes and biosensors. Viscosity and Osmosis.

Concentration of Biomolecules: Ammonium sulfate precipitation, dialysis, flash evaporation, lyophilization, membrane filtration and their applications.

UNIT – II (15 hrs)

Centrifugation: Principle, methodology and applications of preparative, differential, density gradient, analytical and ultra centrifugation and their applications. Analysis of sub cellular fractions.

Chromatography: Principles, methodology and applications of liquid, solid (paper and TLC) and Column chromatography (Ion – exchange, gel permeation, affinity, GC, FPLC and HPLC).

UNIT –III (15 hrs)

Spectroscopy: Laws governing the light absorption, principles, instrumentation and biological applications of UV-VIS, Infrared (IR), FTIR, Atomic absorption (AAS), electron Spin – resonance (ESR). Nuclear magnetic resonance (NMR).

Principle, instrumentation and biological applications of Mass spectrometry, X-Ray crystallography, Circular Dichroism (CD) and Optical Rotary Dispersion (ORD).

UNIT – IV (16 hrs)

Electrophoresis: Electrophoretic process. Native PAGE and SDS - PAGE. Iso electric focusing (IEF), two – dimensional gel electrophoresis, determination of molecular weight, pulsed field gel electrophoresis (PFGE). Methodology and applications of Southern, Western and Northern blots.

Radio Isotopes: Half-life, detection and measurement (GM counter, liquid scintillation counter, gama-ray counters), Cerenkov counting, autoradiography and Quenching. Laboratory safety measures in handling isotopes and biological applications.

Learning Outcomes:

The Course will provide an overview of would know the general and advanced laboratoryprocedures and maintenance of research equipment's, Instrumentation of equipment's.

Unit 1: Get the knowledge of pH, Viscosity and concentration of Biomolecules

Unit II: Able to understand the centrifugation and Chromatography Principle, methodology andapplications.

Unit III: Can get the hands-on experience with Spectrophotometry techniques.

Unit IV: The students will be able to understand the concepts of Electrophoresis and radioisotopes.

References:

1. Principles and Techniques of Practical Biochemistry (2018) 8th edition, Ed. Williams and Wilson.
2. Techniques in Molecular Biology 1983 Ed. Walker & Gastra, Croom Helm.
3. Principles of Instrumental Analysis,1980 2nd Ed. Holt-Sanders.
4. An Introduction to Spectroscopy for Biochemistry, 1981 Ed. Brown Sn., Academic Press.
5. Analytical Biochemistry, 3rd edition (1998) Holmes and Hazel Peck, Longman.
6. An Introduction to Practical Biochemistry. 3rd edition (2001) David t. Plummer, Tata Mac grew – Hill.
7. Biophysical Chemistry, Ed. Shall & Wyman, first edition (2001)Academic Press Vol II & I.
8. A text book of quantitative inorganic analysis including elementary instrumental analysis, (1980) Vogel ELBS.
9. Biochemical Calculations Seigel, IH, (2010) 2nd Ed. John Wiley & Sons Inc.
10. Analytical Biochemistry by David Friefelder.

(B). Enzymology

Objectives:

- To understand the classification of enzymes and fundamentals of enzyme assay. Also, understanding of kinetics of enzyme catalyzed reactions and derivation of Michaelis Menten equation.
- To advance the knowledge on mechanism of enzyme action as well as regulation of enzyme action with relevant examples.
- To study about the techniques of immobilization and application in enzymes in food and pharmaceutical industries.

Unit I (15hrs)

Classification of enzymes, protein confirmation, specificity and active site. Units of enzyme activity, enzyme coupled kinetic assay. Compartmentation of enzymes. Factors affecting velocity of enzyme catalyzed reactions – effect of pH, temperature, enzyme concentration and substrate concentration. Kinetics of enzyme catalyzed reactions. Enzyme kinetics of single substrate reactions, study state assumption, Eadie Hofstee, Hanes plots.

Unit II (15hrs)

Enzyme inhibition: irreversible, reversible, competitive, non-competitive, un – competitive and partial inhibition. Determination of K_I values, substrate inhibition, feedback inhibition and allosteric inhibition. Kinetics of enzymatic reactions having two or more substrates – single displacement reactions, double displacement reactions (Ping-Pong).

Unit III (15hrs)

Enzyme catalysis mechanisms, acid-base catalysis, electrostatic catalysis, covalent catalysis, metalion catalysis, proximity and orientation. Effects, preferential transition state binding.
Catalytic mechanisms of chymotrypsin, Trypsin, Carboxypeptidase, Ribonuclease and Lysozyme.

Mechanism of catalysis with coenzymes – Pyridoxal phosphate, flavin nucleotides, thiaminepyrophosphate, biotin, tetrahydrofolate, lipoic acid.

Unit IV (15hrs)

Enzyme Regulation: Mechanisms, allosteric enzymes – ATPase, cooperativity phenomenon, Sigmoidal kinetics and their physiological significance, Symmetric and sequential models for action of allosteric enzymes and their significance. Feedback inhibition. Reversible and irreversible covalent modifications of enzymes, cyclic and cascade systems, Zymogens, Isoenzymes, multienzyme systems – pyruvate dehydrogenase, fatty acid synthase complex.

Learning Outcomes:

On the successful completion of the course, student will be able to:
Unit I: Understanding of detailed mechanism in enzyme regulation with relevant examples
Unit II: Course material will help in understanding of nomenclature and classification of enzymesand also the fundamentals of enzyme assay
Unit III: Students will thoroughly understand the Kinetics of enzyme essay and derivation ofvelocity equations
Unit IV: Students will gain knowledge in various immobilization techniques and industrialapplication of enzymes

Recommended Books:

1. The enzymes Dixon & Webb, 3rd ed. Longman.
2. Understanding enzymes: Palmer T., Ellis Harwood Ltd.
3. Enzyme Kinetics: Roberts D.V., Cambridge Univ. Press.
4. Enzyme structure and mechanism. Alan Fersht, Freeman & Co.
5. Principles of Enzymology for Food Sciences: Whitaker Marc Dekker.
6. The enzyme Boyer 3rd Ed. Academic Press.
7. Methods in Enzymology Ed. Colowick and Kaplan, Academic Press (continuing series)
8. Text book of Biochemistry with Clinical Correlations (4th edition) – Thomas M. Devlin.
9. Fundamentals of enzymology 3rd edi. Nicholas C. Price and Lewis Stevens.

Online Content:

1. Introduction to Data Mining, Pang-NingTan (2018) Pearson Education India https://books.google.co.in/books?id=64GVEjpTWIAC
2. https://www.udemy.com/course/enzymology/
3. https://www.classcentral.com/course/swayam-enzymology-19860

(C). Cell Biology

Objectives:

- Recalling the structural organization of organelles in both prokaryotic and eukaryotic cells
- Providing information on the functional aspects of the cellular organelles
- Understanding the molecular interaction of cells with regard to metabolism and cell cycle
- Perceiving the molecular interactions in terms of regulation of cell cycle

Unit I (15hrs)

Structure of cells – structure of prokaryotic and eukaryotic cells; Surface appendages – Cilia and Flagella, Capsules, Pili, Fimbriae and slime layers; Cell walls – Algae, fungi, bacteria ; Membranes of Gram positive, Gram negative bacteria and acid fast bacteria; protoplast, spheroplast and endospores; Transport across membrane – active and passive transport, transport channels and pumps, transport across nuclear membrane; Neurotransmission, neuromuscular junction.

Unit II (15hrs)

Cytoskeleton and structural components – Microfilaments, Intermediate filaments, Microtubules; Mitochondria – structure, biogenesis; Chloroplast – structure, biogenesis; Endoplasmic reticulum and Golgi complex – structure, function, vesicular transport and import into cell organelles; Structure and function of ribosomes, lysosomes, peroxysomes.

Unit III (15hrs)

Nucleus structure – structural organization, nucleosome, supranucleosomal structures, specialized chromosomes, polytene and lamp brush chromosomes and chromosome banding; Nucleic acid structure: DNA and RNA; Replication – prokaryotes and eukaryotes;

Unit IV (15hrs)

Mechanism of cell division – Mitosis, meiosis and genetic recombination; regulation of cell cycle – factors and genes regulating cell cycle (Cyclins, CDK and CDKI). Biochemistry and molecular biology of Cancer – malignant growth, tumour suppressor genes (p53, RB) and oncogenes (Ras), chemical carcinogenesis, hormonal imbalances.

Learning Outcomes:

On the successful completion of the course, student will be able to:

Unit I: Able to coordinate structural organization with functions

Unit II: Abe to differentiate the prokaryotic and eukaryotic cells

Unit III: Capable of understanding the molecular mechanism of several diseases

Unit IV: get the Knowledge on mechanism of cell division cancer biology.

Recommended Books:

1. Text book of Cell and Molecular Biology (New Edition), Ajoy Paul, 2015, Books & Allied publishers,
2. Molecular Biology of the Cell, Alberts, B et al., 5th Edition
3. Karp's Cell and Molecular Biology – Gerald Karp, 2016
4. Lodish's Molecular Cell biology, Lodish et al., 7th edition
5. Genes XI (9th Edition) Benjamin Lewin, Jones & Bartlett Learning, 2008
6. Gene cloning and DNA analysis – An Introduction – 6th edition, 2019
7. De Robertis EDP & EMF De Robertis. 2001. Cell and Molecular biology. Lippincott Williams & Wilkins.Bombay.
8. Hardin, Jeff; Bertoni, Gregory Paul; Kleinsmith, Lewis J. (2009) Becker's World of the Cell, Benjamin Cummings.

9. Alberts B, Johnson A, Lewis J, Raff Martin, Roberts K and Walter P. (2007) Molecular Biology of the Cell Garland Publ., New York. 21

1. Sterilization Methods a. Physical and chemical methods b. Phenol coefficient method
    a. (Redial-Walker test)
2. Plating techniques – streak plate, spread plate and pour plate method.
3. Isolation and enumeration of bacteria and fungi from soil
4. Enumeration of surface flora from diseased plant materials
5. Slide culture technique
6. Hanging drop technique for bacterial motility
7. Morphological studies - bacteria, fungi and algae
8. Staining techniques: Negative, simple, Gram, spore, capsular, acid fast and Lacto phenol – cotton blue staining
9. Determination of thermal death point of bacteria
10. Biochemical tests - IMVIC Tests; catalase; oxidase; coagulase, amylase, urease; gelatin
    a. hydrolysis; oxidation – fermentation tests; sugar fermentation; triple sugar iron test; H_2S
    b. production.
11. Isolation of Bacteriophage from sewage water
12. Cultivation of viruses in embryonated Eggs: different routes of inoculation
13. Sap transmission of a plant virus
14. Graft transmission of plant virus
15. Virus inclusion bodies (slides/photographs)

Suggested books/manuals.

1. Microbiological Applications: Laboratory Manual in General Microbiology, 7th ed. By J. Benson.
2. Microbiology: A Laboratory Manual. 4th edition. By J.G. Cappucciono and N. Sherman.
3. Experiments in Microbiology, Plant Pathology, Tissue culture and Mushroom cultivation. 3rd edition. By K.R. Aneja.
4. Practical Microbiology, 2002 by R.C. Dubey and D.K. Maheshwari.
5. Laboratory Manual in Microbiology, 2000. By P. Gunasekaran.
6. Laboratory Experiments in Microbiology by Johnson.
7. Laboratory Manual in Microbiology by Alcamo.
8. Virology – A Laboratory Manual, 1992. By Burleson, et al., Academic Press.
9. Virology Methods Manual, 1996. B.W.J. Mahy and H.O. Kangro. Academic press.
10. A Laboratory Manual. By SM Reddy and S Rami Reddy. Scientific Publications (2005)

1. Qualitative tests for identification of carbohydrates, amino acids and nucleic acids
2. Quantitative tests for Protein (Lowry and Biuret methods), Reducing sugars (DNS method), Glycine, bilirubin, cholesterol.
3. Determination of activity of peroxidase and polyphenol oxidase from leaves/tubers/fruits
4. Purification and study of acid phosphatase from potato tubers: Extraction of enzyme; Effect of substrate concentration; temperature; pH on enzyme activity.
5. Verification of Beer's Law
6. Determination of λ max for colored solutions
7. Determination of DNA and RNA by DPA and Orcinol methods.
8. Determination of nucleic acid bases by UV spectrometry
9. Paper chromatography for separation of amino acids / pigments
10. TLC for separation of lipids / amino acids
11. Partial Purification of proteins
12. SDS – PAGE for separation of proteins
13. Agarose gel electrophoresis for DNA separation
14. Isolation of chloroplasts by sucrose density gradient centrifugation
15. Ion – exchange column chromatography
16. Gel permeation column chromatography

Suggested books/manuals.

1) Biochemical Methods per Agricultural Sciences, 1992. By S. Sadasivam and A. Manikam
2) Practical Biochemistry: Principles and Techniques 1995, 4th Ed. By K. Wilson and J. Walker, Cambridge University Press.
3) Modern Experimental Biochemistry. 1993. 2nd Ed. By R.F. Boyer. The Benjamin Cummings Publ. Company.
4) Physical Biochemistry: Applications to Biochemistry and Molecular Biology, 1982, 2nd Ed. By David Freifelder. W.H. Freeman and Company.
5) Introduction to Practical Biochemistry. 2000. by S.K. Sawhney and Randhir Singh (eds.) Narosa Publ. House.
6) An introduction to Practical Biochemistry, 1987. D.T. Plummer.
7) Laboratory Manual in Biochemistry, 1996. By J.Jayaraman.
8) Florence C. Barseson, Thomas M. Chanders Danny. Wild Brank – Practical Virology.
9) Manual of Biochemistry Deshpande and Shashidhar Rao I K International Publishers.

MB 15064P: (A). Biophysical and Analytical Techniques

1. Measurement of pH and Buffers
2. Ammonium sulphate precipitation
3. Dialysis
4. Paper chromatography for separation of amino acids / pigments
5. TLC for separation of lipids / amino acids
6. Partial Purification of proteins
7. SDS – PAGE for separation of proteins
9. Agarose gel electrophoresis for DNA separation
10. Isolation of chloroplasts by sucrose density gradient centrifugation
11. Ion – exchange column chromatography
12. Gel permeation column chromatography

Reference Books:

1. A Manual of Paper Chromatography and Paper Electrophoresis By Richard J. Block, Emmett L. Durrum, Gunter Zweig · 2016
2. Handbook of Advanced Chromatography /Mass Spectrometry Techniques by Michal Holcapek, Wm. Craig Byrdwell, 2017, Elsevier Science.
3. Electrophoresis in Practice A Guide to Methods and Applications of DNA and Protein SeparationsBy Reiner Westermeier · 2016.
4. Electrophoresis of Enzymes Laboratory Methods By Gunter M. Rothe · 2012, Springer Berlin Heidelberg
5. A Laboratory Manual of Analytical Methods of Protein Chemistry,Volume 5, by H. P. Lundgren, P. Alexander, Elsevier Science.
6. Principles and Techniques of Practical Biochemistry (2018) 8th edition, Ed. Williams and Wilson.

MB 15064P: (B) Enzymology

1. Effect of Enzyme activity (Amylase on starch)
2. Determination of Alpha amylase activity
3. Effect of pH on Enzyme activity
4. Effect of Temperature on Enzyme activity
5. Methods for immobilization of enzymes
6. Enzyme isolation from various tissues and different methods for protein precipitation
7. Isoenzyme assays - Peroxidase, catalases, IDH and SOD
8. Assay of trypsin
9. Assay of alpha-amylase from saliva
10. Assay of LDH from serum
11. Assay of acid and alkaline phosphatase
12. preparation of urease crystals from horsegram seeds and assay
13. Purification of an enzyme and effect of time pH, temperature, substrate concentration, enzyme concentration, inhibition on enzyme activity.

14. Molecular weight determination of enzyme by SDS - PAGE
15. Mitochondrial respiration by oxygraph (O2 electrode)
16. Warburg Manometer

Refernces books:

1. Enzyme Kinetics by Paul Engel. 1977. John Wiley and Sons. Inc., New York.
2.Fundamentals of Enzymology. 3rd Edition by Price.
3. Methods in Enzymology. Volume 22 - Enzyme purification and related techniques. Edited by William B. Jakoby. Academic Press, New York.
4. Methods in Enzymology by W.A. Wood, Academic Press.
5. Advances in Enzymology by Alton Meister, Interscience Publishers.

(C). Cell biology

1. Karyotping, transduction, study of mutations by Ames test
2. Chromosomal aberrations
3. Mitosis and Meiosis – fresh and Permanent
4. Polytene chromosomes – Drosophila and Chyronomes larvae
5. Instrumental methods for Cell biology
6. Subcellular fractionation and marker enzymes
7. Histochemical techniques

Reference books:

1.Cell and Molecular Biology Lab Manual By David Thompson, 2011.
2. Molecular Biology Techniques A Classroom Laboratory Manual By Susan Carson, Heather B. Miller, Sue Carson, D. Scott Witherow, 2012.
3. Advanced Methods in Molecular Biology and Biotechnology A Practical Lab Manual By Khalid Z. Masoodi, Sameena Maqbool Lone, Rovidha Saba Rasool · 2020
4. Cell and Molecular Biology A Lab Manual By K. V. Chaitanya ,· 2013, PHI Learning.
5. Handbook of Molecular and Cellular Methods in Biology and Medicine by Chung-Jui Tsai, Gopi K. Podila, Leland J. Cseke, Peter B. Kaufman, 2003, CRC press.
6. Manual of Histological Techniques By Santosh Kumar Mondal ,· 2017, Jaypee Brothers Medical Publishers Pvt. Limited
7. Handbook of Histopathological and Histochemical Technique By C. F. A. Culling, 2013, Elsevier Science.

MB 25061: MICROBIAL PHYSIOLOGY AND METABOLISM

Objectives:

- To get knowledge on basic concepts of nutritional requirement of microbes
- An in-depth knowledge on microbial metabolism
- To expose the students on the basic understanding of reparation and its reactions.

UNIT – I (12 hrs)

Microbial nutrition- classification of microorganisms based on carbon, energy and electron sources. Major and minor nutritional elements and growth factors.

Chemotrophs - sulphur, ammonia, nitrite, iron, hydrogen and carbon monoxide oxidizers and their importance, Chemoheterotrophs - Acetogens, methanogens, methanogenesis and their importance.

UNIT – II (12 hrs)

Phototrophs - Photosynthetic pigments, photochemistry of PSI and PSII. Modes of CO_2 fixation (Calvin cycle, reductive acetyl CoA pathway, HP pathway). Oxygenic and anoxygenic photosynthetiv bacteria, Halobacterial photosynthesis. Anaplerotic reactions.

Carbohydrate metabolism – EMP, ED, HMP and phosphoketolase pathway in microorganisms. Gluconeogenesis and its significance.

UNIT – III (18 hrs)

Aerobic respiration: TCA cycle- intracellular location and reactions, amphibolic nature, Glyoxalate cycle. Mechanisms of substrate–level phosphorylation. Respiratory electron transport in bacteria and mitochondria. Mechanism of oxidative phosphorylation, uncouplers and inhibitors.

Anaerobic respiration: sulphate and nitrate respiration and their ecological significance. Fermentation: alcoholic, lactate, propionate, mixed acid butyrate and butanol fermentations and their industrial importance. Concepts of primary and secondary metabolism. Biosynthesis of secondary metabolites with special reference to penicillin and polyketides.

UNIT – IV (18 hrs)

Lipid metabolism – Biosynthesis of glycerol's phospholipids and glycolipids, oxidation of saturated and unsaturated fatty acids.

Protein metabolism – Assimilation of inorganic nitrogen and sulphur, biosynthetic pathways of amino acids and their regulation with emphasis on tryptophane and histidine. Catabolism of amino acids (transamination, decarboxylation, deamination). Degradation of proteins by proteases. Urea cycle.

Nucleotide metabolism – Biosynthesis of purine and pyrimidines, nucleotide-salvage and de novo pathways.

Learning outcomes:

On the completion of the course, students should be able to:

UNIT-I: Understand in depth knowledge on microbial nutrition.

UNIT-II: Obtain the complete knowledge in Photosystem I and II, Calvin cycle and carbohydratemetabolism.

UNIT-III: Understand the detailed mechanism of aerobic and anaerobic respiration andbiosynthesis of Primary and secondary metabolites.

UNIT-IV: Understand the biosynthetic pathways of lipid, protein and nucleotides

References:

1. Arora D.K and Seema Gupta, (1996). Bacterial Physiology. Anmol Publications. New Delhi.
2. Caldwell, D.R. (1995). Microbial Physiology and metabolism, Wm. C. Brown Publishers, USA
3. Lansing M. Prescott, John P. Harley and Donald A. Klein. (2007). Microbiology. (5th Edition). McGraw-Hill Company, New York
4. Larry McKane and Judy Kandel. (1996). Microbiology-Essentials and applications. (2nd edition). Mc Graw Hill, Inc., New York.
5. Lubert Stryer. (1995). Biochemistry. (4th edition). W.H. Freeman and company, New York.
6. Moat, A.G. and Foster, J.W. (1988). Microbial Physiology (Second Edition). John Wiley & Sons, New York.
7. S. Ram Reddy and S.M. Reddy (2006) Microbial Physiology, Scientific publications (India) Jodhpur
8. White, D. (1995). The physiology and biochemistry of Prokaryotes, Oxford University Press, Oxford, New York.
9. Zubay, G. (1998). Biochemistry WCB. Mc Graw – Hill, Iowa.
10. Lehninger, Nelson and Cox Principles of Biochemistry, 3rd Edition.

Objectives:

- To import information on the historical developments in molecular biology
- An in-depth study on structure and organization of chromosomes, replication process, transcription process, translation process and mutagenesis.
- To expose the students on the basic understanding of various molecular techniques used in the biological research.

UNIT – I (15 hrs)

Types of genes- structure and functions, co-linearity and Central dogma of molecular biology Modern concept of gene, one gene - one enzyme concept, Chromosome organization in Prokaryotes and eukaryotes. DNA replication (semi conservative, rolling circle, unidirectional and bidirectional), DNA synthesis (reverse transcription), Inhibitors of DNA replication.

Molecular basis of mutations (base substitution, insertion and deletions Frameshift mutations, transitions, transversion, site directed mutagenesis), spontaneous (non-adoptive, mutation rate and hotspot), induced (chemical, physical and base analogue mutagens.

DNA damage and repair mechanisms (methyl directed, mismatch repair, short patch repair). excision repair, recombination repair, SOS system.

UNIT – II (15 hrs)

Mutation screening methods (bacteria, bacteriophages and fungi), evaluation of mutagens using microbial systems. Mutation analysis, Benzers concepts (rII locus in T4 bacteriophages).

Transcription – Structure and functions of rRNA, tRNA and mRNA, General principles, basic apparatus (RNA polymerases, mechanism, promoters, enhancers and other regulatory sequences), mechanism of transcription. inhibitors of transcription. Post-transcriptional modifications -- attenuation, cutting and trimming of rRNA, mRNA& tRNA modification (capping, polyadenylation and splicing), group I, group II intron splicing and RNase P.

UNIT – III (15hrs)

Translation: Basic features of genetic code, Wobble concept, prokaryotic and eukaryotic ribosome, Initiation, elongation and termination. Inhibitors of protein synthesis.

Post translational modifications: Protein folding, structural analysis, signal hypothesis, protein folding, targeting and *in vitro* transcription and translation systems. Basic principles of CRISPR- Cas 9 technology.

UNIT – IV (15 hrs)

Regulation of gene expression – Operon concept, regulatory elements– inducers, repressors, apo- repressors and co – repressors. Evidence for positive and negative regulation. Catabolite repression. Structure, function and regulation of *lac*, *trp* and *ara* operons as models.

Global regulatory responses- heat shock response, stringent response, SOS response, regulation by small molecules (ppGPP, pppGPP and cAMP). Eukaryotic translational control by gene, inhibitory RNA (RNAi), Antisense RNA. Responses of hormone and environmental factors

Learning outcomes:

On the completion of the course, students should be able to:

UNIT-I: Students are able to understand in depth knowledge on molecular biology.
UNIT-II: Must be able to know types of mutagens and their study for further biologicalinnovations.
UNIT-III: Understand the detailed mechanism of Replication in both pro & Eukaryotes.
UNIT-IV: Understand the overall concepts of Transcription and translation for further translationalresearch (Systems biology

References:

1. S. Ram Reddy, K. Venkateshwrlu, V. Krishna Reddy, (2007): Molecular Biotechnology, Kakatiya University.
2. Gardener EJ, Simmons M.J. and Snustad D.P. (2006): principles of Genetics, 8th Edi. John Wiley & Sons, Inc
3. Lewin, B. (2004): Genes VIII. Oxford University Press, Oxford.
4. Griffith AJF Gelbart W.M. Lewontin, RC and Miller JH (2002): Modern Genetic Analysis 2nd Edi. W.H. Freeman, New York.
5. Primrose, S. Twyman R and Old B (2001): Principles of Gene Manipulation, 6th ed. Blackwell Science.
6. Nelson DL and Cox MM (2000): Lehninger Principles of Biochemistry, 3rd ed. Worth Publishing, New York.
7. Baumberg, S ed. (1999): Prokaryotic Gene Expression, Oxford, United Kingdom, Oxford University Press.
8. Burrel, M.M. (1993). Enzymes of Molecular Biology, Humana Press.
9. Lodish, H. Biology, 4th ed. Scientific American Books, W.H. Freeman, New York..
10. Molecular Biology of cell. Albert et al 4th Edition Garland Publishing Inc.
11. Macinski, G.M. and Freifelder, D. (1998). Essentials of Molecular Biology, 3rd Edition, John and Bartlett Publishers.

Objectives:

- To understand the importance of gene transfer mechanisms, plasmid types, transposable elements and cell cycle
- To impart the knowledge of Recombinant DNA technology, Screening methods ,expression of recombinants
- GEMs applications

Unit I (15hrs)

Plasmids: Types, characteristics and functions, replication and applications. Gene transfer methods- Transformation, conjugation and transduction. Bacterial genetic map and mapping of genes.

Molecular recombination- Genetic models of recombination (Holliday model, invasion model) Legitimate illegitimate recombinations and complementation. Transposons and transposable elements in bacteria and eukaryotes (IS elements, P elements and human retrotransposons) and transposition.

Unit II (15hrs)

Cell cycle – over view, phases of cell cycle, progression (MPF cyclins and cyclin dependent kinases, cell differentiation), regulations of cell cycle cell cycle check points, inhibitors of cell cycle

Tumerogenesis: Physical, chemical and biological carcinogens. Carcinogenesis, metastasis, Protooncogenes, oncogenes, Tumor suppressor genes, apoptosis, role of oncogene products in signal transduction. Induction of tumors by *Agrobacterium*.

Unit III (15hrs)

Basic Concepts, principles, and Scope of r-DNA technology. Restriction enzymes – Nomenclature, classification, modification and importance. Accessories- (DNA ligages, Polynucleotide Kinase, alkaline phosphotases, Terminal transferase, SI and Bal31 nucleases).

Cloning Vectors – Types, importance, natural and artificial plasmids (Plasmids, Phagemids, Cosmids and BAC , YAC ,Ti plasmid, binary vectors , SV 40 and retrovirus vectors) and Characteristics of expression vectors.

Vector digestion, Ligation by linkers, adaptors and homopolymer tails. Preparation of DNA probes, construction of DNA libraries (Genomic and cDNA libraries).

Unit IV (15hrs)

Gene transfer methods- Transfermation, Electroporation, Microinjection, transfection and Particle Gun-Bombardment method. Selection of transfermants. *Agrobacterium* Transfection. Screening of recombinants – biochemical and hybridization methods. Microarrays and Macro array methods. Primer designing and applications of PCR.

Expression of cloned genes- DNA fingerprinting, RFLP, RAPD and AFLP and restriction mapping. *lac* and taq promoters, fusion protein tags and purification, inclusion bodies and solubilization of proteins. Genetically engineered organisms (GEO) as cell factories. Recombinant DNA technology applications in biology.

Learning outcomes:

Unit I: Know the plasmids, gene transfer methods ,models and Transposable elements.

Unit II: Students able to know the Cell-cycle its regulations, check points and tumorogenesis .

Unit III: Students get to know about concepts of r-DNA technology, cloning perspectives.

Unit IV: Students should acquire knowledge on screening , expression and purification of recombinants and applications of GMOs.

References:

1) Maloy, S.R., Cronan Jr. Je. Freifelder D (1998). Microbial genetics. Jones and
2) Watson, J.D., Hopkins, N.H., Roberts, J.W., Steitz, J.A. and Weiner, A.M. (1998). Molecular biology of the gene, 4th edition, Benjamin/Cummings publishing company.
3) Voet, D, and Voet, J.G (1995): Biochemistry, 2nd ed. John Wiley and Sons, New York.
4) Watson, J.D. Baker T.A., Bell S.P., Gann A, Levine M ad Losick R (2004): Molecular Biology of the gene, 5th Ed. Pearson Education, Inc.
5) Weaver R.F. (2002): Molecualr Biology, 2nd Edi., Mc Graw-Hill Higher Education,
6) Winnacker, E.L. (1987). From genes to /Clones: Introduction to Gene technology VCK Publications, Federal Republic of Gernmany.
7) White R.J (2001): Gene Transcription, Mechanisms and Control.
8) Microbial Genetics by Frifielder.
9) Introduction to Genetics by Gardner.
10) Fundamentals of Microbial Genetics by T.A. Brown.
11) J.M. Walker and R. Rapley (2002). 4th ed.: Molecular biology and Biotechnology. (Panima Publ.)
12) Demain, A.L., Manual of Industrial Microbiology and Biotechnology, (1999) second edition. Editor in Chief, ASM Press.
13) H. Kreuzer and A. Massey. Recombinant DNA and biotechnology: A guide for Teachers 2nd ed. ASM Press.
14) C. Ratledge and B. Kristiansen: .Basic Biotechnology, 2001. 2nd ed. Cambridge University Press.
15) Sambrook and Russel, Molecular Cloning, 2001. Vol. I – III CSH Press.
16) D. Freifelder - Microbial genetics
17) Gerald Karp (2004) 2nd edition - Cell and Molecular Biology
18) Lewin, B (2004): Genes VIII, Oxford University Press Oxford.
19) Lubert Stryer. (1995). Biochemistry. (4th edition). W.H. Freeman and company,
20) Molecular Biology of the Gene by James Watson, Tania Baker, Stephen Bell, Alexander Gann, Michael Levine & Richard Losick , 6th Edition; CSHL Press; 2007.
21) Molecular Biotechnology by T.A. Brown.
22) Tamarin, R. H. 2004. Principles of Genetics. McGraw-Hill Higher Education. USA
23) Hartwell, et al. 2004 : Genetics:From Genes to Genomes. McGraw-Hill Higher Education. USA

MB 25064: (A). FUNDAMENTALS OF MICROBIOLOGY

Objectives:

- To understand the fundamentals of microbiology, construction and applications of the instruments used in the studies related to various disciplines of biological sciences.
- To appreciate the importance, concept of research and learn the art of thesis, paper writing and publication.

UNIT – I (18 hrs)

Basic microbiology- History and achievements, Major contributions of Leeuwenhoeck, Edward Jenner, Alexander Flemming, Joseph Lister, Robert Koch and Louis Pasteur.

General Characteristics- Prokaryotic and eukaryotic microbes. Preparation of culture media, Isolation and characterization of microorganisms, pure culture techniques, preservation and maintenance of microorganisms.

UNIT – II (15 hrs)

Microscopy- Dark field, bright field, resolving power, numerical aperture, chromatic aberration, phase contrast microscopy, fluorescent microscopy, stereo microscopy, electron microscopy (TEM and SEM).

Staining Techniques- Negative staining, Simple staining, , differential staining- Gram and acid fast staining, flagella staining, capsule and endospore staining.

UNIT – III (10 hrs)

Whittaker's five– kingdom system of classification- Major characteristics used in identification and classification of microbes- Morphological, physiological, ecological genetic and molecular.

Bergey's manual of systematic bacteriology

UNIT – IV (18 hrs)

Control of microbes- Sterilization (dry heat, moist heat and radiation), pasteurization, filtration, Chemical- phenol and phenolic compounds, halogen aliphatic alcohol, formaldehyde, ethylene oxide, heavy metals, anionic and cationic detergents.

Significance of microbes in human health, agriculture, food and dairy industries, waste management and environment protection**.**

Learning Outcomes:

The Course will provide an overview of would know the

Unit I: Gain a strong foundation on basic microbiological practices.
Unit II: Pursuing high skills and knowledge on bacterial isolation, identification and classification.
Unit III: Know about the important aspects of microbial taxonomy.

Unit IV: General and advanced microbiology and understand the applications of microbes in dailylife.

References:

1. Microbiology Vol II (2019) second edition Power and Daginawala.
2. Outlines of Biochemistry 5th edition (2006) Cohn and Stumpf.
3. Microbiology by Dubey & Maheswari (2000)
4. Microbiology by Purohit (2006).
5. Textbook of Microbiology By Vasanthakumari, · 2016, Wolter Kluwer publisher.
6. Textbook of Microbiology By Naveen Kango , 2013, I.K. International Publishing House Pvt. Limited
7. Essentials of Microbiology By Surinder Kumar , · 2015, Jaypee Brothers Medical Publishers Pvt. Limited

(B). MICROBES IN HUMAN WELFARE

Objectives:

- To understand the microbes discovery and distribution.
- To understand the applications of the microbes in food, agriculture and industrial sectors

UNIT-1 (15 hrs)

Introduction to microorganisms- Definition. Discovery, Spontaneous generation vs. biogenesis. Distribution (air, water and soil).

Ultrastructure of bacterial cell- cell wall composition and detailed structure of Gram positive and Gram-negative bacteria. General characteristics of Bacteria, Viruses, Fungi, algae and protozoa

UNIT-II (15 hrs)

Microbes and Environment: Elemental and nutrient recycling, biogeochemical cycles (nitrogen and phosphorus); Esthetics loss of the environment - algal blooms, degradation of structures like buildings, pipelines etc.

Microbes in agriculture: Role of microorganisms in soil fertility and crop productivity; Biological nitrogen fixation; Phosphate solubilization; Mycorrhiza; Plant growth promoting rhizobacteria; composting.

UNIT-III (15 hrs)

Microorganisms and Food: Fermented food and food products; Nutritive and medicinal value of fermented foods; production of various fermented foods-curd, yogurt, cheese and beverages; Principles of food spoilage and contamination. Probiotics and nutraceuticals.

Microorganisms and Human Health; Role of Microorganisms in Human health; Major human diseases caused by important microbial pathogens. Concepts and principles of immunity to microbial infections. Action of antibiotics to combat microbial diseases; Microbial vaccines as prophylactic measures.

UNIT-IV (15 hrs)

Microorganisms and Industry: Microbial fermentations; Types of fermenters and fermentations;Bioprocess engineering; Raw materials.

Production of antibiotics, enzymes, organic acids and pigments. Extremophiles and theirapplications.

Learning Outcomes:

The Course will provide an overview of would know the

Unit I: Gain a strong foundation on basic microbiological concepts.
Unit II: Pursuing high skills and knowledge on microbes in environment and agriculture.
Unit III: Know about the important aspects of microbes in food and human health.
Unit IV: General and advanced microbiology and understand the applications of microbes in dailylife.

References:

1. Microbiology Vol II Power and Daginawala (2019).
2. Microbiology by Dubey & Maheswari (2000)
3. G. Rangaswamy and D.J. Bhagya Raj - Agricultural Microbiology second edition (2009)
4. Atlas and Batra - Microbial Ecology – Fundamentals and applications 1998
5. Eugenia J. Alguin, Gloriasanchez, Elizabethhernandez, environmental Biotechnology cleaner, Bioprocess 2005
6. M.P Dolye, Diez-Gonzalez F and Hill C. (2019) Food Microbiology: Fundamentals and frontiers. (5^{th} edition). ASM Press.USA.
7. Prescot & Dunn (2002) Industrial Microbiology published by Agrobios (India)

(C). SWAYAM/NPTEL/MOOCs

1. Determination of microbial growth curve
2. Effect of temperature, pH and salts on bacterial growth
3. Demonstration of Oligodynamic action
4. Isolation of photosynthetic bacteria
5. Estimation of bacteriochlorophyll pigments
6. Isolation of chemoautotroph's : *Thiobacillus ferroxidans*
7. Demonstration of Winograndsky column
8. Carbohydrate fermentation: acid and gas production
9. Isolation of hydrocarbon utilizing bacteria
10. Alcoholic and lactate fermentations
11. Assay of microbial enzymes (cellulase, pectinase, lipase and proteases)
12. Isolation and cultivation of anaerobic microorganisms
13. Demonstration of microbial toxins
14. Isolation and cultivation of antibiotic producing organisms.
15. Isolation of DNA from microbes, plants and animals.
16. Isolation of plasmid DNA
17. Estimation of DNA by DPA method.
18. Isolation of RNA from yeast
19. Estimation of RNA by Bial's Orcinol method
20. Determination of purity of DNA by spectrophotomeric method
21. Transformation

Suggested books/manuals.

1) Biotechnology: A Laboratory Course. 1996. 2nd ed. J.M. Becker, et al. Academic Press.
2) Methods in Biotechnology. 2002. By Ignacimuthu.

1. Isolation of auxotrophic mutants
2. Replica plating technique
3. UV survival curve
4. Petite mutants
5. Phage titration
6. Induction of mutations in bacteria by physical/chemical agents.
7. Demonstration of Ame's test.
8. Demonstration of conjugation in bacteria

b). Problems

I. DNA characteristics (Tm value, GC/AT, Chargaff's rule)
II. Transcription
III. Translation
IV. Mutations
V. Restriction mapping

rDNA practicles

1. Restriction digestion of sticky ends & blunt ends
2. RNA polymerase activity
3. Polyribosome's
4. Southern blotting
5. Ti plasmid / crown gall disease
6. Replica plating
7. DNA Ladder 1000bp (super coiled plasmid)
8. Restriction analysis and Agarose electrophoresis
9. Dioxic growth
15. Preparation of competent cells.

Suggested books/manuals.

1. Recombinant DNA Laboratory Manual. 1989. J.W. Zyskind and S.I. Bernstein. Academic Pess.
2. Manual of Industrial Microbiology and Biotechnology, 2nd edition, by Demam A.L., Editor in chief 1999, ASM Press.
3. Recombinant DNA and Biotechnology: A Practical guide to students 2nd edition. H. Kreuzer and A. Massey.
4. Molecular clonming Vol. I, II, III, A Practical by Sambrook, and Russel (2001) CSH press.
5. GeneticsA Laboratory Manual by By Gregore Koliantz, Daniel B. Szymanski · 2009

1. Demonstration of Bright field Microscopy
2. Sterilization methods- Autoclave, Hot air oven, Laminar air flow
3. Preparation of different Medias
4. Spread plate Method
5. Streak plate Method
6. Pour plate method
7. Isolation and enumeration of bacteria and fungi from soil
8. Morphological studies - bacteria, fungi and algae
9. Staining techniques: Negative, simple, Gram, spore, capsular, acid fast and Lacto phenol cotton blue staining
10. Hanging drop technique for bacterial motility
11. Slide culture technique
12. Slides

Reference Books:

1) Microbiological Applications: Laboratory Manual in General Microbiology, 7th ed. By J. Benson.
2) Microbiology: A Laboratory Manual. 4th edition. By J.G. Cappucciono and N. Sherman.
3) Experiments in Microbiology, Plant Pathology, Tissue culture and Mushroom cultivation. 3rd edition. By K.R. Aneja.
4) Practical Microbiology, 2002 by R.C. Dubey and D.K. Maheshwari.
5) Laboratory Manual in Microbiology, 2007. By P. Gunasekaran.
6) Laboratory Experiments in Microbiology by Johnson.
7) Laboratory Manual in Microbiology by Alcamo.
8) Laboratory Manual in General Microbiology by Michigan State University Dept of Bacterilogy, 2018.
9) Laboratory Manual of MicrobiologyBy A. . K. Roy, M. M. Prasad, · 2009, New India Publishing Agency.
10) Manual Of Microbiology (2Nd Edition) By K. Sharma · 2007

(B). MICROBES IN HUMAN WELFARE

1. Determination of Physcio-chmical properties of soil
2. Observation of VA mycorrhizae in crop plants
3. Isolation of Phospahte solubilizing bacteria
4. Ammonification in soil
5. Nitrification in soil
6. Denitrification in soil
7. Design of Fermentor
8. Preparation of wine from grape juice and estimation of alcohol
9. Antibiotic Sensitivity test
10. Role of yeasts in bread making
11. Culturing of mushrooms
12. Assay of Cellulase
13. Assay of Amylase
14. Assay of Protease
15. Determination of lactic acid in curd samples
16. Estimation of streptomycin
17. Production of citric acid

Reference Books

1) Experiments in Microbiology, Plant Pathology and Biotechnology. IV edition K.R. Aneja .
2) Principles and Methods of Plant Molecular Biology, Biochemistry and genetics (2005) Agrobios. India.
3) Practical Microbiology by, RC. Dubey and D.K. Maheswari (2008) S. Chand Publ.
4) Manual Industrial Microbiology and Biotechnology Second edition. (1999) A.L.Demain, Editor in chief, ASM press.
5) Manual of Industrial Microbiology and Biotechnology 2nd edition (1999) A.L. Demain and Davis Editor in chief, ASM press.
6) Experiments in Microbiology, Plant Pathology and Biotechnology by K.R. Aneja 4th Ed. (2005).
7) Practical Microbiology by R.C. Dubey and D.K. Maheswari (2008)
8) Microbiology – A Laboratory Manual by S.M. Reddy and S.Ram Reddy, 3rd Ed. (2005).
9) Laboratory experiments in Microbiology by Gopal Reddy et al (2005) 1st ed. Himalaya Publications.

MB 35061: BIO-PROCESSING TECHNOLOGY

Objectives:

- An in-depth study on industrially important microbes
- To make the students knowledgeable on bioprocess concepts.
- To make the students to know various techniques (upsteam and downstream) used in industries.

UNIT – I (15 hrs)

History of fermentation technology, Exploitation of Microorganisms in fermentation Process. Components of fermentation process.

Industrial media and Inoculum- composition, preparation and optimization. Sterilization of media and fermenter. Inoculum development, Starter culture technology and preservation methods of microbial cultures.

UNIT – II (15 hrs)

Fermenter – Design, parts and types of fermenters, probes for online monitoring, physical, chemical and biological sensors. Applications of computer in fermentation process, measurement and control of fermentation process.

Fermentation- Batch, fed batch and continuous fermentations. Microbial growth and product formation kinetics.

UNIT – III (20 hrs)

Fermentation process: Aeration and agitation. Temperature control, oxygen transfer kinetics. Power requirement. Concepts of Newtonian, Non – Newtonian and plastron fluids, apparent viscosity, foam and antifoam. Scaling up of process.

Downstream processing: Solid-liquid separation, release of intracellular components, concentration, purification, formulation of biological products. Monitoring of downstream processing and process integration.

UNIT- IV (15 hrs)

Process economics: starting point, process design, design exercise, cost estimates (capital cost and operating cost estimates) and Goods and Services Tax (GST).

Legal protection and IPR- WTO, IPR in India, patentability and patent application forms, process of patenting. Patent Co-operation Treaty (PCT). Global scenario of patents and India's position, patenting of biological materials. Convention on Biodiversity (CBD),

Learning outcomes:

By the end of this course the students will be able to

Unit I: know historical aspects of industrially important microbes medium preparation andsterilization.
UnitII: The students will be able to understand fermenter design and microbial growth kinetics
Unit III: Down steam processing methods for Industrial products.
Unit IV: The students will be able to understand the Fermentation economics and patentingprocess and rules and regulation of industrial microbiology

References:

1. Stanbury, P.F., Whitaker, A. and Hall, S.J. (2016). Principles of Fermentation Technology, Pergamon Press.
2. W. Crueger and A. Crueger. (2017). Biotechnology: A textbook of Industrial Microbiology. Third Ed.
3. Bioprocessing Technology for Production of Biopharmaceuticals and Bioproducts by Claire Komives, Weichang Zhou 2018.
4. Principles of Downstream processing, by Ronald & J. Lee, Wiley Publications, 2007
5. Doran, P. M. (1995). Bioprocess Engineering principle. Academic Press. London.
6. Biochemical Engineering Fundamentals, Second Edition, James E. Bailey, David F. Ollis McGrawHill. 2001
7. B. Siva Shankar. (2006). Bioseparations: Principles and Techniques. PHI Publications.
8. Sommleitner, B. (2000). Bioanalysis and biosensors for bioprocess monitoring. Advances in biochemical engineering/biotechnology. Vol.66. Springer-Verlag. Berlin.
9. Bioprocess Engineering Principles. Paulin M. Doran. Elsevier Science & Technology Books.200.
10. N. Krisha Prasad. Downstream process technology: A New Horizon in Biotechnology. PHI Publications.

Objectives:

- The objective of this course is students will learn about the structural features of the components of the immune system, their functions and responsiveness.
- Functions of HLA system and transplantation immunology
- T-Cell activation and co stimulation and hyper sensitivity reactions.

UNIT – I (15 hrs)

History and scope of immunology, structure, and function of cells & organs of immune system. Immune response (humoral and cell mediate) Types of immunity, innate immunity, acquired immunity; immunohematology, (Blood groups, Blood transfusion and Rh – incompatibility) phagocytosis, inflammation, and extra cellular killing.

Antigens and Antibodies: Antigens – structure, properties and types of antigens (Iso and allo, haptens, adjuvants) and antigenic specificity. Antibodies- structure, heterogeneity, types and sub types, properties (physico chemical and biological), theories of antibody diversity – production of polyclonal, monoclonal and recombinant antibodies and their applications.

UNIT – II (15hrs)

Antigen - Antibody interactions: Invitro methods – Flocculation, Precipitation, Immuno diffusion, Agglutination, Neutralization, Complement fixation. Immunoelectrophoresis, Immunoflorescence. RIE, CIE, RIA, ELISA and Western Blot, Flow cytometry.

Complement system: complement components, types, complement activation, regulation of complement system, biological consequences and pathways of complement activation and complement deficiencies.

UNIT – III (10 hrs)

Structure and functions of MHC and the HLA system- HLA and tissue transplantation tissue typing, graft versus host reaction and rejection. Antigen Processing and presentation. T-Cell maturation and differentiation. T- cell activation, co-stimulation and T-Cell Receptors.

Auto immunity, autoimmune diseases, tumor immunology–tumor specific antigens, immune response to tumor, immunodiagnosis of tumors, immunodeficiency, Immunotherapy of tumors (alphafeto-protein, carcino embryonic antigen).

UNIT – IV (20 hrs)

Hypersensitivity- classification and types (type I. Anaphylaxis; type II Antibody dependent cell cytotoxicity; Type III Immune complex mediated reactions; type IV cell mediated hypersensitivity.

Immunization- Objectives of immunization, Active and passive, types of vaccines: whole organism vaccines, recombinant vector vaccines, DNA vaccines, synthetic peptide vaccines, subunit vaccines. immunization procedures, adverse reactions of vaccines and Immunotherapy.

Learning outcomes:

References:

1. Kuby Immunology (8th Edition) by Owen, Punt& Stranford by Judy Owen/ Jenni Punt/Sharon Straford 2019.
2. Paul, W.E 2022 Fundamental Immunology 8th Ed.
3. Roitts essential immunology by Seamus J. Martin (Author), Dennis R. Burton (Author), Ivan M. Roitt . 2017.
4. Tizarrd, I.R. 2017. Immunology An Introduction 9th Ed
5. Ross, G.D. Ed Immuno biology of the Complement System.
6. Roitt's Essential Immunology by Peter J. Delves, Seamus J. Martin, Dennis R. Burton, Ivan M. Roitt 2016 13th Ed
7. John W. Kinball –Introduction to Immunology.
8. Abul Abbas, Andrew K. Kich Amn Jordan S. Pober. Cellular and Molecular Immunology 10TH Ed 2021.
9. Bacterial Evasion of the Host Immune System Edited by: Pedro Escoll Published: 2017

Objectives:

- The student will able to learn the basic concepts of medical microbiology and microbial pathogenesis: study of microbes, antimicrobial agents, epidemiology, and virulence factors associated with the pathogen.
- Types of specimans, collection processing of material for laboratory diagnosis, molecular diagnosis etc.

UNIT – I (18 hrs)

Classification and characteristics of medically important microorganisms: infection, virulence, pathogenicity, sources and modes of transmission of infections. Normal Microflora of human body: Detailed study of morphology, cultural characteristics, biochemical properties, pathogenesis, diagnostic laboratory tests, epidemiology and prophylaxis of the following organisms- *Streptococcus*, *Pneumococcus*, *Corynebacterium*, *Mycobacterium*, *Neisseria*, *Hemophilus*.

Sexually transmitted diseases– clinical significance of *Treponema*, *Neisseria,* LGV agent (*Chlamydia, Haemophilus*). Bacteria causing water borne infections *(Escherichia, Salmonella, Shigella, Vibrio*) and wound infections (C*lostridium, Staphylococcus, Pseudomonas*).

UNIT – II (12 hrs)

Detailed study of morphology, cultivation, pathogenesis, diagnostic tests, epidemiology, prevention and treatment of air borne, Waterborn, insect borne, contact, and sexually transmitted viral diseases. *Enterovirus,* and zoonotic viral infections. *Influenza virus, Chicken gunea,* Rhinovirus*, rubella, adenovirus, mumps, measles, varicella, zoster* virus, *Rabies, Japanese encephalitis*. HAV, HBV, HCV, HIV.

Mycoses- Superficial, cutaneous and subcutaneous, Opportunistic mycoses and their control. Detailed study of morphology, pathogenesis, Prevention of Malaria. Amoebiasis, Leshmaniasis, Toxoplasmosis, Exhninococcus grannulosus, Ascariasis, Ancylostomiasis, Filariasis.

UNIT - III (15 hrs)

Types of specimens, specimen collection, handling, transport, processing of material for laboratory investigations, specific and non specific laboratory tests, morphological identification (light and electron microscopy), culture isolation detection of antigen by immunological assays, serological tests, antibody stains, Immunoblotting.

Molecular diagnosis- DNA – DNA or DNA – RNA hybridization, 16srRNA, target ramification systems (PCR, reverse transcript PCR, TMA, NASBA, LAMP) probe amplification systems – Ligase chain reaction (LCR), signal amplification techniques. Applications of nanotechnology in clinical diagnosis.

UNIT – IV (15 hrs)

Antimicrobial agents- Bacterial, viral, fungal and protozoan. Microorganisms producing the antimicrobials, screening and assay of antimicrobial compounds, *(in vitro* and *in vivo)* minimum inhibitory concentration (MIC), minimum leathal concentration (MLC).

Mode of action of antimicrobial agents- Cell wall, nucleic acid, purine, pyromidine, protein. respiration,

oxidative phosphorylation, enzyme inhibitors, cell membrane disruptors, and metabolites, analogues, drug resistance and its side effects. 49

Learning outcomes:

At the end of this course students will be able to:

Unit I: Understand the role of bacterial pathogen in causing infectious disease in humans, naturalbarriers to infection and inflammation

Unit II: Understand the detailed study of bacterial and viral pathogens and mycotic infectionsprotozoal and helminthic infections

Unit III: Understand medical laborotary diagnostic procedures including molecular diagnosis.

Unit IV: Chemotherapy and chemotherapeutic agents and drug resistance.

References:

1. Murray PR et al (2019) Manual of clinical Microbiology (12th Ed.) American Society for Microbiology.
2. Peter M. Howely and David M. knipe (2019) Fields Virology emerging viruses (volume-1) 2020.
3. Davies et al Microbiology 4th edition.
4. Ananthanarayana, R & Panicker CKJ 11th Ed Test Book of Microbiology, Orient Longman, (2020).
5. Evans EGV et al (ed.) Medical Mycology Oxford University press
6. Reichmann, DD et al Churchill Livingstone, 2016 Clinical virology, 4th Ed.
7. Beily and Scott Diagnostic Microbiology 15th Ed. Elsevier publisher. 2021.
8. Panjarathinam R Orient Longman (2007). Text book of Medical Parasitology.
9. Foot-and-Mouth Disease Virus: Current Research and Emerging Trends Edited by: Francisco Sobrino and Esteban Domingo Published: 2017
10. Clinical Microbiology 8th Edition- An Introduction for Healthcare Professionals: Jennie Wilson (2018)
11. Parija SC, Text Book of Microbiology and Immunology, 3rd Ed., Elsevier, 2016.
12. Zinsser An introduction to microbiology 4th Ed 2019.

MBO 35064 (A). Microbial Technology and Entrepreneurship

Objectives:

- The student will able to learn the basic concepts of microbiology and microbial technology, study of microbes, antimicrobial agents, epidemiology, and virulence
- Use of Microbiology in daily life and human welfare

UNIT – I (15 hrs)

Microorganisms in relevance to man and society– Past, Present and Future. Traditional Microbial Technologies – Curdling of Milk, Bread and Wine, making other traditional foods of India and the World.

Microorganisms of Industrial importance – Over view of Isolation, Screening and Maintenance, Microbial cultures and commercially important products, Status, Demand and Production – Indian and Global Scenario.

UNIT – II (15 hrs)

Raw materials for Microbial Processes – Availability and utilization, Significance of locally available raw materials. Production of Pharmaceutical (Antibiotics, Enzymes, Vitamins and Monoclonal antibodies Antibiotics, vaccines) and Commercially important products (Alcoholic beverages, enzymes, acids). Production of fermented milk products Yogurt and Cheese.

UNIT – III (15 hrs)

Microbes in Agriculture – Composting, Vermi composting, Production and applications of bio fertilizers and bio pesticides, Microbial fuels – Methane and Hydrogen production.

Role of microbes in recovery of precious metals and production of bio degradable polymers. Genetically engineered microorganisms – Applications in health, industries, agriculture, environment, pros and cons of genetically engineered microorganisms in the environment.

Microbes as Food - Single cell protein– Mushroom cultivation.

UNIT – IV (15 hrs)

Microbial entrepreneurship– Government schemes for commercialization of microbial technology, Govt.

regulations, Entrepreneurship– Developing a business plan, basic concepts of financial management, major financial statement, over view of human resource management.

Legal and statutory requirements, Marketing, Rural and Women entrepreneurship. Patenting and intellectual property rights.

Learning outcomes:

At the end of this course students will be able to:
Unit I: Understand the role of Microorganisms in the service of man and society andMicroorganisms of Industrial importance
Unit II: Understand the detailed study Raw materials for Microbial Processes and Microbialproducts such as enzymes vitamins and antimicrobial compounds
Unit III: Understand Microbes in Agriculture and food science and technology.
Unit IV: Get the knowledge on microbial entrepreneurship and Legal and statutory requirementsand Marketing

References:

1. Richard Dana Ono, 2013, Business of Biotechnology, Butterworths
2. Doyle PM et al, Food Microbiology- Fundamentals and Frontiers, 2nd Ed. ASM Press
3. Naidu, NVR. (2013) Management and Entrepreneurship I. K. International Pvt Ltd
4. Tripathi, PC., Reddy, PN. Principles of Management, 5th edition, Tata McGraw Hill,
5. Desai V. Dynamics of Entrepreneurial Development & Management – Vasant Desai – Himalaya Publishing House 6th Ed. 2018.
6. Charantimath , PM. (2018) Entrepreneurship Development Pearson Education – 3rg Ed.
7. Naveen K.Singh Dairy Microbiology AND Biochemistry: Recent Development 2017.
8. Amitava Rakshit, A.K. Singh, Manoj Parihar, Vijay Singh Meena.(2021) Biofertilizers

Volume 1: Advances in Bio-inoculants

9. David B. Wilson, Hermann Sahm, Klaus-Peter Stahmann, Mattheos Koffa (2019) Industrial Microbiology.

10. Sanjai Saxena, Sanjai Saxena (2015) Applied Microbiology.

11. Gabby Mathews,(2018) Food and Dairy Microbiology,Edtech publishers.

(B). FOOD SAFETY AND QUALITY MANAGEMENT

Objectives:

- An in-depth knowledge about importance of microbes in food
- Role of packaging material in food safety
- Food safety hazards
- Food safety regulations and quality management

UNIT – I (15 hrs)

Introduction- Definition, concepts and scope of food microbiology. Importance of microbes in food, food as substrate for microbes. Factors influencing food spoilage (intrinsic and extrinsic), microbial growth, survival and death in food. Role of microorganisms in fermented foods and food industry. Economically important fermented products.

Detection of microbes in food - Direct microscopic count (DMC), standard plate count, MPN method, reductase test, membrane filters and molecular methods.

UNIT – II (15 hrs)

Food packaging- Significance and function- Classification of packaging materials- Packing methods- Interaction between and food- Toxicity hazards. Packaging laws and regulations. Biodegradable materials and environmental issues. Labeling requirements, nutritional labeling and coding of foods.

Food Safety Programs- Definitions and importance, Good Manufacturing Practices (GMPs), Pest Control Program, Facility Maintenance, Personal Hygiene, Supplier Control, Sanitary Design of Equipment and Infrastructure, Sanitation Standard Operating Procedures (SSOPs). Product Identification, Tracking and Recalling Program, Preventive Equipment Maintenance Program, Education and Training Program.

UNIT – III (10 hrs)

Hazard Analysis and Risk Assessment- Classification of hazardous material (Physical, Chemical) (additive, natural toxins, pesticides, antibiotics, hormones, heavy metals and packaging components and Biological hazards (virus, bacteria and fungi). Methods for detection of adulterants. Hazard Analysis Critical Control Point (HACCP) system. Microbiological standards - Codex Alimentarius and Food legislation.

UNIT – I V (20 hrs)

Food safety regulation in India- An overview of Food Regulation in India; Food Laws and Regulations; Structure, organization and duties of regulatory system; Duties and responsibilities of food business operator; Registration and Licensing process and requirements; Barcode of Food Products.
Import and Export of Foods; Liability for Defective Products; Food safety management systems and certifications; Regulation of special category Foods: Regulation of Irradiated foods; Genetic modified foods and Dietary Supplements. Functional Foods and Nutraceuticals.

Learning Outcomes:

Unit I: Students should know the role of microbes in food safety and spoilage
Unit II: Students should learn the different packaging material, labeling methods and safety programs
Unit III: Students will acquire the knowledge about hazard analysis and critical control pointsUnit IV: Students get the sound knowledge on food safety in India

References:

1. Pieternel A. Luning, Willem J. Marcelis, Pieternel A. Luning, Willem J. Marcelis (2020) Food Quality Management, Wageningen Academic Publishers
2. Alok Kumar, Alok Kumar ,(2019) Fundamentals of Food Hygiene, Safety and Quality, I.K. International Publishing House Pvt. Limited
3. Food quality management: Technological and managerial principles and practices by Pieternel A. Luning and Willem J. Marcelis 2020.
4. Food Safety And Quality Control 2018 by Pulkit Mathur published by The Orient blackswan.
5. Theodoros Varzakas, Constantina Tzia (2015) Handbook of Food Processing, Food Safety, Quality, and Manufacturing Processes, CRC press.
6. Food Safety and Standards Act, 2006, Rules & Regulations-- ILBCO [23rd Edition, 2022]
7. The Food Safety And Standards Act, 2006 14th Edition 2021 (October) Paperback – 1 January 2020 by Virag Gupta.

C). SWAYAM/MOOCs/NPTEL

1) Diauxic growth
2) Microbial growth kinetics during fermentation process.
3) Determination of mid-point of the bacterial growth curve.
4) Harvesting of microbial cells and demonstration of yield of products.
5) Manometric study in fermentation process.
6) Design of fermenter
7) Production of polyclonal antibodies- demonstration of different routes of immunization,
8) Bleeding of experimental animals,
9) Collection of blood, serum separation,
10) Purification and characterization of immunoglobulins.
11) *In vitro* serological tests: single radial immuno diffusion and double diffusion, Ochterlonly double diffusion, immunoelectrophoresis--counter immunoelectrophoresis, rocket immune electrophoresis, DAC- ELISA. DAS-ELISA.
12) Agglutination reactions, Widal, HA, blood grouping
13) Floculation- VDRL.

Suggested Books/Manuals.

1) Recombinant DNA Laboratory Manual (2014) BY Judith W. Zyskind, Sanford I. Bernstein .
2) Recipes for recombining DNA: A history of *Molecular Cloning: A Laboratory Manual (2020) BY* Angela N.H. Creager
3) Manual of Industrial Microbiology and Biotechnology, 2nd edition, by Demam A.L., Editor in chief 1999, ASM Press.
4) Recombinant DNA and Biotechnology: A Practical guide to students 2nd edition. H. Kreuzer and A. Massey.
5) Molecular clonming Vol. I, II, III, A Practical by Sambrook, and Russel (2001) CSH press.
6) Experimental Biochemistry, A Student companion (2003) Vijay Deshpandes. I.K. Int. Pvt. Ltd.

1. Production of polyclonal antibodies- demonstration of different routes of immunization, bleeding of experimental animals, collection of blood, serum separation, purification and characterization of immunoglobulins.
2. CBP and differential blood picture.
3. Lymphocyte viability test
4. Identification of Staphylococcus and Mycobacteria using Gram and acid fast Staining.

5. Collection and culture of nosocomial microorganisms

6. Bacterial examination of blood, urine and pus.

7. Examination of Blood smear for malaria.

8. Blood hemoglobin estimation

9. Erythrocyte sedimentation rate.

10. Liver function test for hepatitis virus

11. Slide observations: *Candida albicans*, *Mycobacterium leprae*, bacterial spores, *Corynebacterium* sp., *Clostridium tetani, Aspergillus fumigatus.*

12. Preparation of different types of culture media, stating techniques – Gram's staining, F.B. Staining, Albert staining, Capsular staining etc.,

13. Identification of various pathogenic bacteria by biochemical, enzymatic and serological methods.

14. Bacteriological examination of urine, blood, pus, sputum, stools etc, from patients for diagnosis.

15. Microscopic studies of virus infected materials.

16. Handling of lab animals.

17. Examination of pathogenic fungi.

18. Examination of stools for helminthes and Amoeba.

19. Examination of blood smear to identify malarial parasite.

20. Isolation, observation and identification of normal microbial flora of human body.

Suggested Books/Manuals.

1) Medical Microbiology 2020 by Patrick R. Murray PhD, Ken S. Rosenthal PhD, Michael A. Pfaller MD
2) Basic Medical Microbiology by Patrick R. Murray PhD 2017.
3) Manual of clinical Microbiology by Murray PR et al (2007) ASM.
4) A Practical Manual for Medical Microbiology – M aechie and Maecortney 4th ed. (1990).
5) Practical Medical Microbiology (14th ed.) collect JG et al Edinburgh: Churchill living (1996).
6) A Practical book for Microbiology, Techniques and Immunology by Ochie et al (1996) 4th ed. ASM Press.

1. Isolation of lipolytic, proteolytic, producing microorganisms from suitable source.
2. Production of Amylase by Surface culture method
3. Production of Amylase by Submerged culture method
4. Production of Protease
5. Production of sauerkraut
6. Production of Bio fertilizers using nitrogen fixing and phosphate solubilising isolates and packaging
7. Estimation of Antibiotics–Streptomycin & Tetracycline by suitable assay method.
8. Estimation of Organic Acids–Lactic Acid & Citric Acid by suitable assay method.
9. Immobilization of Amylase by using Sodium Alginate method.
10. Microbiological analysis of Butter by SPC
11. Detection for the presence of E .coli & Staph. Aureus in Butter
12. Microbial limit test for PSB market fertilizer product.

REFERENCE BOOKS

1. Experimental Microbiology–Rakesh J. Patel & Kiran R. Patel. (Vol. I&II)
2. Practical Biochemistry by Plummer
3. Microbial technology by Peppler & Periman.
4. Bacteriological Techniques- F.K. Baker
5. Bio fertilizers –Vyas & Vyas (Ekta Publication).
6. Citric acid Biotechnology–J. Achrekar.
7. Enzyme Biotechnology–G. Tripathi.
8. Bio fertilizers– Arun Sharma.
9. Industrial Microbiology–Agrawal / Parihar
10. Biotechnology–S. S. Purohit.
11. Agriculture Microbiology–G. Rangaswami & D. J. Bagyaraj

1. Direct microscopic examination of foods.
2. Estimation of total aerobic count both bacterial and yeast and moulds.
3. Estimation of total microbial bacterial plate count of food sample by direct microscopic and SPC method.
4. Assessment of air quality using plate exposure method and particle counts.
5. Detection of efficacy of surface sterilization using swab and Rinse method.
6. Enumeration of Coli forms and indicator organisms (Most Probable Number)
7. Detection of Coli forms and indicator organisms by confirmed and completed tests, and using membrane filter techniques.
8. Study of the growth curve of micro-organisms.
9. Study of the microbiological quality of milk by MBR test, bread count methods.
10. Estimation of total microbial count of (a) milk products (b) fruits and vegetable products (c) meat, fish and poultry products (d) canned foods.
11. Estimation of acidity of given food sample/beverage
12. Checking the adulteration of different commercial food items.
13. Estimation of toxins and pesticides in food.
14. Detection of adulteration in foods.

Suggested books for reading:

1) A Laboratory Manual of Food Analysis Paperback – 1 February 2020 by Shalini Sehgal.
2) Objective Food Science And Safety Standards Hardcover – 1 January 2021 by Prabodh Halde and sanjeev Sharma.
3) Aneja, K.R. (2001). Experiments in Microbiology, Plant pathology, Tissue culture and Mushroom Production Technology, 3rd Edition, New Age International (P) Ltd., New Delhi.
4) Dubey, R.C. and Maheswari, D.K. (2002). Practical Microbiology, S. Chand & Co., New Delhi.
5) Laboratory Manual of Food Microbiology by Neelima Garg , K.L. Garg , K.G. Mukerji.

Objectives:

- An in depth study on clinical samples, collection, and processing
- Diagnostic methods for Pathogenic Bacteria, viruses and mycoses
- Impart the knowledge among antimicrobial agents

UNIT-1 (10hrs)

General principles of laboratory diagnosis: - Types of clinical specimens, Characterization, Handling, Transport, processing of material, specific and non-specific tests- Microscopy, Staining methods , types of culture medium. Serological and Molecular diagnosis. Applications of nanotechnology in clinical diagnosis.

UNIT-II (10hrs)

Diagnosis of Bacterial Diseases- Isolation and Identification of pathogenic agents by morphological physiological and biochemical characterization. Antibacterial agents: Cell wall inhibitors(penicillins,β-lactums),glycopeptides(vancomycin, protein synthesis inhibitors(amino- glycosides, Tetra cyclins & clindamycin), Nucliec acid inhibitors(quinolones, rifampcin),anti metabolites(sulfonamides),MDTs(isoniazid,Ethambutol).

UNIT-III (10hrs)

Diagnosis of viral Diseases: Isolation and Identification of Viruses from clinical samples using Embronated egg inoculation Cell lines, and electron microscopy

Antiviral drugs-- Stimulation of Host innate immunity, non-nucleoside polymerase inhibitors (PFA). Protein inhibitors – AZT, Immuno modulators.

UNIT-IV (10hrs)

Diagnosis of Fungal Diseases: Isolation and Identification of pathogenic fungi from clinical samples by - culturing mounting (KOH), staining (Lactophenol cotton blue) and direct microscopy,

Anti-fungal drugs: Imidazoles (ketoconazole), Triazoles (flucanozoles, Iotraconazole), Echine candins (Caspofungin, micafungin), polyenes (amphotericin B).

Learning outcomes:

Unit I: The students should learn about the general principles of clinical samples and variouslaboratory diagnostic methods
Unit II: students must learn about the bacterial isolation ,identification of bacterial pathogens andrelevant treatment drug regimen.
Unit III: students should learn about the Viruses its isolation and identification procedures usingadvanced cultivation methods with appropriate medication.
Unit IV: students must learn about the Pathogenic Fungi --isolation, identification and relevantTherapeutics.

References:

1. Textbook Of Diagnostic Microbiology, 6E by Connie R. Mahon MS MT(ASCP) CLS, Donald C. Lehman EdD MT(ASCP) SM(NRM) 2018.
2. Koneman'S Color Atlas And Textbook Of Diagnostic Microbiology, International Edition, 7/E by Gary W. Procop, Elmer W. Koneman 2016.
3. Textbook of Diagnostic Microbiology Hardcover – 14 May 2018 by Connie R. Mahon MS MT(ASCP) CLS, Donald C. Lehman EdD MT(ASCP) SM(NRM).
4. Evans EGV et al (ed.) Medical Mycology Oxford University press
5. Tille, P. M., & Forbes, B. A. (2014). Bailey & Scott's diagnostic microbiology (Thirteenth edition.). St. Louis, Missouri: Elsevier.
6. Ananthanarayana, R & Panicker CKJ 12th Ed Test Book of Microbiology, Orient Longman, (2022).

MB 35065P DIAGNOSTIC MICROBIOLOGY

1. Isolation, observation and identification of normal microbial flora of human body.
2. Identification of Staphylococcus and Mycobacteria using Gram and acid-fast Staining.
3. Collection and culture of nosocomial microorganisms
4. Bacterial examination of blood, urine and pus.
5. Blood hemoglobin estimation
6. Erythrocyte sedimentation rate.
7. Liver function test for hepatitis virus
8. Slide observations: *Candida albicans, Mycobacterium leprae,* bacterial spores,
9. *Corynebacterium* sp., *Clostridium tetani, Aspergillus fumigatus.*
10. Staining techniques – Gram's staining, A.F.B. Staining, Albert staining, Capsular staining etc.,
11. Identification of various pathogenic bacteria by biochemical, enzymatic and serological
12. methods.
13. Bacteriological examination of urine, blood, pus, sputum, stools etc, from patients for diagnosis.
14. Microscopic studies of virus infected materials.
15. Examination of pathogenic fungi.
16. Examination of stools for helminthes and Amoeba.
17. Examination of blood smear to identify malarial parasite.

Suggested Books/Manuals.

1. Textbook of Diagnostic Microbiology (2018) by Connie R. Mahon MS MT(ASCP) CLS, Donald C. Lehman EdD MT(ASCP) SM(NRM)
2. Manual of Clinical Microbiology, Volume 2, (2019) BY Karen C. Carroll ET AL
3. Manual of clinical Microbiology by Murray PR et al (1999) ASM.
4. Manual of Clinical Microbiology, 11th Edition 2015 BY James H. Jorgensen et al.
5. Practical Handbook of Microbiology 3rd Edition, by Emanuel Goldman, Lorrence H Green

MB45061: AGRICULTURAL MICROBIOLOGY

Objectives:

- The student will able to learn the basic concepts of Agricultural microbiology and microbial pathogenesis: study of microbes, antimicrobial agents, epidemiology, and virulence factors associated with the pathogen.
- Types of specimans, collection processing of material for laboratory diagnosis, molecular diagnosis etc.

UNIT – I (15 hrs)

Soil- Definition, components, physical chemical characteristics and classification. Qualitative and quantitative nature of bacteria, actinomycetes, fungi, algae, protozoa and nematodes. Influence of environmental factors on soil microflora. Methods of isolation and enumeration of soil microflora.

Soil organic matter– nature, microbial degradation of carbohydrates, Proteins and other nitrogenous substances, fats, hydrocarbons and pesticides in soil. Humus significance and degradation. Soil enzymes – Nature, isolation, occurrence and ecological significance.

UNIT – II (15 hrs)

Plant– microbe interactions - Rhizosphere. Microflora on plant growth, Ecology of phyllosphere microflora, Biological importance of Phyllosphere microorganisms, Plant growth promoting rhizobacteria (PGPR). Diversity of nitrogen fixers; Mechanism of nitrogen fixation, nodule formation and gene regulation of nitrogen fixation.

Biofertilizers- Microorganisms used in biofertilizers, cultivation and mass production of biofertilizers and bioinoculants (*Rhizobium*, *Frankia*, *Azotobacter*, *Azolla*, *Azospirillum*, *cyanobacteria* and *Mycorrhizae*), Phosphate solubilizing bacteria (PSB), Vermicomposting methods and applications.

UNIT – III (15 hrs)

Plant pathology- Brief history and development of plant pathology, types of plant diseases and their significance. Symptoms of plant diseases. Basic procedures in the diagnosis of plant diseases. Host pathogen interactions- virulence factors of pathogens and defense mechanisms of plants against pathogens. Environmental effects on disease development and disease epidemiology.

Biocontrol- Introduction, biocontrol of foliar and soil borne pathogens and microbial pesticides (bacteria, virus, fungi) production, formulations, economics, safety, advantages and disadvantages. Development of

genetically modified crop plants for control of pests, integrated pest management.

UNIT – IV (15 hrs)

Plant diseases- Symptomatology, etiology, epidemiology, disease cycle, control measures of fungal diseases: damping off of seedlings, Phytopthora leaf rot and stem rots, downy mildew of grapes, rust of groundnut, red rot of sugarcane, tikka disease of groundnut, blast disease of rice.

Bacterial diseases- Citrus canker, blight of rice and angular leaf spot of cotton. Phytoplasmal diseases- Little leaf of brinjal. Viral and viroid: rice tungro, sugarcane mosaic/streak, potato spindle tuber viroid diseases, tomato/tobacco leaf curl, tobacco mosaic, citrus yellow mosaic, papaya ring spot, banana bunchy top.

Learning outcomes: At the end of this course students will be able to:

Unit I: Understand Soil types and chemical characteristics
Unit -II: Understand the Plant microbes' interactions and biofertilizers and their applications
Unit III: Understand plant pathology and biopesticide application in disease control.
Unit IV: Get the knowledge on various types of diseases and their control measures

References:

1. Stolop H.- Microbial ecology : Principles, methods, & applications & biological nitrogen fixation.
2. N.S. Subba Rao – Biofertilizers in Agriculture and forestry 2017
3. N.S Subba Rao- Soil Microbiology 2017
4. Soil Microbiology ecology and Biochemistry 4TH Ed. 2015 by Eldor A Paul.
5. Modern soil Microbiology 3rd Ed 2019 by *Jan Dirk van Elsas, Jack T. Trevors, Alexandre Soares Rosado, Paolo Nannipieri.*
6. Introduction to principles of plant pathology By R.S. Singh 2017.
7. Lynch poole - Microbial ecology : A conceptual approach
8. Advances in Agriculture and Industrial Microbiology Volume-2 by Suraj Kumar Nayak, Bighneswar Baliyarsingh, Ashutosh Singh, Ilaria Mannazzu, Bibhuti Bhusan Mishra.
9. Biofertilizers **Volume 1: Advances in Bio-inoculants 1st Edition – 2021 by AmitavaRakshit, Vijay Meena, Manoj Parihar, H.B. Singh, A.K. Singh**
10. Physiological and Molecular Plant Pathology 2018 by H.N.Gour.
11. Soil Microbiology: Subba Rao, N.S.(4th Ed.) 2014. Oxford & IBH Publishing Co.Pvt. Ltd.,New Delhi.
12. Experiments in Microbiology, Plant Pathology and Biotechnology, Aneja, K.R.2011. New Age International (P) Ltd., Publishers, New Delhi.
13. Microbiology A Laboratory Manual: James, C and Natile, S.(10th Ed.) 2014. Pearson India Education Services Pvt. Ltd., South Asia.
14. Gupta, S.K.(2014)Approaches and trends in plant disease management. Scientific publishers, Jodhpur, India.

MB 45062: ENVIRONMENTAL MICROBIOLOGY

Objectives:

- This course aims to provide the student with an understanding of the current views of microbial association in various environments & also to evaluate the containing roles played by microbes in the environment, and to consider the non pathogenic roles of microbes in the human body.

UNIT – I (18 hrs)

Habitats for microorganisms: Distribution of microbes in soil, water, air. Influence of physical and chemical factors on distribution of microbial flora. Types of microbial interactions and community dynamics.

Bio–geochemical cycles (Bioelements – carbon, nitrogen, sulphur, phosphorus and iron) and their ecological significance. Significance of ammonification, nitrification and denitrification.

UNIT – II (12 hrs)

Aerobiology- Brief account on Phylloplane microflora (Morphology, Physiology, nutrients reduction and Relative humidity & temperature), Microbes and microbial propagules in air. Methods for air microbial flora analysis, Brief account of air–borne transmission of microbes (viruses, bacteria and fungi), their disease fore casting and preventive measures.

Aquatic Microbiology–**T**ypes of Water ecosystems– fresh water (ponds, lakes, streams). Marine habitats (esturies, mangroves, deep sea, hydrothermal vents , saltpans, coral reefs). Zonations of water ecosystem, eutrophication, food chain. Potability of water, Sampling and microbial assessment of water quality and water purification.

UNIT – III (12 hrs)

Bioremediation- Bioremediation of contaminated soil and water using microbial consortia, reversal of global warming, Degradation of xenobiotics (oil slicks, detergents, plastics,) recalcitrance of pesticides (eg. DDT), volatilization of toxic metals by microorganisms. Genetic engineered microorganisms in the environment.

Biofouling and corrosion- Biofouling organisms, problems due to biofouling, antifouling paints and its environmental pollution, biotechnological approach to biofouling control, aerobic and anaerobic corrosion.

UNIT – IV (18 hrs)

Extremophiles– Microbes in extreme environments, adoption mechanisms, applications of extremophiles. Microbial leaching of mineral ores – organisms involved, factors affecting leaching, leaching process of uranium, copper and gold.

Waste treatment- Solid and liquid wastes and their characterization. Liquid waste treatment (microbial diversity and treatments), solid waste treatment- saccharification, gasification, composting, utilization of solid wastes for food (SCP, mushroom, composting, yeast), fuel (ethanol, methanol) and fertilizers. Treatment of industrial effluents.

Learning outcomes:

On the completion of the course, students should be able to:

Unit I: Understand the soil characteristics and Bio-geo chemical cycling. **Unit II:**
Know the microbial analysis of drinking water and aeromicrobiology.**Unit III:**
Acquire the knowledge on bioremediation and microbial leaching.
Unit IV: Know on the different aspects of waste management and sewage treatment systems.

References:

1) Brewing Microbiology: Current Research, Omics and Microbial Ecology Edited by: Nicholas A Bokulich and Charles W Bamforth, 2017
2) Advances in Microbial Ecology volume 15 2013 by J.G.Jones.
3) Metagenomics: Current Advances and Emerging concepts. Edited by: Diana Marco Published: 2017.
4) Indicators for Waterborne Pathogens Kindle Edition by National Research Council, Division on Earth and Life Studies 2020.
5) Drinking Water and Health. Vol 6. National Academics.
6) Indicator of Waterborne Pathogen. National Academics
7) Bioremediation: Applied Microbial Solutions for Real-World Environmental Cleanup. R M Atlas and J Cphilp Eds.
8) Microbial Biodegradation: Genomics and Molecular Biology, Caister Academic Press.
9) Introduction to Environmental Microbiology by Michel Wiley Liss Publication.
10) Microbial Diversity in Time and Space (2013) by R.R. Colwell, K. Ohwada, U. Simidu.
11) Manual of Environmental Microbiology, 4th Edition (2016) Marylynn V. Yates , Cindy H. Nakatsu , Robert V. Miller , Suresh D. Pillai.

MB 45063: FOOD MICROBIOLOGY

Objectives:

- To provide knowledge and skills in production as well as evaluate the microbial quality of the food product.
- To acquire knowledge on dairy and food products
- To extend students' knowledge on traditional fermented products to industrial fermentation products in the applied area of food microbiology.

UNIT – I (15 hrs)

Introduction- Definition, concepts and scope of food microbiology. Importance of microbes in food, food as substrate for microbes. microbial growth, survival and death in food. Food safety.

Detection of microbes in food - Direct microscopic count (DMC), standard plate count, MPN method, reductase test, membrane filters and molecular methods.

UNIT – II (15 hrs)

Contamination and spoilage- Microbiological contamination of food (yeasts, bacteria). Factors influencing food spoilage (intrinsic and extrinsic). Microbial spoilage of cereals, sugar products, vegetables, fruits, meat and meat products, milk and milk products, fish and sea foods, poultry. Spoilage of canned foods. Detection of spoilage and characterization.

Food preservation- Preservation methods, Food additives, canning, processing for heat treatment – D, Z, and F values and working out treatment parameters.

UNIT – III (15 hrs)

Food fermentation - Bread, cheese, vinegar, fermented vegetables, dairy, meat, poultry and fish products. Production of alcohol, fermented beverages (beer and wine). Fermented foods of therapeutic value (probiotics and prebiotics), spoilage and defects of fermented dairy products. oriental fermented foods, their quality standards and control.

Microbes as Food - Single cell proteins (SCPs), edible mushrooms and their cultivation, bioconversions. Genetically modified foods.

UNIT – IV (15 hrs)

Food borne disease and control- Food infection and intoxication, bacterial and non-bacterial food borne pathogens, Risk factors associated with food borne illness, detection of food borne pathogens and their toxins by conventional, rapid automated, molecular and immunological techniques.

Food control agencies and regulations- Laboratory Accreditation, Employee's health standards, waste treatment, disposal and quality control. Hazard analysis and critical control points (HACCP).Good manufacturing process (GMP). Microbiological standards - Codex Alimentarius and Food legislation**.** Quality Systems: BS 5750 and ISO 9000 Series.

Learning Outcomes:

By the end of this course students will be able to:

Unit I: Concepts and scope of food microbiology and know methods for isolation andidentification of microorganisms in food sample.

Unit II: Get the Knowledge of fermented foods and rapid techniques for the microbial analysis of
Unit III: Able to know the food borne diseases and techniques for control harmful microbes 70
Unit IV: Understand the microbial spoilage of food and principles of preservation methods.

References:

1. M.P Dolye, Diez-Gonzalez F and HillC.(2019) Food Microbiology: Fundamentals and frontiers. (5th edition). ASM Press.USA.
2. Frazier WC and Westhoff DC (2017). Food Microbiology. (5th edition). Tata Mc Graw Hill Publishing Company Ltd., New Delhi.
3. Text book of Microbiology 6th Ed 2020 by D R ARORA
4. Food Microbiology 2021 by K.Vijaya Ramesh
5. Food Microbiology by Foster W M, CBS Publication 2015.
6. Modern Food Microbiology 7th Edition by James M. Jay , Martin J. Loessner , David A. Golden
7. Principles of Fermentation Technology 2016 by Peter F Stanbury, Allan Whitaker, Stephen J Hall.
8. Fundamentals of Food microbiology 5th Ed by Bibek Ray Arun Bhunia CRC Press.
9. Food Safety and Quality-Based Shelf Life of Perishable Foods by Peter J. Taormina, Margaret D. Hardin 1st Ed.2021.
10. Food Microbiology: An Introduction (ASM Books) 4th Edition by Kalmia E. Kniel, Thomas J. Montville, Karl R. Matthews.
11. Food Microbiology: Fundamentals and Frontiers (ASM Books) Fifth Edition by Michael P. Doyle, Francisco Diez-Gonzalez, Colin Hill.

MB 45064 (A). INDUSTRIAL MICROBIOLOGY

Objectives:

- An in-depth study on industrially important microbial products
- To make the students knowledgeable on production process of various industrial products.
- To make the students to know various microbial secondary products like antibiotics and vaccines.

UNIT – I (12 hrs)

Introduction- History, industrially important microorganisms and their characteristics, Strain improvement through conventional and modern genetic engineering approaches.

Screening of microbes for products – Primary and secondary screening, detection and assay of products by physico- chemical and biological assays. Strategies for selection and preservation of Industrial strains. Culture collection centers.

UNIT – II (15 hrs)

Yeast– General characteristics, production of active dry, baker's, instant, brewer's, food and fodders yeasts.

Immobilization of cells and enzymes - Techniques and supports – Adsorption, covalent linkage, entrapment and cross-linkage, advantages and disadvantages. Applications of microbial fermentations with immobilized cells/enzymes.

UNIT – III (18 hrs)

Industrial production of enzymes - amylases, cellulases, pectinases, xylanases, proteases and lipases. Scope, utility and methodology of biotransformation, biotransformation of antibiotics, steroids and nonsteroids.

Production of Biofuels (ethanol, methane, hydrogen from starch and lignocellulose). Production methods and applications of organic acids (citric acid, lactic acid, acetic acid).Industrial production of Vitamin B_{12}.

UNIT – IV (15 hrs)

Biopolymers- PHAs and PHBs, extra cellular polymers (xanthenes, rhamnosan, dextrans, pullulan).Single cell oils (SCOs). Biosurfactants-classification, production and applications.

Antibiotic and Vaccine production – History, industrial production of penicillin, streptomycin,avermectins and bacterial and viral vaccines. Production of anticarcinogenic agents.

Learning outcomes:

By the end of this course the students will be able to know

Unit I: Historical aspects of industrial microbiology and screening of microbes for useful products.

Unit II: Production process for Industrial yeast and yeast products as well as immobilization of microbes and enzymes.

Unit III: The types and industrial production of enzymes and biofuels
Unit IV: The types and industrial production of biopolymers, antibiotics and vaccines

References:

1) P. F.Stanbury, A. Whitaker and S.J. Hall .(2017). Principles of Fermentation Technology. (3rdedition). published by Elsevier, Reed Elsevier India Pvt. Ltd.

2) Murray Moo-Young (2019). *Comprehensive Biotechnology, (3rdEdition). Pergamon (AP)*

3) Peppler H.J Pertman D (2014). Microbial Technology, Vol-1and 2.(2nd edition). Academic Press New York.

4) Cruegers Biotechnology: A Textbook of Industrial Microbiology 2017 by Wulf Crueger

5) Nduka Okfor (2018) Modern Industrial Microbiology and Biotechnology, Published by Science Publishers, Enfield NH, USA.

6) L. E. Casida Jr . Industrial Microbiology. Wiley International Ltd

7) Basic Biotechnology, 3Rd Ed by Colin Ratledge online 2012.

8) A.L. Demain and Davis Second edition. (1999) Manual of Industrial Microbiology and biotechnology Editor in chief, ASM press.

(B). BIOSTATISTICS, RESEARCH METHODOLOGY AND BIOINFORMATICS

Objectives:

- Students will be able to make informed decisions based on data and apply statistical tools, data bases and computational techniques in their research works.
- To make the students to understand genome sequence analysis and protein analysis and to know the computational tools in bioinformatics.

UNIT – I (15 hrs)

Introduction to biostatistics, Measures of Central tendency - mean (arithmetic, harmonic and geometric) median and mode, Probability, distribution; Correlation, Co-efficient, Simple linear regression; basic idea of Significance, hypothesis, levels of significance, Student 't', 'Chi' square and goodness of fit.

Classification, tabulation, frequency distribution and graphical representation of data. Analysis of co–variance: introduction, procedure, t-Test for multiple comparisons. Line fitting curves through graph points, standard curves, MLR. Construction of histograms and interpretation.

UNIT – II (15 hrs)

Research methodology- Definition, steps in research process, General characteristics of research selection of research problem, literature survey, hypothesis, ability to construct, presentation and interpretation of research data, preparation of abstract/technical report/manuscript for publication in scientific Peer reviewed journals. Report writing methods Discussion, Summary and Bibliography.

Project writing skills – preparation of research proposal for grants, Background analysis of problem, proposed goal, objectives, targets, implementation of plan and annual budget for project proposal. National and international funding agencies for life sciences research. Research fellow ships.

UNIT – III (15 hrs)

Introduction to computers - Components of Computer, Central Processing Unit (CPU), VDU, Keyboard and Mouse, Other input/output Devices, Computers Memory, Concepts of Hardware and Software; Concept of Computing, Data and Information; Applications of IECT; Types of operating systems – DOS, UNIX and Windows.

Microsoft windows- Creating Presentation; Text Preparation and Power point Presentation, Slide Show (Word, Excel and PPT). Basic of networking; LAN, MAN, WAN; Concept of Internet and its applications in biology, New software for microbiological research.

UNIT – IV (15 hrs)

Bioinformatics: Definition, scope and relevance of bioinformatics, databases, visualization tools, genomics, proteomics, molecular mining, molecular modeling, Drug designing, gene therapy, structure and functional relationship of biomolecules.

Sequence analysis: Concepts, importance and alignment methods (pair wise and multiple sequence alignments). Methods of structure prediction for known and unknown folds. (Homology modeling) Applications of bioinformatics.

Learning outcomes:

Up on completion of the course the students will be able to:

Unit I: Be familiar with statistics in biology Solve problems quantitatively using appropriatestatistical measures.

Unit II: Create and interpret visual representation of quantitative information

Unit III: Understand the importance of biological data bases, programme skills and computationaltools, softwares and their applications in future research.

Unit IV: Understand the whole genome analysis computational tools microarray techniques andprotein analysis.

References:

1) Introduction to Bioinformatics (2017) by Attwood.
2) Statistics for Social sciences: T. Rajaretnam, Sage publication. New Delhi 2016
3) Fundamentals of Statistics (Seventh Edition): S.G. Gupta. Himalaya Publication, Mumbai, 2018
4) Introduction to Biostatistics and Research Methods(Fifth Edition): P.S.S. Sundar Rao, J. Richard, Prentice Hall, New Delhi, 2012
5) John Creswell (2013). Research Design: Qualitative, Quantitative, and mixed methods
6) Approaches. Fourth edition, Sage Publications
7) ICMR, 2016 Ethical Guidelines for Biomedical Research on Human Participants, ICMR, New Delhi
8) Russell Bernard H., Gery W. Ryan Analyzing Qualitative Data: Systematic Approaches, SAGE Publications, 2010.

(C). PUBLIC HEALTH MICROBIOLOGY

Objectives:

- Students will be able to understand the role of microorganisms in public health
- To make the students to understand importance of nutrition in combat the infectious diseases.

Unit-I (15 hrs)

Introduction to Public health- Public health definition and approach. Public health Organizations and functions – World health organization (WHO), Center for Disease control and Prevention (CDC), Occupational Safety and Health Administration (OSHA) and Public health organizations in India, Importance of public health Microbiology, Public health Diseases (Non communicable and communicable)

Unit-II (15 hrs)

Public health Nutrition- Basic terms in food and nutrition, Understanding relationship between food, nutrition and health. Functions of food-Physiological, psychological and social. Role of public health department in community health. Prevention of Nutrition related illness or problems. Government policies and programs to improve public health. Large scale organized and multidisciplinary approaches to nutritional problems. Role of public health nutritionist or professional to improve public health.

Causes, symptoms, treatment, prevention of Protein Energy Malnutrition (PEM), Vitamin A Deficiency (VAD), Iron Deficiency Anemia (IDA), Iodine Deficiency Disorders (IDD), Zinc Deficiency and Flurosis.

Unit-III (15 hrs)

Air and water borne diseases- bacterial, Viral and Fungal. Analysis of microbial load in air and water, air sanitation, water treatment.

Control of Air and water borne diseases (Tuberculosis, diphtheria and Whooping cough Candida infections, *Cryptococcus neoformis* and Influenza common cold flue and SARS. Water born (Cholera, typhoid and hepatitis)

Unit-IV (15 hrs)

Food borne diseases- Food Hygiene, safety, Food spoilage, Food poisoning and food borne infections. Food borne diseases (Typhoid, Cholera, Diarrhea), control of food borne diseases.

Nosocomial Infections- Causes, Control, Prevention and surveillance. Sexually transmitted Infections (STI), HIV/AIDS, Hepatitis B, Syphilis, Genital herpes. Diagnosis of hospital acquired infections. Disposal of infective hospital and laboratory materials, monitoring of sanitation in community.

Learning outcomes:

Up on completion of the course the students will be able to:
Unit I: The students will be gain knowledge on microbial disease, their cause and transmission and will be helpful for students to practice safe and healthy life style

Unit II: Be familiar with statistics of communicable diseases and preventive measures
Unit III: familiar with importance of nutrition in public health
Unit IV: Understand the importance of food borne and nosocomial infections.

References:

1. Mary Jane Schneider. (2020). Introduction to Public Health. 6thedition.
2. Cashman, K. D., Sheehy, T., & O'Neill, C. M. (2019). Is vitamin D deficiency a public health concern for low middle income countries? A systematic literature review. European journal of nutrition, 1-21.
3. Gordis Leon. Epidemiology (6thedition) , Elsevier Saunders, 2018.
4. Somerville Margaret, et al., Public Health and Epidemiology at a Glance, Second Edition, Wiley-Blackwell, 2016.
5. Dona Schneider and David E. Lilienfeld. Lilienfeld's Foundations of Epidemiology, Fourth Edition, Oxford University Press, USA, 2015.
6. Porta Miquel. A Dictionary of Epidemiology 5th edition, Oxford University Press, USA, 2014
7. Vir S.C., (2015), Public health nutrition in developing countries (Part I and II), 1st edition Woodhead Publishing India Pvt, Ltd.
8. Public Health at the Crossroads – Achievements and Prospects. Robert Beaglehole and Ruth Bonita 2nd Edition 2014 Cambridge University Press.

1. Determination of physico – chemical characteristics of the soil –Texture and P^H and conductivity.
2. Estimation of organic matter in soils.
3. Study of microbial activity in soil by respirometry (CO_2 evolution)
4. Isolation and study of Rhizosphere microflora, determination of R:S ratio.
5. Isolation of Rhizobium from root nodule.
6. Estimation of Azotobacter and Azospillum Populations form rhizosphere soil
7. Isolation of phosphate solubilizing bacteria from rhizosphere soil
8. Visit to local field crops for observation of diseases caused by bacteria, fungi and viruses.
9. Ammonification in soil
10. Isolation of antibiotic producing microorganisms from soil
11. Most probable Number Test for coli forms
12. Quantitative analysis of water for microbial members (SPC)
13. Biochemical oxygen demand (BOD), Chemical oxygen demand (COD)
14. Assay of microbial products (a). Streptomycin (b). Penicillin (c). Indole acetic acid
15. Isolation of Yeasts from grapes
16. Preparation of wine from grape juice and estimation of alcohol
17. Estimation of ethanol by dichromate method
18. Microbiological examination of spoiled foods
19. Enumeration of surface Microflora of vegetables
20. Microbiological examination of milk
21. Detection of number of bacteria in milk by breeds count
22. Determination of milk quality by Methylene blue reduction test (MBRT)
23. Bread making process
24. Extraction and analysis of aflotoxins
25. Immobilization of microbial cells/enzymes.
26. Culturing of mushrooms

Suggested Books / Manuals

1. Experiments in Microbiology, Plant Pathology and Biotechnology. IV edition K.R. Aneja
2. Principles and Methods of Plant Molecular Biology, Biochemistry and genetics (2005) Agrobios. India.
3. Practical Microbiology by, RC. Dubey and D.K. Maheswari (2008) S. Chand Publ.
4. Experiments in Microbiology, Plant Pathology and Biotechnology by K.R. Aneja 4th ed. (2005).
5. Practical Microbiology by R.C. Dubey and D.K. Maheswari (2008).
6. Microbiology – A Laboratory Manual by S.M. Reddy and S.Ram Reddy, 3rd Ed. (2005).
7. Laboratory experiments in Microbiology by Gopal Reddy et al (2005) 1st ed. Himalaya Publications.

MB 45062P – (B). BIOSTATISTICS, RESEARCH METHODOLOGY AND BIOINFORMATICS

1. Graphical representation of data, histograms and frequency curves.
2. Descriptive statistics of distribution: Mean mode, median, variance, standard deviation and standard error.
3. Probability distribution – binomial, poisson and normal distributions.
4. Tests of significance on means and proportions – standard normal deviate test,
5. Paired and unpaired test.
6. Application of Chi square test, contingency tables with Yate's correction.
7. Correlation and regression coefficients and their testing, partial and multiple correlation coefficients, multiple regression.
8. Application of analysis of variance (ANOVA). Distance of similarity analysis
9. Basics of computers – basic commands – file creation, copying, moving and deleting in Linux and Windows.
10. Using email, browsing and search engines
11. Using biological databases – Pubmed, NCBI, Swissprot – protein data bank and genebank
12. Different types of sequence analysis queries in BLAST and FASTA
13. Multiple sequence alignments and Phylogenetic alignments (phylogenetic tree analysis).
14. Usage of gene and protein structure prediction softwares.
15. Genomic and proteomics available on the web and their use.
16. Statistical software available on the web and their use.

Suggested Books / Manuals

1. Fundamentals of Statistics (Seventh Edition): S.G. Gupta. Himalaya Publication, Mumbai, 2021.
2. John Creswell (2018) 5th edition. Research Design: Qualitative, Quantitative, and mixed methods
3. Introduction to Biostatistics and Research Methods(Fifth Edition): P.S.S. Sundar Rao, J. Richard, Prentice Hall, New Delhi, 2012
4. Approaches. Fourth edition, Sage Publications
5. ICMR, 2016 Ethical Guidelines for Biomedical Research on Human Participants, ICMR, New Delhi

1. Isolation and Identification of microorganisms from air.
2. Isolation and Identification of microorganisms from water and evaluation of water quality.
3. Community survey to identify the malnutrition cases.
4. Community health surveys
5. Different types of communication with rural people –To educate regarding the communicable diseases.
6. Identification of different disease symptoms in malnutrition
7. Personal hygiene and sanitation
8. Importance of First-AID
9. Analysis of food for pathogen identification.
10. Educate about nosocomical infections.

Suggested References

1. Text Book of Social and Preventive Medicine 2021 by Park JE and Park K
2. Manual of Clinical Microbiology by Karen C. Carroll (Editor); Michael A. Pfaller (Editor); Marie Louise Landry (Editor); Alexander J. McAdam (Editor); Robin Patel (Editor); Sandra S. Richter (Editor); David W. Warnock (Editor)
3. Evidence Based Public Health 2011, 2nd edition by Brownson, RC., Baker, EA., Leet. TL., Follespie. KN, Oxford University Press
4. Epidemiology for Public Health Practice 4th edition 2010, by Friis, RH., and Sellers, TA, 2nd Edition, Gaithersburg, MD: Aspen Publication,

Yogi Vemana University: Kadapa
Internal Examinations
Microbiology

Time: 1 Hour **Max. Marks: 25**

PART-A

Answer any FIVE of the following questions 5 x 2 = 10 Marks Each question carries Two (2) Marks

1. Unit-1/3
2. Unit-1/3
3. Unit-1/3
4. Unit-1/3
5. Unit-2/4
6. Unit-2/4
7. Unit-2/4
8. Unit-2/4

PART-B

Answer any ONE of the following questions 1 x 15 = 15 M

Each question carries Fifteen (15) Marks

9. Unit-1/3

OR

10. Unit-2/4

Yogi Vemana University:
Kadapa M.Sc Degree
Examinations-November/April

Model question paper
Microbiology
I/II/III/IV Semesters

Time: 3 Hours **Max. Marks: 75**

PART-A

Answer any FIVE of the following questions 5 x 3 = 15 Marks Each question carries Three (3) Marks

1. Unit I
2. Unit I
3. Unit II
4. Unit II
5. Unit III
6. Unit III
7. Unit IV
8. Unit IV

PART-B

Answer all questions **4 x 15 = 60 Marks**
Each question carries Fifteen (15) Marks

9. Essay Question
OR
10. Essay Question
11. Essay Question
OR
12. Essay Question
13. Essay Question
OR
14. Essay Question
15. Essay Question
OR
16. Essay Question

Yogi Vemana University:
Kadapa M.Sc Degree Examinations-November/April

Model question paper
Microbiology
III Semesters
Diagnostic Microbiology (Skill Oriented Course)

Time: 3 Hours **Max. Marks: 75**

PART-A

Answer any FIVE of the following questions 5 x 3 = 15 Marks Each question carries Three (3) Marks

17. Unit I
18. Unit I
19. Unit II
20. Unit II
21. Unit III
22. Unit III
23. Unit IV
24. Unit IV

PART-B

Answer all questions **4 x 15 = 60 Marks**

Each question carries Fifteen (15) Marks

25. Essay Question

OR

26. Essay Question

27. Essay Question

OR

28. Essay Question

29. Essay Question

OR

30. Essay Question

31. Essay Question

OR

32. Essay Question

YOGI VEMANA UNIVERSITY COLLEGE: KADAPA

DEPARTMENT OF MICROBIOLOGY

Practical Model Question Paper: Total Marks: 100

1. Major Experiment - 25 Marks
2. Minor Experiment
   - A. - 10Marks
   - B. - 10 Marks
3. C. Spotters - 35 Marks
4. D. Record - 10 Marks
5. E. Viva-voce - 10 Marks

Papers for pre-Ph.D. Examination

S. **No.**	Course	Total Marks
Paper - I	Research Methodology	100
Paper - II	Research Specialization (Syllabus will be framed by research supervisor based on research topic of the research student)	100
	Total	**200**

Department of Microbiology

Syllabus for Pre-PhD: Paper 1 (Research Methodology)

UNIT 1:

Basic microbial methods- Sterilization and disinfection techniques, isolation, enumeration, identification and preservation of microorganisms. Principles and applications of light, phase contrast, dark field, fluorescent and electron microscopy (SEM, TEM). Production techniques of industrially important microbial metabolites (Vitamins, antibiotics, amino acids, beverages, SCP, Vaccines).

UNIT 2:

Separation techniques- cell fractionation, cell disruption, isolation and separation of cell organelles. Principles and applications of Centrifugation (preparative and analytical), dialysis, chromatography principles and applications (paper, TLC, affinity, ion-exchange, column, GLC and HPLC). Electrophoresis principles and applications (agarose gel, PAGE, Iso-electric focusing, 2-D gel analysis). Colorimetry and spectrophotometry principles and applications (UV, Visible, IR, MS, NMR) X-ray crystallography. Use of radio isotopes in biology, labelling and measurement and Auto-radiography.

UNIT 3:

Molecular and immunological techniques- isolation and estimation of DNA, RNA and proteins. Hybridization, blotting techniques (southern, Northern and Western). PCR and its variants, RAPD, RFLP, AFLP and micro arrays. Enzymes and vectors in cloning and expression. Handling of experimental animals. Immunization, polyclonal and monoclonal antibody production, in vitro Antigen-antibody detection methods (ODD, SRID, IE, RIE, FACS, ELISA and RIA).

UNIT 4:

Biostatistics- collection, classification and tabulation of data. Importance of statistics in biology. Principles of experimental design, normal distribution test, significance, analysis of variance, F- test, T-test, regression analysis.

UNIT 5:

Characteristics of research- definition, steps in research process, selection of research problem, literature survey, hypothesis, ability to construct, presentation and interpretation of research data, preparation of abstract/technical report/manuscript for publication in scientific journals, preparation of research proposal for grants.

Yogi Vemana University, KadapaPre - Ph.D. Examinations

Dept. of Microbiology

Model Question Paper Paper I – Research Methodology

Answer any five of the following **5x20 = 100 Marks**

1. UNIT 1

(Or)

2. UNIT 1

3. UNIT 2

(Or)

4. UNIT 2

5. UNIT 3

(Or)

6. UNIT 3

7. UNIT 4

(Or)

8. UNIT 4

9. UNIT 5

(Or)

10. UNIT 5

Prof. O. Vijayasarathi Reddy Department of Biochemistry S.V. University Tirupati, Andhra Pradesh Phone No: 9440046293 E-mail: ovsreddy@yahoo.com	**Prof. P. Umamaheswari Devi** Department of Microbiology Sri Padmavathi Mahila University Mobile: 9848894900 E-mail:umadevi66@yahoo.co.in
Dr. D. Madhusudhana Reddy Associate Professor Dept. of Microbiology Plamuru University Telangana sate Phone: 9676150158 E-mail: dadireddy@gmail.com	**Prof. K.P.J. Hema Latha** Department of Microbiology College of Science and Technology Andhra University Vishakha patnam-530003, Andhra Pradesh. Phone: +91-9490133250 Email: hemalathakpj@@gmail.com
Prof. Gobardan Das Special Center for Molecular Medicine Jawaharlal Nehru University New-Delhi-110067 Phone: +919971106287 Email: gobardhan.das07@gmail.com	**Dr. A. Dinakar Rao** Associate Professor Center for Bioinformatics Pondicherry University Puducherry Phone: 0413-2654946; +91-8940108019 Email: ampasaladr@bicpu.edu.in

Dr. Yogesh Shouche Scientist 'G' Microbial Culture Collection (MCC) National Center for Cell Science (NCCS) NCCS Compex, Pune University Campus Ganeshkhind Pune- 411007, Maharashtra Phone No: +91-020-25708052, 25708000, +91-9822623257 Email: yogesh@nccs.res.in	**Dr. Ramesh Ummanni** Center for Chemical Biology, CSIR-IICT, Tarnaka, Uppal Road, Hyderabad-500 007, Phone: +91-9640210494 Email: aummanni@iict.res.in rameshbiochem@gmail.com
Dr. C. Suresh Scientist E, Department of Biochemisty,FABP, National Institute of Nutrition Hyderabad-, Telengana (State) Tel: +91-9000902985 Email: sureshnin2000@gmail.com	**Dr. T. Anand** Scientist-E Division of Biochemistry and Nano sciences Defense Food Research Laboratory Siddarth Nagar, Mysore – 570011, Karnataka Tel: 91- 821-2579487 Email: ananddfrl@yahoo.com
Prof. M.A. Singaracharya Department of Microbiology Kakatiya University Warangal- 506009 Telengana Phone: 91-9849208919 Email: singaracharyam@gmail.com	**Prof. V. Rangaswamy** Department of Microbiology Sri Krishna Devaraya University Anantapur – 515055 Phone No: 8333832874 08554-273168 Email: rangamanjula@yahoo.com
Prof. Lokanatha Valluru Department of Zoology Rayalaseema University Kurnool Mobile: 9652840923,9492640923	**Dr. Y.Suresh**, Department of Aniamal Sciences, School of Life sciences, University of Hyderabad, Gachibowli Hyderabad-500046, Telengana,

Tel: lokanathav@yahoo.co.in	Tel: +91-9912851355 Email: sureshnin2000@gmail.com
Prof. S. D. S. Murthy Department of Biochemistry S.V. University Tirupati, Andhra Pradesh Phone No: 9440587902 E-mail: sdsmurthy@rediffmail.com	**Prof. S. Rajagopal** School of Plant Sciences University of Hyderabad Hyderabad. Mobile: 9866046509 E-mail: psrajagopal@yahoo.com
DR. S. Paramageetham Department of Microbiology S.V. University Tirupathi Mobile:9346840042 E-mail: paramageetham@yahoomail.com	**Prof. A. Suvarnalatha Devi** Department of Applied Microbiology Sri Padmavathi Mahila University Mobile: 8374820199 E-mail: drsuvarnapallipati@gmail.com

Prof. Ch. Paramageetham, S. V. University,

Prof. V. Uma Maheshwara Rao, ANU,

Dr. B. Chitra, Member (Industry)

Dr. L. Veeranjaneya Reddy, Chairman BoS

YOGI VEMANA UNIVERSITY::KADAPA

DEPARTMENT OF MICROBIOLOGY – 516 005

Minutes of the meeting of Board of Studies Council held on 11.04.2022 at 10.00 AM in virtualmode and in the Dept. of Microbiology, Yogi Vemana University, Kadapa

Members Present:

1. Prof. Ch. Paramageetham : External member
2. Prof. V. Uma Maheshwara Rao : External member
3. Prof. D. Vijaya Raghava Prasad : Member
4. Dr. L. Veeranjaneya Reddy : Head & Chairman, BoS
5. Dr. D. Vijaya Lakshmi : Member
6. Dr. M. Subhosh Chandra : Member
7. Dr. B. Chitra : Member (Industry)
8. Mr. M. Chenna Reddy : Member (PG Meritorious student)

The Board of Studies in Microbiology considered the following agenda for the meeting.

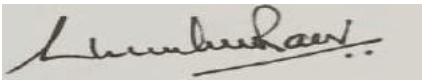
1. Course pattern, syllabus, scheme of examination for M.Sc. Microbiology w.e.f. 2021-22 along with Programme Educational Objectives (PEOs), Programme Outcomes (POs), Programme Specific Outcomes (PSOs), Course Objectives (COs) and Expected Course Outcomes (ECOs).
2. Modalities for implementation of National Education Policy (NEP) in M.Sc. course and encourage students to join in MOOCs/SWAYAM/NPTEL.
3. Scrutiny of Question papers of midterm of M.Sc. course and semester end examinations of pervious year (2020-21).
4. Panel of question paper setters for M.Sc. course in Microbiology.
5. Pre-Ph.D. written examination syllabus for Ph.D. Paper – I (Research Methodology) and Paper – II (Research Specializations).
6. Panel of paper setters for pre-Ph.D. written examinations (both papers).
7. YVURCET syllabus.
8. Panel of experts for selection committee.
9. Any other item.

Resolutions

1. Reviewed and resolved to approve CBCS pattern with National Education Policy as per the pattern suggested by University College.
2. Each course is holding four credits. The scheme of examinations for CBCS in University are as follows: 75+25 (Sem End + Internal)
3. It is resolved to motivate the students to participate in one SWAYAM/ MOOCs/ NPTEL programme of their choice in specified field.
4. Resolved to introduce community service programme for M.Sc. Microbiology course of CBCS & NEP pattern. Modalities for implementation of community service programme will be worked out.
5. Previous year question papers of M.Sc. Microbiology are scrutinized and found to be in order.

6. Resolved to approve the panel of examiners/paper setters for M.Sc., pre-Ph.D. written exams, YVUCET/APPGCET and YVURCET/APRCET.
7. Approved the syllabus for pre-Ph.D. degree course in Microbiology Paper – I and Paper – II specialization papers.
8. Approved the syllabus for conducting entrance exam of YVURCET/APRCET.
9. Resolved to approve the panel of experts for constitution of selection committee.

Signatures:

1. Prof. Ch. Paramageetham, S. V. University, Tirupati : 
2. Prof. V. Uma Maheshwara Rao, ANU, Guntur : 
3. Prof. D. Vijaya Raghava Prasad, Member :
4. Dr. L. Veeranjaneya Reddy, Head & Chairman, BoS : 
5. Dr. D. Vijaya Lakshmi, Member : 
6. Dr. M. Subhosh Chandra, Member :
7. Dr. B. Chitra, Member (Industry) :
8. Mr. M. Chenna Reddy, Member (PG Meritorious student) :

M.Sc. Physics

SYLLABUS

Program Code:PHYYVU

Based on National Education Policy (NEP) - 2020

Choice Based Credit System (CBCS)

(With effective from Academic Year 2021 – 2022)

Yogi Vemana University,
Vemanapuram, Kadapa – 516005, A.P. INDIA
(A State University, Accrediated with "B" Grade by NAAC)

Department Vision

To become an internationally recognized centre of excellence in academics and research in the area of Physics and related inter-disciplinary fields.

Department Mission

- The Department of Physics since its inception in 2007 has played a pivotal role in the University. This course aims to train the young students with the following objectives
- To impart high quality Science education in a vibrant academic ambience
- To prepare students to take up challenges as a researcher in diverse areas of theoretical and experimental physics
- Excellent laboratory and internet facilities
- Students to take admission to pursue Ph.D. programs in various advanced research areas like Atmospheric Science and Advanced Materials
- During 3rd and 4th semesters, students may opt special papers for the following areas: Condensed Matter Physics and Electronics.

Program Educational Objectives of M.Sc. (Physics)

1. To impart high quality education in Physical Sciences.
2. To prepare students to take up challenges as globally competitive physicists/researchers in diverse areas of theoretical and experimental physics.
3. To make the students technically and analytically skilled.
4. To give exposure to a vibrant academic ambience.
5. To create a sense of academic and social ethics among the students.
6. To prepare them to take up higher studies of interdisciplinary nature.

Program Outcomes of M.Sc. (Physics)

1. The students will obtain good knowledge in Physical Sciences. They will be trained to compete national level tests like UGC-CSIR NET, JEST, GATE, APSET etc., successfully.
2. They will be prepared to take up challenges as globally competitive physicists/researchers in diverse areas of theoretical and experimental physics.
3. They will be technically and analytically skilled enough to pursue their further studies.
4. They will have a sense of academic and social ethics.
5. They will be capable of taking up higher studies of interdisciplinary nature.
6. They will be able to recognize the need for continuous learning and develop throughout for the professional career.

Important notes:

The basic criteria of University Grants Commission (UGC) have been followed in preparing the course structure of this programme.

Minutes of the meeting of the Board of Studies in Physics

Minutes of the meeting of the Board of Studies in Physics (PG) held on 22 April, 2022 in the Chambers of Head of Department, Physics, Yogi Vemana University College, Yogi Vemana University, Kadapa – 516005.

MEMBERS PRESENT:

1	Dr. Y.P. Venkata Subbaiah	Chairman, Dept. of Physics, Y.V.University, Kadapa
2	Prof. K. Krishna Reddy	Member, Dept. of Physics, Y.V.University, Kadapa
3	Prof. Y. Nazeer Ahammed	Member & Head, Dept. of Physics, Y.V.University, Kadapa
4	Dr. M. Raghavender	Member, Dept. of Physics, Y.V.University, Kadapa
5	Prof. K.T. Rama Krishna Reddy	Member, Dept. of Physics, S.V.University, Tirupati
6	Prof. M.V. Lakshumaiah	Member, Dept. of Physics, S.K.University, Ananthapuram
7	Dr. G.V. Ramana	Member, Dept. of Physics, SCNR Govt. Degree College, Proddaturu
8	Dr. Pamulapati Venkata Seshaiah	Member, Industry management/Institute
9	Mr. R. Venkatesh	PG Meritorious Student (Student's Representative), Dept. of Physics, Y.V.University, Kadapa

The chairman welcomed the members and placed before them the following agenda for discussions.

AGENDA:

ITEM-1: Consideration of approval of Syllabi for M.Sc. (Physics) I – IV Semesters for the students who are admitted for the academic year 2021-2022 onwards. The syllabi include mandatory core papers, internal electives and open elective in III semester in accordance with the CBCS pattern of NEP 2020.

ITEM-2: Consideration of approval of model question paper and panel of examiners.

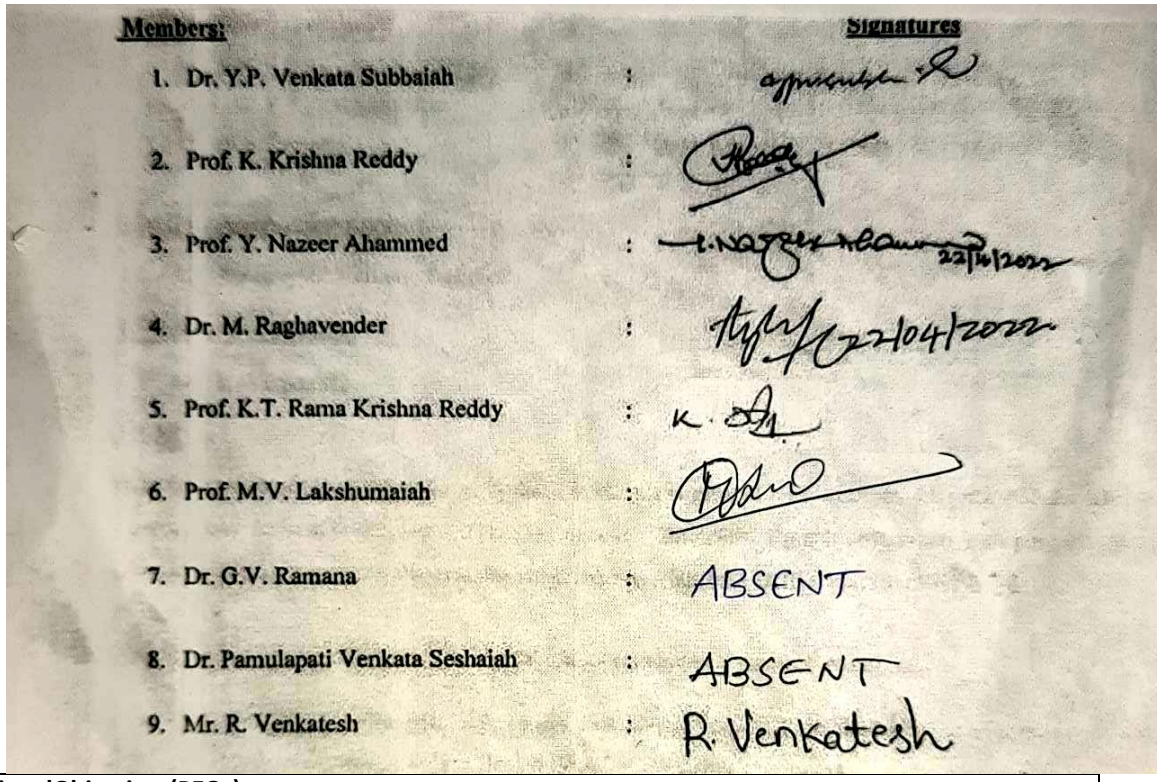
ITEM-3: Consideration of decision taken by the Chairman, Board of Studies in Physics in consultation with the internal members in case of exigencies on behalf of the Board of Studies.

ITEM-4: Consideration of existing Internal (25M) and External marks (75M) proportions for each paper in I, II, III and IV semester for University College and Affiliated College(s).

RESOLUTIONS:

1. M.Sc. Physics (CBCS) Syllabi (I – IV Semesters) for the students who are admitted in the academic year 2021 – 22 are considered and discussed in detail. All the suggestions are incorporated and unanimously approved by the members for I, II, III & IV Semesters of M.Sc. (Physic)
2. It is resolved to approve the model Question Paper for M.Sc. Physics for all the semesters and Panel of Examiners Paper wise for paper setting and valuation.
3. It is resolved to authorize Chairperson, Board of Studies to take appropriate decisions on behalf of Board of Studies in consultation with internal BOS members, if situation warrants.
4. It is resolved to have the following proportion of internal and external marks for each paper in I, II, III and IV semester for University College and Affiliated college(s).

   University College – Internal:25 External:75
   Affiliated College(s) – Internal:25 External:75



Members:		Signatures
1. Dr. Y.P. Venkata Subbaiah	:	
2. Prof. K. Krishna Reddy	:	
3. Prof. Y. Nazeer Ahammed	:	22/4/2022
4. Dr. M. Raghavender	:	22/04/2022
5. Prof. K.T. Rama Krishna Reddy	:	
6. Prof. M.V. Lakshumaiah	:	
7. Dr. G.V. Ramana	:	ABSENT
8. Dr. Pamulapati Venkata Seshaiah	:	ABSENT
9. Mr. R. Venkatesh	:	R. Venkatesh

ProgramEducationalObjectives(PEOs)	
PEO1	The student will have significant prospects in the various fields like academics, industry, research organization, consultancy, defense and entrepreneurial pursuit at national/international level.
PEO2	The student will achieve peer recognition as an individual or team member having specialized knowledge and expertise to identify, formulate, investigate, analyze and implement on the problems in physical sciences.
PEO3	The student will have a solid foundation for academic excellence and quality leadership to meet the challenges in interdisciplinary and multi-disciplinary environment
PEO4	The student will have ability to adopt, absorb and develop innovative and new technology in physical sciences and related areas through lifelong learning process.
PEO5	The student will inculcate value system and work ethically in a multidisciplinary environment, to enhance the advancement in physics in general and contribute significantly through their critical thinking and scientific competence.

ProgramSpecificOutcomes(PSOs)	
PSO1	On completion of the course the students will be able to explain the wide range of physical phenomena with underlying principles with respect to condensed matter physics, nuclear and particle physics both scientifically and in the wider perspective to the community.
PSO2	The current status of physics and associated developments can be understood and explained thoroughly.
PSO3	Show the ability to solve physics related problems and demonstrate the physics phenomenon through experiments.
PSO4	Well qualified to clear national level and state level qualifying examinations for research and teaching at graduate and postgraduate levels.
PSO5	The knowledge acquired during the course would also make the students able to pursue their higher studies as well as to use their knowledge to get into R & D and industrial sector.
PSO6	The knowledge acquired during the course will make the students to think, innovate and help to make original contribution to the domain knowledge.
PSO7	The inter-disciplinary knowledge gained during the course will help the student to understand a problem in a better way and would be able to address the problem with a complete understanding.

ProgramOutcomes(POs)	
PO1	**Physics knowledge:** The MSc physics programme create a comprehensive scientific knowledge, and this knowledge will help to understand, explain, and to solve advanced scientific problems.
PO2	**Problem analysis:** Identify, formulated and analyse advanced problems in physics.
PO3	**Design/development of solutions:** Design solutions for complex problems using the knowledge of physics.
PO4	**Conduct investigations of complex problems**: Use methodology and knowledge of physics to design innovative experiments, analyse and interpret the data.

PO5	**Modern tool usage**: To apply modern experimental and theoretical tools of physics along with modern computation technology to predict and model advanced problems in physics.
PO6	**Physics and society**: Apply the knowledge of physics to critically assess and analyse the problems of society.
PO7	**Environment and sustainability**: To ensure that the development in physics maintains and sustains the environment.
PO8	**Ethics**: Apply and commit to professional ethics of physics.
PO9	**Communication**: Effectively communicate the activities of physics to physics community and to society through effective presentation, reports and documentation.
PO10	**Life-long learning:** Recognize the need to engage in independent and life-long learning in the context of scientific/ technological change.

M.Sc. Physics Syllabus

(For the students admitted from the academic year 2021 – 22 onwards)

Semester	Components of Study	Course Code	Title of the Course	No. of credits	No. of hours per week	Practical/ Project	Internal Assessment	Semster End Exams	Total
SEMESTER-I	Mandatory Core	PHY15071	**Classical Mechanics and Theory of Relativity**	04	04		25	75	100
		PHY15072	**Atomic and Molecular Physics**	04	04		25	75	100
		PHY15073	**Solid State Physics**	04	04		25	75	100
	Internal Elective	PHY15074	**(A) Analog and Digital Electronics**	04	04		25	75	100
			(B) Integrated Circuit Fabrication Technique		04				
			(C) Introduction to VLSI design and CMOS fundamentals		04				
			Tutorial and Seminar	00	04		00	00	000
	Practical-I	PHY15075	**PHY15071, PHY15072 & PHY 15073 (General Lab)**	04		16		100	100
	Practical-II	PHY15076	**PHY15074 (Internal Elective Lab)**	04		16		100	100
	Sub-total			24	28	32	100	500	600
SEMESTER-II	Mandatory Core	PHY 25071	**Statistical Mechanics**	04	04		25	75	100
		PHY25072	**Electromagnetic Theory, Lasers & Modern Optics**	04	04		25	75	100
		PHY25073	**Mathematical Physics**	04	04		25	75	100
	Internal Elective	PHY25074	**(A) Computational Methods and Programming**	04	04		25	75	100
			(B) Computer Architecture and Networking		04				
			(C) Sensors and Transducers		04				
			Tutorial and Seminar	00	04	00	00	00	000
	Practical-I	PHY 25075	**PHY25071; PHY 25072 (General Lab)**	04		16		100	100
	Practical-II	PHY 25076	**PHY25074 (Internal Elective Lab)**	04		16		100	100
	Sub-total			24	28	32	100	500	600
SEMESTER-III	Mandatory Core	PHY 35071	**Quantum Mechanics – I**	04	04	04	25	75	100
		PHY 35072	**Nuclear and Particle Physics**	04	04	04	25	75	100
	Core Internal Electives	PHY 35073	**(A) Condensed Matter Physics (CMP)-I**	04	04		25	75	100
			(B) Advanced Electronics		04				
			(C) Applied Spectroscopy		04				
	Open Elective	PHY 35074	(A) Frontiers of Physics	04	04		25	75	100
			(B) Nanomaterials and Devices						
			(C) SWAYAM / MOOCs / NPTEL						
	Practical-I	PHY 35075	**General Lab**	04		16		100	100
	Skill Orien-ted Course Practical	PHY 35076	**Core Internal Elective Lab**	04	04	16	0	100	100
			Tutorial and Seminar		04	00	00	00	000
	Sub-total			24	32	32	110	490	600
SEMESTER-IV	Mandatory Core	PHY 45071	**Quantum Mechanics – II**	04	04		25	75	100
		PHY 45072	**Analytical Techniques**	04	04		25	75	100
	Core Internal Elective	PHY 45073	**(A) Condensed Matter Physics (CMP)-II**	04	04		25	75	100
			(B) Communication Systems		04				
			(C) Photonics		04				
	Internal Elective	PHY45074	**(A) Physics of Semiconductor Devices**	04	04		25	75	100
			(B) Vacuum and Thin Film Physics		04				
	Practical	PHY 45075	**Core Internal Elective Practical Lab**	04		16		100	100
	Multi-Disci-plenary Course / Project/Lab	PHY 45076	**Meterology and Atmospheric Instrumentation or Project work or Practical**	04		16		100	100
	Sub-total			24	28	32	100	500	600
Grand Total				**96**	**240**		**400**	**2000**	**2400**

- All core papers are Mandatory
- Internal/Open Elective – Choose one paper each.Open Electives are for the students of other Departments in the varsity.
- Skill Oriented course practical is mandatory.
- Interested students may register for SWAYAM /MOOCs/ NPTEL with the approval of the concerned DDC for the award of the grade as 'open elective'
- Multi-disciplinary Course / Project work / Lab is mandatory. Circle formation with other subjects/Dept. of Arts/ Commerce.
- Project Work – Collaboration with departmental research labs or with various firms/companies/societies.

SEMESTER-I

Mandatory Core	PHY 15071	CLASSICAL MECHANICS AND THEORY OF RELATIVITY

Course Objectives - This course enables the students:

A. To define the concepts of Langrangian Mechanics.
B. To interpret the concepts of Hamiltonian Mechanics.
C. To explain generating function, canonical transformation & Poisson brackets.
D. To illustrate the dynamics of a rigid body and non-inertial frames of reference.
E. To formulate the concepts of coupled oscillators.
F. To learn the Special theory of Relativity and concepts of Relativistic Mechanics.

Course Outcomes - After the completion of this course, students will be able to:

1. Formulate the Lagrangian mechanics concepts and solve the problems with the help of Lagrangian mechanics.
2. Compare the formulation of HamiltonianandLagrangian mechanics and solve the problems of classical and relativistic mechanics
3. Solve the problems of generating function, canonical transformation & Poisson brackets.
4. Formulate the equations of rigid body dynamics and demonstrate the examples of noninertial frames of reference.
5. Solve the equations of coupled oscillator and to examine the two coupled pendulums, and double pendulum related problems.

UNIT – I: Lagrangian Mechanics and Hamiltonian Mechanics

Newtonian mechanics of one and many particle systems: Conservation laws, Constraints and their classification, Degrees of freedom: Generalized coordinates: Principle of virtual work, D'Alemberts principle, Lagrange's equations of motion. Applications: Inclined plane, Linear harmonic oscillator and simple pendulum.

Hamiltonian principle, Lagrange's equation from Hamilton's principle, Hamilton's equation of motion. Applications: Simple pendulum, Compound pendulum. (1-4)

UNIT – II: Canonical Transformations and Hamilton - Jacobi Theory

Canonical Transformations, Generating function and their properties, Condition for transformation to be canonical, Illustration of canonical transformation, Poisson – Brackets, Canonical equations in terms of Poisson, Bracket notation. Lagrange - Brackets and their properties.

Hamiltonian - Jacobi equation, one dimensional harmonic oscillator, Small oscillations and normal modes, Action Angle variables, Kepler problem in action angle variables. (4,5)

UNIT –III: Motion in a Central Force Field

Reduction to the equivalent one body problem; Motion in a central force field: Conditions for closed orbits: Inverse square law of forces: Kepler's laws of planetary motion; Rutherford scattering.

Rotations – Space and body fixed axes: Angular momentum and Torque; Eulerian angles – Euler's equations of a rigid body: Motion of symmetrical top ; Expression for slow and fast precessions; Larmour precision; Gyroscope. (1-3,6)

UNIT –IV: Special Theory of Relativity

Introduction – Postulates of Special Theory of Relativity – The principle of constancy of light – The Lorentz transformations. Relativistic Kinematics: The velocity transformations – The transformations for the acceleration of a particle, The Doppler effect.

Relativistic Mechanics: The mass of a moving particle – The relativistic dynamics of a single particle – Applications of relativistic dynamics of a single particle : Motion in electric field – Motion in a magnetic field – Experimental verification of the variation of mass with velocity – Bucherer's experiment - Transformation of momentum and force. (7-9)

Books for Reference

1. Classical Mechanics by N.C. Rana and P.S. Joag (Tata Mc-graw Hill) 1991
2. Classical Mechanics by H. Goldstein (AddiWesely) 1980
3. Classical Mechanics by J.C.Upadyaya
4. Classical Mechanics by Gupta, Kumar and Sharma
5. Classical dynamics of particles by J.B.Narion Academic press
6. Introduction to Classical Mechanics by R.G. Takwale and P.S. Puranic
7. Theory of Relativity by W.Pauli
8. Introduction to the theory of relativity by P.G.Bergmann

9. Introductory Relativity by W.G.V.Rossner

SEMESTER-I

Mandatory Core	PHY 15072	ATOMIC AND MOLECULAR PHYSICS

Course Objectives - This course enables the students:

A. To learn about the intricacies of spectra of Hydrogen-like atoms
B. To understand the concepts of Zeeman and Startk effects and their applications.
C. To study the details of rotational and vibrational spectra of molecules.
D. To learn about the FTIR and vibrational spectroscopy and the corresponding instrumentations.
E. To understand the concepts of Frank-Condon principle and application.

Course Outcomes - After the completion of this course, students will be:

1. Able to deal with problems related to Hydrogen-like atomic spectra
2. Having knowledge about the Zeeman and Startk effects and their applications
3. Through with the knowledge of rotational and vibrational spectra of molecules
4. Able to comprehend the instrumentation techniques that are used in different regions of spectra
5. Understanding principle and working of IR and FTIR spectrometers.
6. Learning the Frank-Condon principle and intensity distribution in absorption and emission spectra.

UNIT I: Atomic Spectra

Hydrogen atom (one electron atom) - quantum numbers- Spectra of hydrogen atom- Spectra of alkali elements- Fine structure- Elements with more than one valence electron- Forbidden transitions and selection rules- Vector atom model – Spin-orbit interaction energy- Space quantization- Stern-Gerlach (S-G) experiment-Coupling schemes- Spectral terms and term symbols, Ground states based on electron configuration - LS coupling - JJ coupling- Interaction energies in LS and JJ couplings - Hund's rule of multiplicity - Pauli's exclusion principle - Equivalent and non-equivalent electronic systems – Applications of atomic spectra.

UNIT II: Zeeman and Stark Effects

Zeeman effect, Normal and anomalous Zeeman effects, Experimental details, Zeeman effect of hyperfine structure, Magnetic moment of the atom and Lande's 'g'-factor, Zeeman effect in sodium atom, Lande g-formula for LS and JJ couplings - Paschen-Back effect- Splitting of sodium lines and selection rules, Stark effect, Experimental details, Weak and strong field effects- linear and quadratic Stark effects-Width of spectral lines.

UNIT III: Diatomic Molecular Spectroscopy – Rotational Energies

Rotational, vibrational, electronic spectra of diatomic molecules, Types of molecules: Linear, symmetric top, asymmetric top and spherical top molecules, Rotational spectra of a diatomic molecule as rigid rotator – Energy levels and spectra of non-rigid rotor – Intensity of rotational lines - Rotational spectra of polyatomic molecule (OCS, CO2) -Evaluation of rotational constants -Effect of isotopic substitution on rotational levels- Stark modulated microwave spectrometer- Applications of rotational spectroscopy - Determination of molecular structure, dipole moment, atomic mass- Microwave oven.

UNIT IV:Diatomic Molecular Spectroscopy – Vibrational Spectra

Vibrational spectra of diatomic molecule – Diatomic molecule as simple harmonic oscillator – Anharmonic oscillator – Energy levels and spectrum – Molecule as vibrating rotator – PQR branches – progressions and sequences – Vibrational analysis of electronic spectra - Deslander's table – Evaluation of vibrational constants – Morse potential energy curve – Frank-Condon principle – Intensity distribution in absorption and emission spectra - Effect of isotopic substitution on vibrational bands – IR spectrometer – FTIR spectroscopy – Principle – Interferometer arrangement – advantages - Applications of vibrational spectroscopy: Identification of molecular constituents – Elucidation of molecular structure.

Books for study

1. Introduction to Atomic Spectra, H.E. White, McGraw-Hill Kogakusha. Ltd., New Delhi.
2. Fundamentals of Molecular Spectroscopy, C.N. Banwell and E.M.Mc Cash,Tata McGraw-Hill Pub. Co. Ltd., New Delhi,1994.
3. Spectroscopy, Vol. I & III, B.P. Straughan&S. Walker, John Wiley & Sons, Inc., NY,1976.
4. Introduction to Molecular Spectroscopy, G.M. Barrow, McGraw - Hill Book Co, 1962.
5. Spectra of Diatomic Molecules, G. Herzberg, D.VanNostrand Company Inc, New York 1950.
6. Molecular Spectroscopy, J.M. Brown, Oxford Science Pub. Oxford, 1998.
7. Molecular Structure and Spectroscopy, G. Aruldhas, Prentice- Hall of India, Pvt., 2005.
8. Elements of Diatomic Molecular Spectra by H. Dunford – Addison-Wisely, 1957.

SEMESTER-I

Mandatory Core	PHY 15073	SOLID STATE PHYSICS

Course Objectives - This course enables the students:

A. To understand the bonding in solids and study crystal structuresand properties.
B. Acquire knowledge of the behaviour of electrons in solids and on expression for thermal and electrical conductiveties in metals.
C. To become familiar with the Band theory and difference between metals, semiconductors and insulators.
D. To develop an understanding on the properties of Semiconductor materials.
E. To get familiarized with the different parameters associated with superconductivity and the theory of superconductivity.

Course Outcomes - After the completion of this course, students will be:

1. Able to differentiate types of crastalsbased on their structure.
2. Able to explain how the predicted electronic properties of solids differ in the classical free electron theory, quantum free electron theory and the nearly free electron model.
3. Able to explain Band theory and difference between metals, semiconductors and insulators.
4. Able to understand the properties and applications of different types of semiconductor meterials.
5. Able to differentiate between type-I and type-II superconductors and their theories.

UNIT – I: Lattice Energies and Lattice Vibrations

Bonding in Solids - Ionic and van der Waals crystals – Elastic properties – Stress and strain – Elastic moduli - Lattice energy calculations for ionic and van der Waals crystals – Lattice vibrations: Mono and diatomic one dimensional infinitely long lattices – Vibrational spectra – Infrared absorption in ionic crystals – Vibrational spectra of finite lattice – Quantization of lattice vibrations – Phonons – Properties – Experimental measurement of dispersion relation.

UNIT – II: Transport Phenomena and Band Theory

Concept of electrical and thermal resistivity – Expression for thermal and electrical conductivities for metals – Lorenz number - Different scattering mechanisms – Matthissen's rule- Formulation of Boltzmann transport equation – Relaxation time approximation

Free electron theory - Band theory of Solids - Motion of electron in periodic potential – Bloch function - Kroning-Penny model – Formation of energy bands in solids — Brillouin zones – Concept of effective mass – Distinction between metals, insulators and semiconductors.

UNIT – III: Semiconductor Physics

Intrinsic and extrinsic semiconductors – Expression for position of Fermi levels and carrier concentrations – Variation of Fermi level with temperature – np product – Degenerate and non-degenerate semiconductors – Charge neutrality equation - Carrier mobility, conductivity and their variation with temperature – Direct and indirect band gap semiconductors – Differences and examples – Hall effect – Drift and Diffusion – Diffusion equation - Einstein relation – Generation, Recombination and life time of non-equilibrium carriers – Hayness-Shockley experiment.

UNIT – IV: Superconductivity

Concept of zero resistance – Magnetic behavior –Meissner effect – Type I and Type II superconductors - Isotope effect – Specific heat behavior –Expression for entropy difference between normal and superconducting states – Two-fluid model – London's equations – Penetration depth – BCS theory –Josephson junctions – SQUIDS - Applications of superconductors – High T_C superconductors (Conceptual)

Books for Study

1. SolidState Physics, C. Kittel, John Wiley & Sons.
2. SolidState Physics, Neil W. Ashcroft & N David Mermin
3. Solid State Physics, A.J. Dekkar, Macmillan India Ltd.
4. Elementary Solid State Physics, M. Ali Omar, Addison-Wesley.
5. SolidState Physics, M.A.Wahab, Narosa Publishing House.
6. SolidState Electronic Devices, B.G. Streetman.
7. High T_C Superconductivity, C.N.R. Rao and S.V. Subramanyam.
7. SolidState Physics, S.O. Pillai.
8. Electrons in Solids, Richard H. Bube.
9. Semiconductor Device fundamentals, Robert F. Pierret, Addison and Wesley Longmann

SEMESTER-I

I n t	**P H Y**	**AN AL OG**

e r n a l E l e c t i v e	**1 5 0 7 4 (A)**	**AN D DI GI TA L EL EC TR ON ICS**

Course Objectives:

A. To impart knowledge about a variety of special, power and microwave solid state electronic devices, their structure and the underlying physical principles.
B. To expose the students to the Operational Amplifiers and to add to the knowledge on the variety of circuits encompassing all major class of applications.
C. Combinational logic and Sequential logic circuits would be dealt with in all its expanse and rigor to give a good feel of the different types of Flip-Flops and their useses.
D. Microcompueter concept is introduced and intended to impart knowledge on 8085 Microprocessor.

Course Outcomes:

1. Understanding the physics of the devices their characteristics and applications, to be able to use them in electronic circuits
2. Students would develop an insight into the Operational Amplifier device and applications during and after the course
3. In depth understanding would enable the students to appreciate the beauty of the subject and design logic circuits that are technically sound.
4. Students would develop a comprehensive understanding of Microprocessor.
5. Students would be aware of writing assembly language programs for 8085 Microprocessor to understand their use in larger and complex systems.
6. Students would enjoy the new and stimulating ideas behind the future novel devices and would also appreciate the link between electronics and the quantum effects that come into play.

UNIT – I: Introduction to Electronic Devices:

P-N junction and its characteristics, BJT, characteristics, BJT as amplifier, Field Effect Transistor (FET): Structure and working of JFET, Characteristics, and parameters of JFET. Advantages of FET over BJT. FET as switch and Amplifier Application of FET as voltage variable resistor. Structure of MOSFET, depletion type and enhancement type, MOSFET Characteristics, MOSFET as variable resistor, Concept of CMOS. Structure, working and Characteristics of UJT. Application of UJT as a Relaxation oscillator.

UNIT – II: Operational Amplifiers:

Block diagram of a typical Op-Amp, differential Amplifier, Comparator open loop configuration, inverting and non-inverting amplifiers. Op-amp with negative feedback, CMRR, frequency response, slew rate. Instrumentation Amplifier, Integrator and differentiator. Waveform generators (Square and triangle). Converters: R-2R Ladder D/A Converter, Successive Approximation A/D Converter.

UNIT – III : Digital Electronics

Combinational Logic: Multiplexers, Decoder, Demultiplexer, Data selector, Multiplexer, Encoder. Sequential Logic: Flip–Flops, 1-bit memory, The RS Flip-Flop, JK Flip – Flop, JK Master Slave Flip–Flops, T Flip-Flop, D Flip-Flop, Shift Registers, Serial in Serial out, Serial in Parallel out, parallel in Serial out, Parallel in Parallel out Registers. Counters: Asynchronous and Synchronous Counters, MOD-3 Counter, MOD-5 Counter.

UNIT – IV: 8085 Microprocessor

Introduction to microcomputers, memory, input/output, interfacing devices, 8085 CPU-Architecture-BUS timings Demultiplexing the address bus generating control signals, instruction set, addressing modes, illustrative programs – writing assembly language programs, looping, counting and indexing counters and timing delays, stack and subroutine.

Text Books

1. Micro Electronics by Milliman and Halkias. TMH Publications
2. OP-Amps & Linear Integrated Circuits, by RamakanthA.Gayakwad,PHI 2nd Edition, 1991.
3. Digital Systems by Ronald J. Tocci, 6th Edition, PHI, 1999.

4. Digital Principles and Applications by A.P. Malvino and Donald P.Leach, Tata McGraw- Hill, New Delhi, 1993.
5. Microprocessor Architecture, Programming &Appplications with 8085/8086 by Ramesh S.Gaonkar, Wiley – Eastern Ltd, 1987 (UNIT – V)

Reference Books

1. Electronic Devices and Circuit Theory by Robert Boylested and Louis Nashdsky, PHI, New Delhi, 1991
2. Micro Electronics by Sedra and Smith
3. Electronic Principles by Malvino, 6th Ed. TMH
4. Linear Integrated circuits by Roy Choudhry
5. Operational amplifiers by Collins

SEMESTER-I

Internal Elective	**PHY 15074 (B)**	**IC Fabrication Technology**

Course Objectives - This course enables the students:

A. To learn about the wafer preparation methods, various deposition techniques
B. To study the the concepts of crystal growth techniques.
C. To understand the details of oxidation, impurity distribution and photomasking.

Course Outcomes - After the completion of this course, students will be:

1. Understand the preparation of silicon ingot.
2. Students would develop P-type and N-type silicon crystal growth using Czochralski and Bridgmen techniques.
3. In depth understanding of film thermal and anodic oxidation, diffusion process, etc.
4. Students would be aware the photomaksing, etc.

UNIT – I: IC Fabrication Technology

Wafer preparation: Silicon crystal growth, Czochralski and Bridgmen techniques. Wafer orientation, Sawing and polishing, Crystal orientation, Doping of crystals during growth.

Epitaxial deposition: Introduction theory, Growth of an Epitaxial layer, evaluation of Epitaxial layers.

UNIT – II: Oxidation

Introduction, equipment for thermal oxidation, oxidation process, oxide evaluation, recent advances in oxidation technology, oxide thickness determination, oxidation function, redistribution of dopant atoms during thermal oxidation, anodic oxidation.

UNIT - III: Impurity

Introduction and redistribution, the idea of diffusion, diffusion process, diffusion analysis, ion implementation,

UNIT – IV: Photomasking

Introduction – generation of photomask. Metallization: Metallization of requirements, vacuum deposition, deposition techniques, vacuum deposition cycle.

Books for Study

1. Instrumentation Measurement and Analysis by Nakra and Choudary, 4th Edition, Tata Mc Graw-Hill, 1985.
2. Instrumentation – Devices and Systems by Rangan, Sarma and Mani, 2nd Edition, Tata Mc Graw-Hill, 1997.
3. Measurement of Systems Applications and Design by Earnest O.Doeblin, 7th Edition, Mc Graw-Hill, 1990.
4. A course in Electrical; and Electronic Measurements and Instrumentation by A.K. Sawhney, 3rd Edition, Dhanpat Rai & Company, 2016.
5. Electronic Instrumentation and Measurements Techniques, Cooper and Albert D. Helfriek, 3rd Edition, Pearson India Education, 2016.
6. Applied Electronics by G.K. Mithal, 20th Edition, Khanna Publishers, 1997.
7. Principles of Industrial Instrumentation by D. Patranabis, Tata Mc Graw-Hill, 1976.
8. Semiconductor device fundamentals by Robert F. Pierret, Addision Wesley Longman, 1996.

SEMESTER-I

Internal Elective	**PHY 15074 (C)**	**Introduction to VLSI design and CMOS fundamentals**

Course Objectives - This course enables the students:

A. To learn the principles of large scale integration (LSI) and very large scale integration (VLSI).
B. To understand the working principles of MOSFETs, CMOS, transmission gate circuits.
C. To learn the characteristics and its performance of integrated circuits, CMOS, MOSFETs, etc.

Course Outcomes - After the completion of this course, students will be:

1. Understanding the concepts of LSI, VLSI, MOSFETs.
2. Students would develop JFET, MOSFET
3. In depth understanding of CMOS ICs, CMOS logic gates, its characteristics.

UNIT - I: **An Overview of VLSI and Logic Design with MOSFET**

Complexity and Design, Basic concepts, Ideal switches and Boolean operations, MOSFETs as switches, Basic logics gates in CMOS, Complex logic gates in CMOS, Transmission Gate circuits, Clocking and data flow control.

UNIT - II: Physical Structure and Fabrication of CMOS ICs

Integrated Circuit layers, MOSFETs, CMOS layers, Designing FET arrays, Overview of silicon processing, Material growth and deposition, Lithography, The CMOS process flow, Design rules.

UNIT - III: **Elements of Physical Design and Electrical Characteristics of MOSFETs**

Basic concepts, Layout of basic structures, Cell concepts, FET sizing and the unit transistor, Physical design of logic gates, Design hierarchies, MOS physics, nFET current-voltage equations, FET RC model, pFET characteristics, Modeling of small MOSFETs.

UNIT - IV: **Electronic analysis of CMOS logic gates**

DC characteristics of the CMOS inverter, Inverter switching characteristics, Power dissipation, DC characteristics: NAND and NOR gates, NAND and NOR transient response, Analysis of complex logic gates, Gate design for transient performance, Transmission gates and pass transistors.

Designing High-speed CMOS Logic Networks- Gate delays, Driving Large capacitive loads, Logical effort, BiCMOS drivers.

Book for Study

1. John P. Uyemura, "Introduction to VLSI circuits and Systems", John Wiley & Sons Asia) Pet Ltd., 2003.
2. S.K. Ghandhi, "VLSI Fabrication principles", 2/e, John Wiley & Sons (Asia) Pte. Ltd., 2003.
3. S.M. Sze, "VLSI Technology", 2/e, McGraw-Hill, 1988.
4. N.H.E. Weste and K. Eshraghian, "Principles of CMOS VLSI design", Pearson Education, Inc., 1999.
5. Yuan Taur and T.H. Ning, "Fundamentals of Modern VLSI devices", Cambridge University, Press, 1998.
6. R.L. Geiger, P.E. Allen and N.R. Strader, "VLSI design Techniques for Analog and Digital Circuits", McGraw-Hill, 1990.

SEMESTER-I

.(General Lab)

Practical-I

Course code: **PHY15075** Max.Marks:100

[1]. Determination of temperature coefficient of resistance of a given thermister.

[2]. Determination of Young's modulus of a given glass plate by interference method and hence calculate Poisson's ratio.
[3]. Determination of Band gap of a low impurity Ge crystal by measuring its Resistivity at different temperatures using Four Probe method.
[4]. Evaluation of see beck co-efficient and thermo e.m.f of a bulk sample.
[5]. Determination of Planks constant using photoelectric effect
[6]. Determination of Hall coefficient in a metal and carrier density of a given Material by using Hall setup.
[7]. To determine the Bohr magneton by observing splitting of spectral lines for Zeeman effect.

SEMESTER-I

(Electronics Lab)

Practical-II Course code: **PHY15076** Max.Marks:100

[1] Construct the basic logic gates [OR, AND, NOT] by using NAND & NOR gate and verify its truth tables.
[2] Construct and study the working of (a) R-S flip flop (b) J-K flip flop (c)D- flip flop, and verify its truth tables.
[3] Design and study the Asynchronous, Synchronous, Mod-3 and Mod-10 counters.
[4] Study the analog to digital converter using 8 bit ADC 0808.
[5] Perform a program of addition, subtraction, multiplication by using 8085 microprocessor.
[6] Study and convert digital to analog by using DAC R-2R ladder network.

SEMESTER-II

Mandatory Core	PHY 25071	STATISTICAL MECHANICS

Course Objectives

A. To understand the dependence of equilibrium properties of various systems on their microscopic constituents and compute thermodynamic parameters by using classical statistics.
B. To learn to use methods of quantum statistics to obtain properties of systems made of microscopic particles which either obey Fermi-Dirac statistics or Bose-Einstein statistics.
C. To grasp the concepts of first order and second order phase transitions and critical phenomena.
D. To understand phase transition arising in Ising model.
E. To learn to obtain the properties of out-of-equilibrium systems using concepts from equilibrium physics.

Course Outcomes: Students should be able to

1. Use various ensemble theories to calculate the thermodynamic properties of different systems.
2. Compute properties of systems behaving as ideal Fermi gas or ideal Bose gas.
3. Classify transitions as first order or second order.
4. The student should be able to reproduce the exact solution of Ising model in one dimension and solve it using mean field theory.
5. Understand the approach required to predict the evolution of non-equilibrium systems.

UNIT- I: Ensembles

Phase space – Macro and micro states - Contact between Statistics and Thermodynamics - Concept of ensembles – Types of ensembles - Ensemble average - Liouville's Theorem – Micro canonical ensemble: ideal gas – Gibb's paradox and its resolution – Entropy and probability – Canonical ensemble – Ideal gas in canonical ensemble – Grand canonical ensemble – Ideal gas in grand canonical ensemble – Comparison of various ensembles.

UNIT – II: Partition Functions

Canonical partition function – Free energy and relation with thermodynamic quantities - Molecular partition function – Translational partition function – Rotational partition function – Vibrational partition function – Electronic and Nuclear partition functions – Applications of Rotational partition function – Applications of vibrational partition function to solids.

UNIT – III: Maxwell – Boltzmann and Bose – Einstein Statistics

Classical and Quantum Statistics - Maxwell - Boltzmann distribution –Density of States - Velocity and Energy distribution - Calculation of mean values – Equipartition theorem - Bose – Einstein distribution, Bose – Einstein condensation - Black body radiation and the Planck's radiation law - Dulong and Petit's law - Einstein and Debye's theories of heat capacities - Liquid helium – Two fluid model of liquid helium II.

UNIT – IV: Fermi – Dirac Statistics & Fluctuations

Fermi - Dirac distribution – Electrons in metals – Thermionic emission – Magnetic susceptibility of free electrons – White dwarfs – Fluctuations in ensembles, Onsagar's one dimensional and reciprocal relations - Ising Model - Random walk and Brownian motion, First and second order phase transitions.

Books for study

1. Statistical Mechanics ,B.K. Agarwal, Melvin Eisner,2nd Edition, New Age International (P)Ltd.
2. Statistical Mechanics and properties of Matter by ESR Gopal — Student Edition (EllisHorwood)
3. Statistical and Thermal Physics ,F. Reif—4thEdition,McGraw Hill
4. Statistical Mechanics, R.K. Pathria and Paul D. Beale, Elsevier
5. Fundamentals of Statistical Mechanics, B.B. Laud, New Age International Publishers
6. Elementary Statistical Mechanics, S.L. Guptha and V. Kumar, PragathiPrakashan Publications

Books for reference:

1. Statistical Physics,Bhattacharjee
2. Introduction to Modern Statistical Mechanics, David Chandler, OxfordUniversity Press

SEMESTER-II

Mandatory Core	PHY 25072	ELECTROMAGNETIC THEORY, LASERS AND MODERN OPTICS

Course Objectives - This course enables the students:

A. To understand the electromagnetic theory and propagation of light in different types of medium.
B. To identify conditions for lasing phenomenon and properties of the laser.
C. To compare continuous and pulsed lasers.
D. To classify different types of lasers with respect to design and working principles
E. To illustrate various applications of laser e.g. holographic non-destructive testing and Fourier optics.
F. To understand the construction of optical fiber and its applications.

Course Outcomes - After the completion of this course, students will be:

1. Having knowledge about the electromagnetic theory and propagation of light in different types of medium.
2. To evaluate conditions for lasing phenomenon and properties of the laser.
3. To calculate cavity modes of a given cavity and identify the given resonator is stable or unstable one.
4. To evaluate Q-switching and the mode-locked lasing phenomenon.
5. To appraise different type of lasers with respect to design and working principles.
6. To assess applications of a laser for holography and Fourier optics.
7. Familier about Optical Fiber and its applications.

UNIT – I: Electromagnetic Theory

Maxwell's equations in differential and integral forms, Scalar and Vector potentials- Gauge invariance, The general wave equation, Propagation of light in isotropic dielectric medium – Dispersion, Propagation of light in conducting medium-skin depth, Reflection and refraction at the boundary of a dielectric interface – Fresnel's equations- Propagation of light in crystals-Double refraction. Electromagnetic radiation ; Retarded potentials, Radiation from moving point

charge, Radiation from oscillating dipole (electric and magnetic dipoles), Radiation from linear antenna – Radiation resistance, electric quardrupole radiation, Lienard – Wiechert potentials.

UNIT – II: Lasers and Non-Linear Optics

Basic principles of lasers – Spontaneous and stimulated emission – Laser beam properties - Einstein coefficients - Population inversion – Pumping schemes – Threshold condition for laser oscillation –Types of lasers- Ruby laser- Nd:YAG laser - GaAs laser, -Dye laser - Argon ion laser-CO_2 laser - rate equations for three level and four level lasers- Laser applications.

Basic Principles – Origin of optical nonlinearity - Harmonic generation – Second harmonic generation – Phase matching condition – Third harmonic generation – Optical mixing – Parametric generation of light – Parametric light oscillator – Frequency upconversion – Self focusing of light - Guided wave optics - Pulse compression - Optical solutions.

UNIT – III: Holography and Fourier Optics

Introduction to Holography – Basic theory of Holography – Recording and reconstruction of Hologram – Diffuse object illumination – Speckle pattern – Fourier transform Holography – Applications of Holography.

Introduction to Fourier optics– Two dimensional Fourier transforms – Transforms of Dirac-Delta function – The convolution integral – convolution theorem- Spectra and correlation – Parsevel's formula – Auto correlation and cross-correlation – Apodization – Array theorem – Fourier methods in diffraction - Fraunhouffer diffraction of single slit, double slit and transmission grating using Fourier method.

UNIT – IV: Fiber Optics

Total internal reflection - Optical fiber modes - TE and TM modes– Single mode fibers – Graded index fibers – Fiber materials and fabrication – Mechanical properties of fibers – Fiber optic cables – Attenuation – Signal distortion on optical wave guides- Erbium doped fiber amplifiers – Solitons in optical fibers - Block diagram of fiber optic communication system - Applications of optical fibers in communication and medicine.

Text and Reference Books

1. Introduction to Electrodynamics, D.J. Griffiths, 4 th Edition, Prentice-Hall of India, ND,2513.
2. Electromagnetics, B.B. Laud, 3rd Edition, New Age International Publishers Ltd, ND, 2511.
3. Fundamentals of Electromagnetic theory, 2nd Edition, S.K. Dash and S.R. Khuntia, ND,2511.
4. Modern Optics by G.R. Fowels, 1989.
5. Laser and their Applications, M.J. Beesly, Taylor and Francis, 1976
6. Lasers and Non-Linear Optics, B.B. Laud, 3rd Edition, New Age International Publishers Ltd, New Delhi, 2511.
7. Optics, E. Hecht, Addison Wiley,1974.
8. Optical Fiber Communications, Gerel Keiser, McGraw Hill Book, 2005.

SEMESTER-II

Mandatory Core	PHY 25073	MATHEMATICAL PHYSICS

Course Objectives-This course enables the students:

A. To learn about Special Functions
B. To understand the concepts of Laplace Transform and Fourier Transform and their applications.
C. To know about Partial Differentiations and Tensors
D. To gain knowledge on complex variables
E. To gain familiarity with the Cauchy's theorem and integral formula.

Course Outcomes - After the completion of this course, students will be:

1. Able to use Special functions for evaluating integrals, Legendre, Bessel and Hermite differential eauations.
2. Able to apply Laplace Transform and Fourier Transform to solve LCR circuits, Operational Amplifiers, resonance of simple pendulum etc.
3. Numerically able to solve partial differential equations
4. Solving eigenvalue problems numerically
5. Comfortable in dealing with integral equations

UNIT - I: Special Functions

Beta and Gamma Functions – Definitions and properties – Evaluation of integrals, Legendre, Bessel and Hermite differential equations – Solutions – Generating functions – Orthogonal properties of Legendre, Bessel and Hermite Functions (Proof not necessary) – Recurrence relations – (Proof for Legendre polynomials only)

UNIT - II: Integral Transforms

Laplace Transform: Properties of Laplace transforms **–**Derivative of Laplace transform–Laplace transform of a derivative –Laplace transform of periodic functions- Inverse Laplace transform and its properties –Inverse Laplace theorem –Convolution theorem-Evaluation of inverse Laplace Transforms by Convolution theorem.Solution of linear differential equations with constant coefficients - Applications to LCR circuits, Operational amplifiers and resonance of simple pendulum.

Fourier Transform: Infinite Fourier Sine and Cosine transforms–Properties of Fourier transforms - Derivative of Fourier transform –Fourier transform of a derivative- Fourier Sine and Cosine transform of derivatives-Finite Fourier transforms – Applications of Fourier Transforms.

UNIT - III: Partial Differentiations and Tensors

Partial Differentiations: Laplace equation – Method of separation of variables – Application of Laplace equation to two dimensional steady state of heat flow in a thin rectangular plate and a long cylinder. Wave equation in two dimensions – Application to the vibration of a rectangular membrane and circular membrane.

Tensors: Definition – Contravariant, Covariant and Mixed tensors – Dummy suffix notation- Addition, subtraction, contraction, inner product, outer product, symmetric and anti-symmetric tensors - Application of Tensor theory to strain, thermal expansion and piezoelectricity.

UNIT – IV: Complex Variables

Functions – Complex differentiation - Analytic function - Cauchy – Reimann equations –Derivatives of elementary functions – Singular points and classification. Complex integration - Cauchy's theorem – Integrals of special functions – Cauchy's integral formula – Taylor's and Lorentz theorem (statements only) – Residues, calculations of residues - Residue theorem – evaluation of definite integrals.

Reference Books

1. Functions for Scientists and Engineers, W.W. Bell, Van Nostrand Co., London (1968).
2. Fourier Analysis, Hsu P.Jewi, Unitech Division.
3. Laplace Transforms, Murray Spiegle, Schaum's outline series, McGraw Hill,New York.
4. Applied Mathematics for Engineers, Pipes and Harval, III Edition, McGrawHill Books Co.
5. Vector Analysis & Introduction to Tensor Analysis, M. R. Spiegel, Schaum's Series 1959.
6. Physical Properties of Crystals, J.F. Nye, Schaum'sSeries, OxfordUniv. Press, 1957.
7. Theory and Properties of Complex Variables, S. Lipschutz, Schaum'sSeries, McGraw Hill.
8. Mathematical Physics, H.K. Das and Ramaverma, S. Chand & Co. Ltd., New Delhi (2011).
9. Mathematical Physics, B. Bhattacharyya, New Central Book Agency Pvt. Ltd., (2010).
10. Applied Mathematics for Engineers and Physicists –Lious A Pipes &Lawrance R. Rarvill.
11. Mathematical Physics –AK Ghatak, IC Goyal and SL Chua-Macmillan India Ltd
12. Vector and Tensor Analysis –Scham Series.
13. Mathematical Physics –SatyaPrakash

SEMESTER-II

Internal Elective	PHY 25074 (A)	COMPUTATIONAL METHODS AND PROGRAMMING

Course Objectives - This course enables the students:

A. To learn the fundamentals of C-programming language and also expressions and I/O statements, control statements, arrays, user define functions and pointers.
B. To learn the fundamentals of MATLAB and applications.
C. To obtain training on linear, non-linear and curve fitting methods, which are useful for solving Algebraic, transcendental and simultaneous equations.
D. Instruct them to calculate integrals and differentials using different numerical methods.
E. Train them to solve partial differential equations numerically.

Course Outcomes - After the completion of this course, students will be:

1. Able to write and execute C-programs for solving problems.
2. Able to work with MATLAB and handle large data set.
3. Develop a good knowledge in solving Algebraic, transcendental and simultaneous equations.
4. Able to to solve partial differential equations numerically.

UNIT – I: C programming language

(a) Fundamentals of C

C character set – Identifiers and keywords – Constants – Variables – Data types – Declarations of variables – Declaration of storage class – Defining symbolic constants – Assignment statement. Operators : Arithmetic operators – Relational operators – Logic operators – Assignment operators – Increment and decrement operators – Conditional operators.

(b) Expressions and I/O statements: Arithmetic expressions – Precedence of arithmetic operators – Type converters in expressions – Mathematical (library) functions – Data input and output - Getchar and putchar functions – Scanf – Printf – Simple programs.

(c) Control statements: If-Else statement – Switch statement – The ?Operator – GO TO – While , Do-while, FOR statements – BREAK and CONTINUE statements.

(d) Arrays One dimensional and two dimensional arrays – Initialization – Type declaration – Inputting and outputting of data for arrays – Programs of matrices addition, subtraction and multiplication.

(e) User Define function: The form of C functions – Return values and their types – Calling a function – Category of functions. Nesting of functions.Recursion.ANSI C functions – Function declaration. Scope and lifetime of variables in functions.

(f) Pointers: Accessing the address of a variable. Declaration and Initialization of pointer variables. Accessing the value of a variable through its pointer. Pointer Expressions- Pointers and arrays – Pointers and structures.

UNIT II – Fundamentals of MATLAB and Applications

Basics of Matlab – Matlab windows- On-line help- Input-Output-File types-Platform Dependence - Creating and working with Arrays of Numbers – Creating, saving, plots, printing Matrices and Vectors – Input – Indexing – Matrix Manipulation-Creating Vectors Matrix and Array Operations Arithmetic operations- Relational operations – Logical Operations – Elementary math functions , Matrix functions – Character strings

Applications-1: Linear Algebra,-solving a linear system, Gaussian elimination, Finding Eigen values and eigenvectors, Matrix factorizations

Application-2: Curve Fitting and Interpolation-Polynomial curve fitting on the fly , Least squares curve fitting, General nonlinear fits, Interpolations

UNIT – III: Linear, non-linear equations and curve fitting

(a) Solution of Algebraic and transcendental equations – Bisection, Falsi position and Newton- Rhapson methods – Basic principles – Formulae – Algorithms.

(b) Simultaneous equations: Solutions of simultaneous linear equations – Gauss elimination and Gauss-Seidel iterative methods - Basic principles – Formulae – Algorithms

(c) Curve fitting – Least squares fitting – Linear and quadratic equations.

UNIT – IV:
(a) Interpolations: Concept of linear interpolation – Finite differences – Newton's and Lagrange's interpolation formulae –Principles and Algorithms

(b) Numerical differentiation and integration: Numerical differentiation – algorithm for evaluation of first order derivatives using formulae based on Taylor's series – Numerical integration – Trapezoidal and Simpson's 1/3 rule – Formulae – Algorithms.

(c) Numerical solution of ordinary differential equations: Euler, method, fourth order Runga-Kutta Method.

Books for reference

1. Programming with 'C', Byron Gottfried, Tata McGraw Hill.
2. Numerical Methods, E. Balaguruswamy, Tata McGraw Hill.
3. Let Us C, YeswanthKanetkar.
4. Rudra Pratap, Getting started with Matlab 7, Oxford, Indian University Edition, 2006
5. Y.Kirani Singh and B.B.Chaudhuri, MATLAB Programming, Prentice-Hall India, 2007
6. Computer oriented numerical methods, Rajaraman.

SEMESTER-II

Internal Elective	PHY 25074 (B)	Computer Architecture and Networking

Course Objectives - This course enables the students:

A. To understand the logic circuits, input and ourput devices and memory systems.
B. To learn the principles of Universal gates of NAND, NOR, I/O devices.
C. To learn the interface BUS circuits, and memoty systems.

Course Outcomes - After the completion of this course, students will be:

1. Students would be able to construction the logic gates and flip-flops.
2. The students will able to construct the counters, multiplexers.
3. Students would understand the writing of assembly language program for the microprocessors, multi computers,
4. In depth understanding of RAM and ROM.

UNIT – I: Logic Circuits Logic functions – synthesis of logic functions – Minimization of logic - Synthesis with NAND and NOR gates – Implementation of Logic gates – Flip-Flops – Registers and shift registers – counters – decoders – multiplexers – PLDs – sequential circuits. Basic structure of computers: Functional units – Basic operational concepts – Bus structures performance – Multiprocessors and multi computers.

UNIT – II: Machine Instructions and programs Numbers, arithmetic operations and characters – memory locations and address, operations – Instructions and instruction sequencing –addressing modes – assembly language – basic input/output operations – subroutines – encoding of machine instruction. Instructions – assembly languages – O/I operations-registers and addressing – instructions – assembly language – instructions of 68000 and Intel Pentium.

UNIT – III: Input/output organization Accessing I/O devices – interrupts – direct memory access – buses 240 interface circuits – standard I/O interface.

UNIT – IV: Memory System

Concepts semiconductor RAM memories – Randomly memories - cache memories performance considerations – virtual memories – memory management requirements – secondary storage arithmetic: addition and subtraction of signed numbers – design of fast adders – multiplication of positive numbers – signed operand multiplication – fast multiplication – integer division –floating point numbers and operations.

Books for Study

1. Hamacher C Vranesic Z and Zaky S. Computer Organization, 5th Edition, McGraw Hill 2002.
2. Stallings W. Computer Organization and Architecture 6th Edition, Pearson Education 2003
3. Mano M M, Computer System Architecture 3rd Edition Phi 1993
4. Yarbrough J.M. Digital Logic Applications and Design, Thomas Learning 1997
5. Heuring VP and Jordan HF Computer Systems Design and Architecture, Pearson Education 1977

SEMESTER-II

Internal Elective	PHY 25074 (C)	Sensors and Transducers

Course Objectives - This course enables the students:

A. To understand the fundamentals of sensors and transducers and opto-electronic devices.
B. To learn the principles of transducers, gauges, LEDs, FETs, filters and amplifiers.
C. To learn the characteristics of LVDT, phtodiode, couplers, detectors and amplifiers.

Course Outcomes - After the completion of this course, students will be:

1. The students able to construct transistor, FET..
2. The students will able to understand the concepts of optoelectronic devices.

3. They can understand the device structure and characteristics of photovoltaic cell, LED, LCD and photodiode.
4. In depth understanding of filters, detectors and amplifiers.

UNIT – I: General Introduction to sensors/transducers

Definition of a transducer/sensor. Role of a transducer in a generalized measurement system. Classification of transducers. Classification of transducers. Significant parameters of transducer. Temperature scales. Mechanical temperature sensors. Platinum resistance thermometer. Thermistors. Thermocouples.

UNIT –II: Displacement and strain transducers

Displacement transducers - Variable resistance, inductance and capacitance. Linear voltage differential Transformer (LVDT) Strain - Definition, Principal of working of strain gauges. Gauge factor. Types of strain gauges. Materials for strain gauges. Temperature compensation. Application

UNIT –III: Opto - electronic transducers

Photoemission tube. Photomultiplier cell. Photoconductive cell. Photovoltaic cell (solar cell). Photodiode, Photo – transistor, Photo FET, Light emitting diode. Liquid crystal display. Optoelectronic couplers. Laser diode.

UNIT –IV: Single conditioners (Filters, Detectors & Amplifiers)

Filters – Integrators, Differentiators and active filters. Detectors Peak Detectors sample and _ hold circuits. Phase sensitive detector and precision rectifiers, Amplifiers – chopper stabilized DC amplifiers. Instrumentation amplifiers. Logarithmic and anti-logarithmic amplifiers Isolation amplifiers, Lock in amplifiers.

Books for Study

1. Instrumentation Measurement Analysis, Nakra and Chaudary, 4th Edition, Tata Mc Graw-Hill, 1985.
2. Instrumentation - Devices and Systems, Rangan, Mani and Sharma, 2nd Edition, Tata Mc Graw Hill, 1983.
3. A course in Electrical and Electronic Measurements and Instrumentation, AK Sawhney, 4th Edition, Dhanpat Rai & Company, 2016.
4. Instrumental Methods of Analysis, Willard, Meritt, Dean and Seattle, 7th Edition, Van Nostrand,1981.
5. Hand Book of Biomedical Instrumentation, RS Khandpur, 3rd Edition, Tata Mc Graw-Hill, 1987.
6. Fundamentals of Electronic Devices, David A. Bell, 5th Edition, Oxford University Press, 2008.
7. An introduction to Operational amplifiers, SV Subramanyam, 2nd Edition, Macmillan India,1980.

SEMESTER-II

(General Lab)

Practical-I

Course code: **PHY 25075** Max.Marks:100

[1]. To study the V-I Characteristics of GUNN DIODE.

[2]. Determine the wave lengths of mercury vapor lamp spectrum using Hartmann's dispersion formula using a prism?

[3]. Study the Gaussian nature of LASER beam cross section and evaluate the beam spot size and divergence angle?

[4]. Determination of Stefan's constant using black body radiation chamber?

[5]. (a)To determine of wave lenth of laser beam

(b) To find the refractive index of the glass plate

[6]. (a) Study of total internal reflection and caluculation of refractive index of PMMA rod

(b) Det NA,bending loss and splice loss of a given multimode optical fibre

(c)Det of NA,mode field diameter and V number of a given single mode fibre

[7]. Study the V-I charecterstics of Gunn diode.

SEMESTER-II

(Computer Lab)

Practical-II

Course code: **PHY25076** Max.Marks:100

[1]. Write a programme to convert centigrade to Fahrenheit and vice versa.
[2]. (a) Write a programme to sort of an array in descending or ascending order and to find its median.
(b) Write a programme to find the largest element in an array.
[3]. (a) Write a programme to calculate the factorial loosing recursion.
(b)Write a programme to find the sum of series $1-x+x^2-x^3+$
[4]. Write a programme to add, subtract, multiply and divide of any two input numbers using function.
[5]. (a)Write a programme to find the even and odd numbers using while, do while and for loops.
[6]. Write a programme to find natural numbers upto 100 using while do while and for loops.
[7]. Write a programme to find the roots of a equation by using Bisection method.
[8]. Write a programme to solve a cubic equation by using Newton-Raphson method.
[9]. Write a programme to find the integral value using Trapezoidal rule.
[10]. Write a programme to find integral value using Simpson 1/3 rule.
[11]. Write a programme to find roots of a equation using Regular falsi method

SEMESTER-III

Mandatory Core	PHY 35071	QUANTUM MECHANICS – I

Course Objectives - This course enables the students to:

A. to learn the important postulates of quantum mechanics.
B. To know the concepts of wave function, operator and quantum mechanical tunnelling.
C. To learn particle motion and its equation. Three different pictures like Schrodinger picture, Heisenberg picture and Interaction picture.
D. To know how to evaluate Eigen values and Eigen fuctions of a particle in different problems.
E. Formulate various approximate methods to solve real problems which can not be solved analytically.
F. To learn classical theory of scattering and quantum theory of scattering and method of evaluation of scattering parameters.

Course Outcomes - After the completion of this course, students will be able to:

14. differentiate classical theory and quantum theory and also understand the concept of wave particle duality.
15. Learn Bra and Ket notation of the function and also matrix representation of the operator.
16. Understand the method of evaluating eigen fuctions and eigen values of particle in different situations.
17. apply the WKB Approximation to solve the real problems.
18. Understand classical theory of scattering and quantum theory of scattering and method of evaluation of scattering parameters.

UNIT - I: Formulation and Simple Problems

Wave particle duality – Wave functions in coordinate and momentum representation- Postulates of quantum mechanics -Linear vector space: Hilbert space - Dirac's Bra and Ket notations- Hermitian operators and their properties- Matrix representation of an operator- Unitary operators- Unitary transformation - The Kronicker Delta and Dirac delta functions

Eigen values and Eigen functions for finite potential well and step barrier – Quantum mechanical tunneling

UNIT - II: Quantum Dynamics and Simple Problems

Equations of motion - Schrodinger Picture- Heisenberg Picture- Interaction Picture- Equivalence of various Pictures- . Poisson and Commutation brackets- Their Properties

Eigen values and Eigen functions for Simple harmonic oscillator- Polynomial method and abstract operator method in one dimension- Eigen values and Eigen functions for a free particle and particle in a box in three dimensions.

UNIT - III: Approximate Methods

Time independent perturbation theory for non-degenerate levels: Perturbed harmonic oscillator, Normal Helium atom, Stark effect of the plane rotator. First order perturbation theory for degenerate levels: First order Stark effecting in hydrogen atom; Time dependent perturbation theory: Transition to continuum (Fermi Golden rule). WKB approximation – Turning points and connecting formulae: Application to potential barrier. Variational methods.

UNIT - IV: Scattering Theory

Introduction: classical theory of scattering - Quantum theory of scattering - Method of partial wave analysis - Scattering by a perfectly rigid sphere - Greens function in scattering theory - Born approximation - Validity of Born approximation - optical theorem.

Reference Books

1.QuantumMechanics: S.L.Kakani and H.M.Chandalia.SultanChandandSonsFirst Edition
2. Advanced Quantum Mechanics : B.S. Rajput, Pragatiprakasan.
3. Quantum Mechanics: V.K. Thankappan, Wiley Eastern Limited
4. A Textbook of Quantum Mechanics : P.M. Mathews and K. Venkatesan, Tata McGrawHill Publishing Company.
5. Quantum Mechanics: S.L. Gupta, V. Kumar, H.V. Sharma and R.C. Sharma Jai PrakashNath and Company.
6. An introduction to QuantumMechanics, P.T. Mathews c Graw Hill Publishing Company.

SEMESTER-III

Mandatory Core	PHY 35072	NUCLEAR AND PARTICLE PHYSICS

Course Objective:

A. To impart the knowledge regarding the fundamental and basics of Nucleus and its models.
B. To provide the knowledge of the Two-nucleus problem, concept of nuclear force.
C. To acquire knowledge about the nuclear accelerators and their classification
D. To learn the concepts of nuclear fission and nuclear fusion reactions and reactors basic technology.
E. To have a good understanding of interaction of charged particles with matter.
F. To have an elementary idea of particles and their classification.

Course Outcome:

1. Student will have an idea developed about the nucleus.
2. Student will have a concept and nature of nuclear force.
3. Student will learn about the the nuclear accelerators and their classification.
4. Student will develop good knowledge about nuclear reactions and nuclear reactor technology.
5. Student will have an idea about the interaction of particles with matter.
6. Student will understand te nature, interaction etc.. of the elementary particles.

UNIT – I:Nuclear Forces and Reactions

General properties of nuclei: Parity, isospin, Magnetic dipole moment, electric quadrupole moment and nuclear shape.

Nuclear Forces and Models: Characteristics of nuclear forces – Ground state of Deuteron – Proton – Proton scattering – Neutron – Proton scattering – Meson theory of nuclear forces – Bethe-Weizacker semi-empirical binding energy equation and its applications, Nuclear shell model - energy levels and calculation of angular momentum- its validity and limitations.

Nuclear Reactions: Types of nuclear reactions –Compound nuclear reactions – Bhor's theory- Nuclear cross section – Direct reactions- stripping and pick up reactions - Resonance theory – Briet Wigner one level formula.

UNIT – II: Nuclear Accelerators

Introduction – Ions sources – Classification of accelerators - Electrostatic accelerators – Cockcroft-Walton accelerator, Van de Graff accelerator and Tandem accelerators - Linear accelerators – Drift tube and Wave guide accelerators – Low energy circular accelerators – Cyclotron and Betatron – High energy circular accelerators – Proton and electron Synchrotrons and Microtron.

UNIT – III: Nuclear Reactors

Nuclear fission reactions – Types of fission - Distribution of fission products – Neutron emission on fission – Spontaneous fission – Nuclear fission and thermonuclear reactions – Hydrogen bomb.

Nuclear fusion reactions - Nuclear chain reactions – Four factor formula – The critical size of a reactor – General

aspects of reactor design – Classification of reactors – Research reactors and Power reactors.

UNIT – IV:Elementary particles

Discovery and classification of elementary particles – Types of interactions – Conservation laws – Iso-spin, parity, charge conjugation – Time reversal – CPT theorem – Properties of leptons, mesons and baryons – Elementary particle symmetries (SU_2 and SU_3 symmetries) – Quark model – Higg's particle – Elementary ideas.

Reference Books

1. Nuclear Physics, Irving Kaplan, Narosa Pub. (1998).
2. Nuclear Physics, Theory and experiment – P.R. Roy and B.P. Nigam, New Age Int.1997.
3. Atomic and Nuclear Physics (Vol.2), S.N.Ghoshal, S.Chand&Co. (1994).
4. Nuclear Physics, D.C.Tayal, Himalaya Pub. (1997).
5. Atomic and Nuclear Physics, R.C.Sharma, K. Nath& Co., Meerut.
6. Nuclei and Particles, E.Segre.
7. Introduction to Nuclear Physics, H.A. Enge, Addison Wesley (1975).
8. Introduction to Nuclear Physics, K.S. Krane.

SEMESTER-III

Core Internal Elective	**PHY 35073 (A)**	**CONDENSED MATTER PHYSICS (CMP– I): Physics of Crystalline Materials**

Course Objectives - This course enables the students

A. To become familiar with crystal growth techniques and identify imperfection in crystals.
B. To become familiar with the electrical behaviour of dielectric materials and understand the field charge induced by dielectrics.
C. To learn the properties and applications of ferroelectrics
D. To become familiar with the theory behind the ferromagnetic and anti-ferromagnetic materials.
E. To understand the photoconductivity and luminescence properties of solids.

Course Outcomes - After the completion of this course, students will be

1. Able to learn various crystal growth techniques and understand the imperfection if any in the crystals.
2. Able to acquire knowledge about the properties of dielectrics and ferroelectrics.
3. Able to describe the ferromagnetic and anti-ferromagnetic materials and their applications.
4. Able to measure photoconductivity of the given material by using appropriate equipment.
5. Able to acquire knowledge on thermoluminescence, electroluminescence, photoluminescence, cathodoluminescence and chemiluminescence properties of solids.

UNIT - I: Crystal Growth and Imperfections in Crystals

Crystal growth: Nucleation and growth – Homogeneous and heterogeneous nucleation – Classification of crystal growth techniques – Melt growth: Bridgman,Czochralski techniques.

Imperfections: Classification of imperfections – Point defects – Schottky and Frenkel defects - Expressions for equilibrium defect concentrations – Colour Centres –Production of colourcentres – Line defects – Dislocations – Edge and Screw dislocations – Burger vector – Estimation of dislocation densities – Mechanism of creep – Experimental determination of creep activation energy.

UNIT- II: Dielectrics and Ferroelectrics

Dielectrics: Introduction – Dipole moment – various types of polarization – Electronic, ionic and orientational polarization –Measurement of dielectric constant – Applications of dielectrics.

Ferroelectrics: Piezo-, Pyro- and ferroelectric crystals– Spontaneous polarization – Classification and properties of ferroelectrics - Ferroelectric domains – Oxygen ion displacement theory – Applications of ferroelectrics.

UNIT- III: Ferromagnetism and Anti-ferromagnetism

Ferromagnetism:Introduction – Weiss molecular field theory – Temperature dependence of spontaneous magnetization – Heisenberg model – Exchange interaction – Ferromagnetic domains – Magnetic bubbles – Bloch wall – Thickness and energy – Ferromagnetic spin waves – Magnons – Dispersion relations.

Anti-ferromagnetism: Introduction – Two sub lattice model of anti-ferromagnetism – Ferri magnetism - Ferrites – Structure – Applications – Multiferroics.

UNIT-IV: Photoconductivity and Luminescence

Excitons: Weakly bound and tightly bound – Photoconductivity – Simple model – Influence of traps – Space charge effects – Determination of photoconductivity. Luminescence – Various types– Thermoluminescence, Electroluminescence, Photoluminescence, Cathodoluminescence and Chemiluminescence - Excitation and emission – Decay mechanisms – Applications.

Reference Books

1.Introduction to Solid State Physics, Charles Kittel VII edition, John Wiley & Sons.
2.SolidState Physics, A.J.Dekker, McMillan Publications.
3.Material Science and Engineering, V.Raghavan, PHI, New Delhi.

4.Crystal Growth, B.R.Pamplin, Pergmon Press.
5.Crystal Growth from High Temperature Solutions, D.Elwell and H.J.Scheel,Academic Press.
6.SolidState Physics, M.A.Wahab, Narosa Publishing House.
7. Fundamentals of Solid State Physics, Saxena, Gupta, Saxena, Pragathi Publications, Meerut.
8. Solid State Physics, R.L.Singhal, KedarNath Ram Nath& Co. Pub.

SEMESTER-III

Core Internal Elective	PHY 35073 (B)	ADVANCED ELECTRONICS-I

Course Objectives - This course enables the students:

A. Course on advance electronics intends to impart knowledge on microprocessors and microcontrollers architecture.
B. Unit I of the course addresses the architecture of the 8086 Microprocessor and their addressing modes and instruction set.
C. Unit II addresses the architecture of the advanced microprocessors like 80386, 80486 and 80586 and also basics of Pentium and Pentium pro.
D. Unit III addresses assembler and assembler programs.
E. Unit IV addresses the architechture of 8051 Microcontroller and its addressing modes and instruction sets. In the same unit it is planned to teach the students about PIC 16F873A and its interface with LED displays, LCDs, Sensors and Actuators.

Course Outcomes - After the completion of this course, students will be:

1. Learning architecture of different microprocessors and microcontrollers.
2. Able to learn addressing modes and instruction sets of 8086, 80386, 80486 and 80586 microprocessors.
3. Able to write assembly languge to instruct microprocessors.
4. Able to acquire knowledge on architechture of 8051 Microcontroller and its addressing modes and instruction sets.
5. Able to learn about PIC 16F873A and its interface with LED displays, LCDs, Sensors and Actuators.

UNIT I – 8086 Microprocessors and its Architecture

8086 Microprocessor Architecture, memory paging. **Addressing modes**: Data addressing modes, program-memory addressing modes, and Stack- memory addressing modes.

Instruction Set: Data movement instructions, Arithmetic and Logic instructions, Program control instructions, Assembler details, Data conversions

UNIT II – Advanced Microprocessors

80386 Architecture – Addressing modes – Instruction sets - 80486 Architecture – Addressing modes – Instruction sets - 80586 Architecture – Addressing modes – Instruction sets – Pentium and Pentium pro basics

Unit - III: Assembler and Assembler Programs

Basic idea – PIC 16 series instruction set and ALU – Assemblers and Assembler format – creating simple programs – Adopting a development environment – Building structured programs – Flow control : Branching and Subroutines – Generating time delays and intervals – Logical instruction – Arithmetic instructions.

Unit - IV: 8051 Microcontroller and PIC 16F873A

Introduction of microcontroller 8051, Internal Architecture,Instruction set, addressing modes, PIC 16F87XA Timer 0 and Timer 1 – 16F87XA Timer 2, Comparator and PR2 register – capture/Compare/PWM (CCP) Module – Pulse width modulation – ADC module.

Interface: LED displays – Liquid crystal displays –Sensors –Actuators.

Books for Study

1. The Intel Microprocessors 8086/80-88,80186/80188.80286,80386, Pentium and Pentium pro processor architecture, programming and interfacing by B. B. Brey 4/e, PHI,1999
2. Microprocessors and interfacing, Programming and hardware by Douglas V. Hall, 2/e McGraw Hill International Edition, 1992.
3. The 80x86 IBM PC and Compatible computer (Volumes I &II) by Muhammad Ali Mazidi and Janice Gillespie Mazidi, 2/e, Prentice-Hall Inc.,1998.
4. Soft ware, Hard ware and applications by Walter A. Tribel and Avatar Singh, PHI, 1995.
5. Microcomputer systems: The 8086/8088 Family Architecture Programming and Design by Yu Cheng Lin and Glenn A. Gibson, PHI 1992.
6. Designing Embedded Systems with PIC Microcontrollers: Principles and Applications by Tim Wilmshurst, First Edition, 2007, Newnes – Elsevier – Publishers.

Reference Books:

1. Microcontrollers: Theory and Applications by Ajay V. Deshmukh, , Tata Mc Graw-Hill, New Delhi, 2005.
2. Designing with PIC Microcontrollers by John B. Peatman, Pearson Education,Inc.,1998.
3. The 8051 Microcontroller and Embedded systems, by Mahammad Ali Mazidi and Janice GillispieMazidi, Pearson Education Asia, Pvt. Ltd., 2000.

SEMESTER-III

Core Internal Elective	PHY 35073 (C)	APPLIED SPECTROSCOPY

Course Objectives -This course enables the students

A. To become familiar with Beer's law and working of Spectrophotometer.

B. To learn about the IR spectrophotometry and Fourier Transform Infrared Spectrometer used for the study of molecular structure.
C. To familier with the principles of Fluorescence and Phosphorescence spectroscopy and their applications.
D. To learn the theory of Raman scattering and application of Raman Spectroscopy.
E. To learn the technique of structure determination using IR and Raman spectroscopy.
F. To learn non-linear Raman phenomenon and photo-acoustic Raman scattering and multi photon spectroscopy.

Course Outcomes - After the completion of this course, students will be

1. Able to learn absortion principle and spectrophotometrs working in different spectral regions.
2. Able to undertake molecular structure elucidation.
3. Able to use effectively the Fluorescence and Phosphorescence spectroscopic techniques for various analytical purposes.
4. Able to determine the structure of molecules using IR and Raman spectroscopy.
5. Able to acquire knowledge about the non-linear Raman phenomenon and photo-acoustic Raman scattering and multi photon spectroscopy.

UNIT I – Spectrophotometry

Introduction- Beer's law – Absorptivity – UV and visible absorption- Instrumentation- Essential parts of spectrophotometer- Gratings and prisms – Radiant energy sources – filters – Photosensitive detectors- Barrier layer cells – Photo emissive cells – Photomultiplier tubes –Relationship between absorption in the visible and UV region and molecular structure – IR spectrophotometry - Fourier Transform Infrared (FTIR) Spectrometer – Molecular structure.

UNIT II - Fluorescence and Phosphorescence Spectroscopy

Introduction – Flourescence- Resonance Flouorescence- Normal Fluorescence-Intensities of Transitions – Non-radiative decay of fluorescent molecules – Phosphorescence and the nature of the rriplet state- Population of the triplet state – Delayed fluorescence- Excitation spectra - Experimental methods – Emission lifetime measurements – Time resolved emission spectroscopy – Applications of Fluorescence and Phosphorescence

UNIT III - Raman Spectroscopy

Introduction- Theory of Raman Scattering – Rotational Raman Spectra- Vibrational Raman Spectra – Mutual Exclusion principle – Raman Spectroscopy/ Sample Handling Techniques- polarization of Raman Scattered Light – Single Crystal Raman Spectra – Raman Investigation of Phase Transitions – Resonance Raman Scattering – Structure Determination using IR and Raman Spectroscopy.Difference between Raman spectra and Infrared spectra.

UNIT IV - Non-linear spectroscopic phenomena

Non-linear Raman phenomenon - Hyper Raman spectroscopy – Stimulated Raman spectroscopy – Inverse Raman effect – Coherent Anti-stokes Raman scattering – Photo-acoustic Raman scattering – Multi Photon Spectroscopy

Prescribed Books:

1. Molecular spectra and Molecular structure Volume I, **G. Herzberg** (2nd Edition, Van. Nostrand London)
2. Fundamentals of Molecular Spectroscopy,**C.N. Banwell**(Tata Mcgraw- Hill Publishing Company Ltd, 1983)
3. Spectroscopy,**Straughan and Walker** (volume 2 and volume3, John wiley and Sons, 1976)
4. Molecular Structure and Spectroscopy,**G. Aruldhas**(Printice- Hall of India, Pvt. Ltd. 2001)
5. Instrumental Methods of Analysis,**Willard, Merritt, Dean and Settle** (CBS Publishers and Distributor, New Delhi, 200)

SEMESTER-III

Open Elective	PHY 35074 (A)	FRONTIERS OF PHYSICS

Course Objectives - This course enables the students belong to other subjects:

A. To know the life sketchs of great Indian Physisists and their concributions.
B. To learn about the different conventional energy sources available on Earth and their characteristics.
C. To obtain knowledge on Non-Conventional Energy sourses.
D. To know the concepts of Nuclear Physics and advantages and disadvantages of Nuclear power.

Course Outcomes - After the completion of this course, students of non-physics stream will be:

1. Able to get knowledge on great Indian Physisists and their research contributions.
2. Exposed to the knowledge on various energy sourses available and their advantages and future treats.
3. Develop a good understanding about the Nuclear power and Nuclear power stations of India.

Unit I: Contribution of Indian Scientists:

J.C.Bose, Dr.C.V.Raman, S.N.Bose, M.N.Saha, Prof. SatishDhawan, Dr.B.D.NagChaudhary, H.J.Bhabha, Dr.A.P.J.AbdulKalaam, Dr.Vikram Sarabhai, Prof.S.Bhagavantham, Prof. C.N.R.Rao

Unit II: Conventional Energy

Role of new and renewable energy source; solar energy-solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion

Wind energy-Sources and potentials, horizontal and vertical axis windmills, performance characteristics,Tidal and wave energy: Potential and conversion techniques

Unit-III Non-conventional Energy

Non-renewable sources such as petroleum, natural gas, coal (Rayalaseema Thermal Power Project and Ramagundam Thermal Power Project)andHydel power plants – Srisailam Hydroelectric power plant and NagarjunaSagar Hydroelectric power plant

Unit IV: Nuclear Energy

Introduction Nuclear Physics concepts; Nuclear power plants – Advantages and disadvantages

1. Kalpakkam Atomic power station
2. Tarapur Atomic power station

Source: The relevant material of the above units must be down loaded from authenticated web location from https://www.google.com

SEMESTER-III

Open Elective	PHY 35074 (B)	NANOMATERIALS AND DEVICES

Course Objectives - This course enables the students belong to other subjects:

A. To know the fundamentals of nanomaterials – One, two dimentional.
B. To learn about the quantum confinement, properties of nanomateials.
C. To obtain knowledge on preparation of nanomaterials.
D. To know the concepts of properties and characterization of nano devices.

Course Outcomes - After the completion of this course, students of non-physics stream will be:

1. Able to get knowledge on nanomaterials.
2. Exposed to the knowledge on various types of nanomaterials preparations.
3. The students will able to ge the knowledge on nano devices and its working.

UNIT-1: Introduction to Nanomaterials

Introduction to Nanomaterials -Zero, One and Two Dimensional Nanomaterials Quantum confinement, Density of states, Dependence of dimensionality – Physical and chemical properties.

UNIT –II: Synthesis of Nanomaterials

Introduction to Bottom –up and Top- down approaches

Ball milling –Inert Gas condensation – Physical vapour deposition -, Molecular Beam Epitaxy – Sputtering – Pulsed laser Deposition –Chemical vapour deposition - Sol Gel – Hydrothermal Synthesis

UNIT- III: Nano –Carbon

Carbon molecules: Nature of the carbon bond –New Carbon structure –carbon clusters –Small carbon clusters – Discovery of C_{60} –Structure of C_{60} and its properties –Synthesis of buckyballs and Applications.

Carbon Nanotubes: Fabrication –Structure - Electrical Properties – Mechanical properties – Applications of carbon Nanotubes

Graphene: Fabrication – Structure – Electrical Properties – Mechanical properties – Applications.

UNIT –IV: Nano Devices

Introduction – Nanofabrication –Photo- Lithography – Pattern transfer – Introduction to MEMS –Single Electron Transistor – Solar Cells – Light Emitting diodes –Gas Sensors- Microbatteries – Field emission display devices – Fuel Cells.

Books for Study

1. Nanomaterials: Synthesis, Properties and Applications – Edited by A.S. Edelstein and R.C. Cammarata, Institute of Physics Publishing, 2002.
2. Introudction to Nanotechnology – Charles P. Poole Jr and Frant J. Owens, Wiley Interscience, 2003.
3. Nanopracticles from Theroy to Applications edited by Gunter Schmid, Wiley VCH, 2004.
4. Nanoelectronics and Nanosystems by K. Glosekotter and J. Dienstuthi (Springer), 2004.

SEMESTER-III

(General Lab)

Practical-1

Course code: **PHY 35075** Max.Marks:100

1. Determination of Planks constant using LED?
2. Determination of ultrasonic velocity in a Quartz crystal?
3. Study of I-V Characteristics of a given Solar cell?
4. Determination of lande g-factor using ESR spectrometer?
5. Drawvthe V-I charecterstics of Light dependence resistor(LDR)?
6. Study the Characteristics of a GM counter?
7. Det absorption and transmittance coefficients of a given samples by using Spectrophotometer

SEMESTER-III

(Condensed matter physics –I)

Practical-1I

Course code: **PHY 35076** Max.Marks:100

1. Study of dielectric constant and det of curie temperature of Ferro electric ceramics?
2. Study the vibrations of a mono atomic and diatomic lattice by an electric analog?
3. Det of Energy gap of a given junction diode by reverse saturation method?
4. Find the magnetic susceptibility for a given solid material by using Gouys method?
5. Study of Magneto resistance of a Semiconductor?
   (a)To plot the current-voltage characteristics of a CdS photo-resister at constant irradiance.
   (b) To measure the photocurrent as a function of irradiance at a constant voltage
6. Study of thermoluminescence of F-centers in alkali halides Crystals Except X-ray unit

SEMESTER-III

(Electronics Lab)

Practical-I1

Course code: **PHY 35076** Max.Marks:100

1. Assembly language program for Arithmetic operation Addition,Substraction with 8051 microcontroller?
2. Interfacing of 8051 microcontroller with D.C motor?
3. Interfacing of 8051 microcontroller with Stepper motor?
4. Square wave and triangular wave generation by using 8051 microcontroller?
5. Interfacing of 8086 microprocessor with Stepper motor?
6. Interfacing of Traffic light controller with 8051 microcontroller?

SEMESTER-IV

Mandatory Core	**PHY 45071**	**QUANTUM MECHANICS-II**

Course Objective:

A. To learn about the identical particles and Pauli Exclusion Principle.
B. To learn how to include angular momentum and spin of the particle in operator and evaluate eigen function and eigen values of such system.
C. To learn the basics of relativistic quantum Mechanics.
D. To acquint with the concenpt of wave fields.
E. To learn how to do the quantization of wave fields.

Course Outcome:

1. Will be able to understand about the identical particles system.
2. Will be able to know the importance of angular momentum, general angular momentum and sin angular momentum of the particle in solving eigen value and eigen function of the system.
3. Will be able to understand the central concept and principles of relativistic Quantum Mechanics.
4. Will be able to understand the concept of negative energy states in the system.
5. Will be able to learn method of Canonical quantization along with Lagrangian formulation of field and Hamilton formulation of field.
6. Able to to know the system of Fermiouns and Bosons.

UNIT- I: Identical Particles and Molecules

Identical particles- Indistinguishability of Identical particles- Construction of Symmetric and Anti-symmetric wave functions for two and three particle systems - Pauli's Exclusion Principle- Hydrogen molecule- Spin-orbit interaction- Ortho and Para hydrogen- Spin statistics connection.

UNIT - II: Angular Momentum

Introduction: Definition of angular momentum operator - Commutation rules for angular momentum - Eigen values and Eigen functions of L_z and L^2 - Angular momentum in general - Allowed values of angular momentum J - Eigen values of J_+ and J_- angular momentum matrices - Addition of angular momeeta and Clebsh -- Gorden co-efficients: Clebsh – Gorden co-efficient for $J_1=J_2=1/2$ and $J_1=1$, $J_2=1/2$ - spin angular momentum and Pauli's spin matrices.

UNIT - III: Relativistic Quantum Theory

Klein – Gorden Equation – Probability Current Density – Inadequacies of K.G. Equation – Dirac's Relativistic Equation for a Free Particle - Dirac`s Matrices – Dirac`s Equation in Co-variant form – Plane wave solution – Negative Energy States – Spin Angular Momentum -Existence.

UNIT - IV: Quantization of Wave Fields

Concept of Field - Method of Canonical Quantization: Lagrangian Formulation of Field, Hamilton Formulation of Field - Second Quantization – Field equation - Quantization of Non-relativistic Schroedinger equation – Commutation and Anti-commutation Relations, The N-representation - System of Fermions and Bosons – Creation and Annihilation.

Reference Books

1.QuantumMechanics:S.L.Kakaniand H.M. ChandaliaSultanChandandSonsFirst Edition
2. Advanced Quantum Mechanics : B.S. Rajput, Pragatiprakasan
3. Quantum Mechanics : V.K. Thankappan, Wiley Eastern Limited
4. A Textbook of Quantum Mechanics : P.M. Mathews and K. Venkatesan, Tata McGraw Hill Publishing Company
5. Quantum Mechanics : S.L. Gupta, V. Kumar, H.V. Sharma and R.C. Sharma, Jai PrakashNath and Company
6. An Introduction to Quantum Mechanics, P.T. Mathews McGraw Hill Publishing Company

SEMESTER-IV

Mandatory Core	PHY 45072	ANALYTICAL TECHNIQUES

Course Objectives - This course enables the students

A. To learn about the different crystal systems.
B. To learn the concepts of X-ray diffraction especially principles of Bragg's, Laue and Powder diffraction. To know the the method of determination of lattice constants of various structures.
C. To learn principle and working of Electron Spin Resonance and Mossbauer Spectrometrs.
D. To learn principles and working of Nuclear Magnetic Resonance Spectrometer and NQR Spectrometer.
E. To learn basic principles, instrumentation and applications of advanced spectroscopic amd Microscopic techniques.

Course Outcomes - After the completion of this course, students will be

1. Able to learn the method of determination of lattice constants of various crystal structures using X-ray Diffraction techniques.
2. Able to acquire knowledge on principle and working of Electron Spin Resonance and Mossbauer Spectrometrs.
3. Able to learn principles and working of Nuclear Magnetic Resonance Spectrometer and NQR Spectrometer.
4. Able to familier with basic principles, instrumentation and applications of advanced spectroscopic amd Microscopic techniques.

UNIT- I: Diffraction Methods for Structure Analysis

Crystal systems: Symmetry elements, Concept of point groups and space groups. Reciprocal Lattice: Geometrical construction, Relation between direct – Reciprocal Lattice X- ray diffraction, Bragg's law, Laue methods, Powder X-ray Diffractometer– Focusing circle geometry-Determination of lattice constant of a cubic and tetragonal structures using d-spacings, Single crystal X-ray Diffractometer- Electron diffraction and Neutron diffraction: Basic principles and applications.

UNIT - II: Electron Spin Resonance and Mossbauer Spectroscopy

Electron spin resonance spectroscopy: Magnetic moment of an electron, two states of an electron in a magnetic field, ESR theory- Spin-spin interaction, Spin-lattice interaction - Hyperfine interaction-g factor, Line widths and Intensities, Relaxation effects, Experimental methods and applications.

Mossbauer spectroscopy: Introduction-Mossbauer effect, Recoilless emission and absorption, Mossbauer spectrum, Mossbauer nuclides-Experimental methods - Isomer shift - Hyperfine interactions and applications.

UNIT – III: NMR and NQR Techniques

Introduction to NMR: Nuclear spin and magnetic moment, Quantum description of NMR,
theory of NMR, chemical shift, Spin-lattice (T_1), spin-spin (T_2) couplings, Bloch equations, Theory of relaxation mechanisms for spin ½ nuclei, Proton NMR, Carbon-13 NMR and NMR applications.

Basic concepts of NQR spectra: Half integral and integral spins, Instrumentation, Super regenerative oscillator, CW oscillator, Pulse RF detection and applications.

UNIT – IV: Advanced Spectroscopic and Microscopic Techniques

Basic principles, Instrumentation and applications of X ray fluorescence spectroscopy, Photoelectron spectroscopy, Photo Acoustic spectroscopy. Basic principles, Instrumentation and applications of Scanning electron microscopy, Transmission electron microscopy, Atomic force microscopy, Energy dispersive spectroscopy, Differential scanning calorimetry and Thermo gravimetric analysis.

Text Books and Reference Books

1. Elements of X-ray Diffraction, B.D. Cullity.
2. Methods of Surface Analysis, Techniques and Applications, J.M. Walls Cambridge
University Press, 1990.
3. Neutron Diffraction, G.E. Bacon, OxfordUniversity Press, London, 1962.
4. Electron Diffraction, T.B. Rymer, Methnen, London, 1970.
5. X-ray Structure Determination, H. Stout and LH. Jenson, Macmillan, London, 1968.
6. An Introduction to Electron Paramagnetic Resonance, M. Bersohn, J.C. Baird, Benjamin Inc., London, 1966.
7. Instrumental Methods of Analysis, Willard Merritt, Dean Settle, CBS publishers,
New Delhi, 1986
8. Spectroscopy, B.P. Straughan and S. Walker, John Wiley & Sons Inc., New York,1976.
9. Spectroscopy, G. Chatwal and S. Anand, Himalaya Pub., 2502.
10. Spectroscopy, B.K. Sharma, Goel Publishers House, Meerut, 1975.
11. NMR Spectroscopy, R.K. Harris, Longman Sci. Tech, 1983.

SEMESTER-IV

Core Internal Elective	**PHY 45073 (A)**	**CONDENSED MATTER PHYSICS – II**

Course Objectives -This course enables the students

A. To become familiar with elastic properties of solids.
B. To learn about thermal properties of solids.
C. To understand the energy band theory and Fermi surfaces.
D. To learn the concept of Brillouin zones of simple cubic, bcc fcc lattices.
E. To learn about the nano-structured materials and their methods of preparation.
F. To learn the techniques like XRD/SPM/STM/AFM used for the determination of particle size.

Course Outcomes - After the completion of this course, students will be

1. Able to learn various elastic and thermal properties of solids.
2. Able to understand the applications of energy band theory and fermi surfaces.
3. Able to estimate Brillouin zones various crystal lattices.
4. Able to prepare nano-materials using CVD and Sol-Gel processes.

5. Able to use techniques like XRD/SPM/STM/AFM for the determination of particle size.

UNIT - I: Elastic Properties of Solids

Lattice as a homogeneous and continuous medium - Analysis of stress and strain tensors – Hooke's law - Elastic compliances and stiffness constants – Elastic energy density – Reduction in the number independent elastic constants in cubic crystals – Cauchy's relations – Bulk modulus and compressibility – Elastic waves in cubic crystals – Formulation and solution of wave equations along [100], [110] and [111] directions – Experimental determination of elastic constants – Pulse-echo technique.

UNIT - II: Thermal Properties of Solids

Quantum theory of lattice vibrations – Properties of phonons – Lattice specific heat at low temperatures – Einstein and Debye models – Born cut-off procedure – Inelastic scattering of neutrons by phonons – Experimental study of dispersion curves – Inadequacy of harmonic model – Anharmonicity – Thermal expansion – Gruneisen parameter- Lattice thermal conductivity – Elementary kinetic theory – Role of U and N processes.

UNIT - III: Energy band theory and Fermi Surfaces

Energy band theory: – Periodic potentials – Bloch's theorem and functions – Electron motion in periodic potentials – Origin of energy gap – Brillouin zones – Reduced zone and periodic zone schemes – Brillouin zones for simple cubic, bcc and fcc lattices, Tight binding model.

Importance of Fermi surface – Characteristics of Fermi surface – Construction of Fermi surface - Quantization of electron orbits - Experimental study of Fermi surface: Anomalousskin effect – Cyclotron resonance – de Haas van Alphen effect.

UNIT - IV: Nano - structured Materials

Definitions _ Nano- crystalline – XRD patterns –General Methods of preparation of Nano structured materialss by Physical and Chemical routes. Inert Gas condensation Chemical Vapor Deposition, and sol – zel process, Growth of nanocrystals in Glasses through thermal treatment (Glass ceramics). Particle size estimation by XRD/SPM,/STM/AFM Techniques. Size quantization effects, Band gap expansion (Blue shift) in semiconductors, quantum wells, wires and Dots- density of states. Applications of nano materials with specific examples.

Reference Books

1.Introduction to Solid State Physics, Charles Kittel7th Edition, John Wiley & Sons.
2.Solid State Physics, A.J.Dekker, MacMillan.
3.Solid State Physics, H.C. Gupta, Vikas Publishing House.
4.Elementary Solid State Physics, M.Ali Omar, Addison Wesley.
5.Solid State Physics, M.A.Wahab, Narosa Publishing House.
6.Science of Engineering Materials, C.M.Srivastsava and C.Srinivasan, New Age Inter. Pub.

SEMESTER-IV

Core Internal Elective	HY 45073(B)	COMMUNICATION SYSTEMS

Course Objectives - This course enables the students:

A. To learn details of Computer Communications systems like ISDN, LAN, TDMA, FDMA, ALOHA and CSMA.
B. To know the concept of CDMA.
C. To acquaint with optical Fiber systems and Coherent optical fiber systems used for the communication.
D. To learn wireless communication systems like GSM, cellular, 1G, 2G, 3G etc.
E. To get basic knowledge on Satellite and optical communications.

Course Outcomes - After the completion of this course, students will be:

1. Able to learn technology behind computer communication systems.
2. Able to acquire knowledge on optical Fiber systems and Coherent optical fiber systems used for the communication.
3. Able to understand and work on wireless communication systems like GSM, cellular, 1G, 2G, 3G etc.
4. Able to understand Satellite and optical communications and technology involved.

UNIT I - Computer Communications Systems

Types of networks, Design features of computer communication networks – ISDN, LAN Time Division Multiple Access (TDMA), Frequency division multiple Access (FDMA), ALOHA, slotted ALOHA and carrier sense multiple Access (CSMA), Introduction to CDMA.

UNIT II - Fiber Optics Communication

Optical Fiber System : Intensity modulation/direct detection, optical transmitter circuit, Optical receiver circuit, system design considerations, Digital Systems & planning considerations, Analog systems, distribution systems, Advanced multiplexing strategies.

Coherent Optical Fiber Systems: Basic Systems, Detection principles, Practical Constraints, Modulation formats, Demodulation schemes, Receiver sensitive, Signal and Multi carrier systems.

Unit – III: Introduction to wireless communication systems

Global system for mobile (GSM): cellular concept, system design. Transmission system, Receiving system; frequency re-use; Spread spectrum modulation; Multiple access techniques as applied to wireless communications; 1G, 2G, 3G wireless networks.

Unit – IV: Satellite and Optical communications

Introduction Satellite systems: Orbiting satellites, satellite frequency bands, communication satellite system-modulation and multiple access format-satellite systems in India, Satellite receiving systems, G/T ratio, satellite uplink and down link analysis. Applications to communications and remote sensing. Introduction to Optical communications systems: Optical fibers, sources and detectors, analog and digital systems.

Text Book

1. Modern Digital and Analog communication system, B.P. Lathi: Oxford 3 rdEdition.
2. Digital Communications Fundamentals and Applications, Bernard Sklar, Sklar Pearson Education.
3. Taub and Schilling, “Principles of Communication Systems”, Second edition, Tata McGraw Hill edition, 1991
4. Simon Haykin, “Communication Systems, Third Edition”, John Willey & Sons, Inc.1994.
5. Wayne Tomasi, “Advanced Electronics Communications Systems”,IV Edi, P. Hall,Inc,1998
6. John M. Senior, “Optical Fiber Communications”, Second Edition, PHI, 1999
7. Gerd Kesier “Optical Fiber Communications” Second Editaion, McGrw- Hill International Editions,1991.
8. Principles of Communication, R.E. Ziemer, WH Tranter 5th Edition John Wiley (Fifth module).

Reference Books

1. Morden Electronic Communication Systems, Wayne Tomoasi, Person Education/PHI.
2. Digital Communication, John G Proakis, MGH.
3. Digital Communication Techniques Simon, Hindey Lindsey PHI.
4. Communication Systems, Simon Haykin, John Wiley & Sons. Pvt. Ltd.
5. Principles of Communication Systems, Taub and Schilling, Tata McGraw-Hill.
6. Digital and Analog Communication System, K. Sam Shanmugam. John Wiley.
7. Communication Systems Engineering, Proakis, Pearson Education.
8. Digital and Analog Communication System, Leon W Couch, Pearson Education/PHI.
9. Introduction to Statistical Signal Processing with Applications, M.D. Srinath, P.K.
10. Rajasekaran, R.E. Viswnathan PHI.
11. Analog and Digital Communication, M.S. Roden PHI.
12. Digital Modulation and Coding. Wilson, Pearson Education.

SEMESTER-IV

Core Internal Elective	PHY 45073 (C)	PHOTONICS

Course Objectives - This course enables the students:

A. To understand the light propagation phenomenon through fiber optic cable
B. To understand various loss mechanism of signal while travelling through an optical fiber.
C. To understand the basic working principle of waveguides and its design parameters.
D. To identify waveguides for applications in fiber optics communication systems
E. To understand the principle of working of fiber based sensors for various application purposes.

Course Outcomes - After the completion of this course, students will be:

1. Able to illustrate the principle of fiber optics communications.
2. Able to distinguish between various loss mechanism in fiber optics communication system.
3. Able to utilize the idea of waveguide for different application purpose.
4. Able to categorise different waveguides for the utilization in optics communication system
5. Able to interpret different fiber sensors and their respective application and can recommend this technique for other new application.

UNIT - I: Fibre Optic Components and Sensors

Connector principles, Fibre end preparation, Splices, Connectors, Source coupling, Distribution networks, Directional couplers, Star couplers, Switches, Fiber optical isolator, Wavelength division multiplexing, Time division multiplexing, Fiber Bragg gratings. Advantage of fiber optic sensors, Intensity modulated sensors,
Mach-Zehnder interferometer sensors, Current sensors, Chemical sensors –Fiber optic rotation sensors. Optical biosensors: Fluorescence and energy transfer sensing, molecular beacons and optical geometries of bio-sensing, Bio-imaging, Biosensing.

UNIT - II: Integrated Optics

Introduction – Planar wave guide – Channel wave guide – Y-junction beam splitters and couplers - FTIR beam splitters – Prism and grating couplers – Lens wave guide – Fabrication of integrated optical devices - Integrated photodiodes – Edge and surface emitting laser – Distributed Bragg reflection and Distributed feed back lasers - Wave guide array laser.

UNIT - III: Optical Signal Processing

Introduction, Effect of lens on a wavefront, Fourier transform properties of a single lens, Optical transfer function, Vanderlugt filter, Image spatial filtering, Phase-contrast microscopy, Pattern recognition, Image de-blurring, Photonic switches, Optical transistor, Optical Gates- Bistable systems, Principle of optical Bistability, Bistable optical devices, Self electro-optic effect device.

UNIT - IV: Photonic Crystals

Basics concepts, Theoretical modeling of photonic crystals, Features of photonic crystals, Methods of fabrication, Photonic crystal optical circuitry, Nonlinear photonic crystals, Photonic crystal fibers, Photonic crystals and optical communications, Photonic crystal sensors.

Text and Reference Books

1. Fibre Optic Communication, Joseph C. Palais, Pearson Education Asia, India, 2001
2. Introduction To Fibre Optics, A.Ghatak And K.Thyagarajan, Cambridge University Press, New Delhi, 1999
3. Optical Guided Wave Signal Devices, R.SymsAndJ.Cozens. Mcgraw Hill, 1993.
4. Optical Electronics, A Ghatak and K. Thyagarajan, Cambridge University Press, New Delhi,1991
5. Fundamentals of Photonics, B.E.A. Saleh and M.C. Teich, John Willy and Sons,1991
6. Introduction to Fourier Optics, Joseph W. Goodman, McGraw-Hill, 1996.
7. Nanophotonics, P.N.Prasad, Wiley Interscience, 2003.
8. Biophotonics, P.N.Prasad, Wiley Publications, 2004.

SEMESTER-IV

Internal Elective	PHY 45074 (A)	PHYSICS OF SEMICONDUCTOR DEVICES

Course Objectives - This course enables the students:

A. Introducing the concept of junctions and interfaces between semiconductors
B. To understand V-I characteristics of p-n junction diode and concepts of Zener and Avalanche breakdown in p-n junctions.
C. To learn the characteristics of majority carrier diodes, microwave devices and transferred electronic devices and their applications.
D. To learn principle of operation and V-I charateristics of various junction transistors like BJT, FET, MOSFET, Charged Coupled Devices etc.
E. To acquint with the semiconductor technology and Optoelectronic devices.

Course Outcomes - After the completion of this course, students will be:

1. Able to know about the junctions and interfaces of semiconductors.
2. Understand V-I characteristics of various diodes.
3. Aquire knowledge on characteristics of various semiconductor devices and their useses.
4. Learn about the junction transistors and their various applications.
5. Obtaining commond on the semiconductor technology and Optoelectronic devices.

UNIT - I: Junctions and Interfaces

P-N Junctions, Description of P-N Junction action – Junction in equilibrium- application of bias – energy band diagrams – Types of junctions - Abrupt junction – calculation of the built-in voltage - electric field and potential distributions – Expression for Depletion layer capacitance, Static I-V characteristics of p-n junction diodes: Ideal diode model- Derivation of ideal diode equation. Real diodes – Carrier generation – recombination in the junction depletion region, I-V characteristics of Real Diodes.

Zener and Avalanche breakdown in P-N junctions, Applications of breakdown diodes. Metal-Semiconductor interfaces, Ohmic and Schottky contacts.

UNIT- II: Junction Diodes

Majority carrier diodes: Tunnel diode- I-V characteristics, Equivalent circuits as an oscillator and amplifier, Backwarddiode, Schottky barrier diode - operation and applications.

Microwave devices: Varactordiode-basic principle, equivalent circuit, figure of merit and applications, p-i-n diode operation and its applications.

Transferred electronic devices- Gunn diode, IMPATT diode, TRAPATT diode, BARITT diode - basic principle, operation and its applications.

UNIT - III: Junction Transistors

Bipolar junction transistors: Principle of operation, Carrier recombination in the Emitter-Base junction depletion region – Effect of collector bias variation, avalanche multiplication in the collector – base junction and base resistance.

Junction field-effect transistors: JFET Principle of operation, Static I-V Characteristics of the idealized model.

MOS transistors and charge-coupled devices: MOS capacitor – Surface field effect – Energy band diagrams of an MOS capacitor for different bias conditions - C-V characteristics of the MOS capacitors - Basic Structures and the operating principle of MOSFET, I-V characteristics of an ideal MOSFET, Charge Coupled Devices (CCD)- principle of operation.

UNIT – IV: Semiconductor Technology and Optoelectronic Devices

Technology of Semiconductor Devices: Crystal growth and Wafer preparation, Methods of p-n junction formation, Growth and deposition of dielectric layers, Planar technology, Masking and lithography, Pattern definition, Metal deposition techniques.

Optoelectronic devices: Solar cell- principle of operation- p-n homo-junction Si solar cell – device configuration – electrical characteristics- Photodetectors- Junction –photodiode- Principle of operation, Light Emitting Diode (LED).

Books for Study

1. Introduction to Semiconductor Materials and Devices, M.S. Tyagi, John Wiley & Sons (Asia) Pvt. Ltd., Singapore, 2500.
2. Microwave Devices and Circuits, Samuel and Y. Lao, Prentice-Hall of India, 1999.
3. Microwave and Radar Engineering, M. Kulkarni, UMESH Publications, New Delhi, 1999.

Reference Books

1. Physics of Semiconductor Devices , S.M. Sze, 3rd Edition , Oct.2506, John Wiley.
2.SolidState Electronic Devices, B.G. Streetman, PHI, New Delhi.
3. Semiconductor device fundamentals, Robert F. Pierret, Tata Mcgraw Hills

SEMESTER-IV

Internal Elective	PHY 45074 (B)	VACUUM AND THIN FILM PHYSICS

Course Objectives - This course enables the students to:

A. Definevacuum and compare various vacuum pumps and gauges.
B. Outline the thermodynamics of thin films.
C. Illustrate the mechanism of thin film formation.
D. Explain various techniques of thin film formation.
E. Summarize various properties of thin films.

Course Outcomes -After the completion of this course, students will be able to:

1. Demonstrate various types of pumps and gauges, inspect leak in vacuum and can design avacuum system.
2. Define the thermodynamical parameters of thin films and can outline interdiffusion in thin films.
3. Demonstrate the stages of thin film formation and can outline the conditions for the formation of amorphous, crystalline and epitaxial films.
4 Illustrate and compare physical vapour deposition (PVD) and chemical vapour deposition (CVD) techniques.
5. Define various thin film properties and outline the techniques of their determination.

UNIT I – Production and Measurement of Vacuum

Fundamentals of kinetic theory of gases – Vacuum fundamentals

Production of Vacuum: Mechanical oil sealed Rotary pumps - Roots pump – Turbo molecular pump - Vapor pumps – Diffusion pump - Sorption pump

McLeod gauge- Thermal conductivity gauges-Pirani gauge – Cold cathode Ionization gauges- Penning gauge – Hot cathode ionization gauge - Bayard- Alpert gauge- Quadruple mass spectrometer; Vacuum application – Tungsten filament and discharge lamps – Electron tubes- Vacuum metallurgy- Space simulators and freeze drying

UNIT II - Methods of Thin film Preparation

Physical methods: Vacuum evaporation, Types of evaporation sources - Resistive heating electron beam evaporation – Co-evaporation - Two source evaporation and three source evaporation - Flash evaporation- Laser ablation - Reactive evaporation - Epitaxial deposition- Hot wall epitaxy and Molecular beam epitaxy

Sputtering: Glow discharge, DC sputtering, RF sputtering, Magnetron sputtering, Reactive sputtering; Chemical Methods: Electroplating – Spray Pyrolysis – Chemical vapor deposition (CVD)

UNIT III - Growth and Thickness measurement of Thin Films

Condensation – Nucleation – and growth of thin films – Langmuir Frenkel theory of condensation – Theories of thin film nucleation – Capillarity theory – Statistical or Atomistic theory – Comparison of nucleation theories – The four stages of film growth – Incorporation of defects during growth

Thickness Measurement: Multiple beam Interferometer (MBI) – Quartz Crystal Thickness Monitor

UNIT IV – Properties of Thin Films

Sources of electrical resistivity in metallic conductors – Sheet resistance – Temperature coefficient of resistance – Influence of thickness on the resistivity – Fuchs-Sondheimier theory – Hall Effect

Reflection and Transmission at an Interface - Reflection and Transmission by a single film – Reflection from an absorbing film – Multilayer films – Determination of optical constants by ellipsometry

Applications of thin films

Thin film resistors – Capacitors – Beam splitters – reflection and anti reflection coatings – Optical filters

Prescribed Books:

1. "Vacuum Technology" A.Roth, North Holland, 1986.
2. "Vacuum Science and Technology" V.V. Rao, T.B. Ghosh and K.L. Chopra, Allied Publications, 1998.
3. "Fundamentals of Vacuum", Ward & Bann
4. "Hand book of Thin Film Technology" L.I. Maissel and R.L. Glang, McGraw Hill Bool Co., 1970.
5. "Thin Film Phenomenon" K.L. Chopra, McGraw Hill Bool Co., New York1969.
6. " Hand Book of Technologies for Films and Coatings" R.F. Bunshah, Noyes Publication, 1996.
7. "The Material Science of Thin Films", M. Ohring, Acddemic Press, New York, 1992.
8. "Preparation of Thin Films", JoyGeorge

SEMESTER-IV

Multi-Disiplenary Course	PHY 45075	METEROLOGY AND ATMOSPHERIC INSTRUMENTATION

Course Objectives - This course enables the students

A. To learn about the Earth's atmosphere and radiation laws.
B. To acquire the knowledge on Weather parameters and their measurement techniques.
C. To get knowledge about the ambient air composition and different techniques available for the measurement of air pollutants.
D. To learn basic principle and technology of RADAR and its application in measurement of meteorology.

Course Outcomes - After the completion of this course, students will be

1. Able to learn about the different layers of the Earth's atmosphere and their characteristics.
2. Able to learn concept of Black body radiation and related radiation laws.
3. Get the knowledge about the weather parameter and their measurement techniques.
4. Acquire the knowledge on ambient air composition, primary pollutants and secondary pollutants and their measurement techniques.
5. Know the effects of various air pollutants and their mitigation techniques.
6. Able to familier with basic principles, instrumentation and applications of RADAR used for the measurement of meteorology.

UNIT I- Earth's atmosphere

Layers of the atmosphere, variation of temperature with height in the atmosphere; Atmospheric pressure; Composition of the atmosphere-expressing the amount of a substance in the atmosphere; Energy balance of earth and atmosphere, Green house effect, Solar and terrestrial radiation; Block body radiation, laws of black body radiation -Plank's Law, Stefan – Boltzmann Law, and Wien's Displacement Law.

UNIT II - Meteorological Instrumentation

Ground based climatic station and automatic weather station for the measurement of air temperature, humidity, atmospheric pressure, wind speed, velocity and Rainfall.

Upper air observations- Rawinsonde, Radiosonde, GPS sonde-estimation of convective boundary layer height, thermo dynamical parameters and construction of T-Phigram.

UNIT III – Air pollution and its measurement techniques

Primary gaseous pollutants (CO_2, CH_4, CO AND NOx)- sources and their effects on climate/human health. Secondary gaseous pollutants (Ozone and PAN)- Formation and their effects on human health. Gaseous pollutants measurement techniques – principles, block diagrams and working. Description of aerosols, sources of aerosols, aerosol production mechanisms, effects of aerosols on climate and human health. Measurement techniques- direct measurements by sampling and remote sensing measurement by Multi Wavelength solar Radiometer and LIDAR.

UNIT IV – Radar Principles and Meteorology

Introduction to RADAR, Types of Radars- Mono-static, Pulsed radar, FM-CW radar; Basic principles of Pulsed (Wind Profiler) radar- Antenna Basics- radar signal processing ; Types of Radar Scattering theory- Wind Vector calculations; Wind Profiler Applications- Aviation, Tropical Cyclone, Thunderstorm, meteorological (Synoptic and Mesoscale) and Environmental.

Prescribed Books:

1. Battan, L.J. Radar Observation of the Atmosphere, University of Chicago Press, 1973, USA
2. Doviak, R.J., and D.S. Znic, Doppler Radar and Weather Observations. Academic Press, San Diego, Calif., 1993, USA
3. B.R. Bean and E. J. Dutton, radio meteorology, U.S. Govt, print. Off (Washingtion), 435p.1996.
4. Handbook of the Atmospheric Science- Principles and Applications by C. N. Hewitt and Andrea V. Jackson Black well publishing company, USA, 2003.
5. Atmospheric Chemistry and Physics by John H. Seinfeld and Spyros N. Pandias
6. Air Pollution by JermyColls, Spon Press, New York, 2002.
7. Atmospheric Pollution by Aerosols by V.K. Sharma, Scientifi Publishers, Jodhpur, 1994.

SEMESTER-IV

Condensed Matter Physics-II

Practical-II

Course code: **PHY45075** Max.Marks:100

[1]. To index the bragg reflections in a powder x-ray photograph of a Cubic crystal and to find lattice parameter?

[2]. Find the magnetic Susceptibility for different concentrated solutions by using Quinck's tube method.
[3]. Study the Electron Spin Resonance spectra of Mn^{2+} in a sea shell and determine the g-factor and hyperfine splitting constant?
[4]. Find the Photo elastic constant for given Perspex crystal
[5]. To study the Photoconductivity of CdS photo-resistor at constant Irradiance and constant voltage
(a). To plot the current- voltage characteristics at constant irradiance.
(b). To measure photocurrent I at constant voltage.Φ Ph as a function of Irradiance.
[6]. Calculate the Magnetic Transition temperature of a given Ferromagnetic material by using Inductance method.

SEMESTER-IV

(Communication electronics Lab)

Practical-II Course code:
PHY45075 Max.Marks:100

[1]. Study the operation of Differential Phase Shift keying modulation and Demodulation.
[2]. Study the operation of Frequency shift keying modulation and Demodulation.
[3]. Study the operation of pulse code modulation and Demodulation.
[4]. Study the channel analog Time Division Multiplexing and De -Multiplexing technique?
[5]. To study the various losses are occurred in fibre optics analog link?
[6]. To study the various losses are occurred in fibre optics digital link?

SEMESTER-IV

(Metrology and Atmospheric Instrumentation or Project work or Practical)

Practical-I Course code:
PHY45076 Max.Marks:100

[1]. Diagonis of variation of wether/meteorological parameters observed by Automatic Weather Station (AWS) .
[2]. To caluculate the mass concentration of total suspended particulate matter[TSPM] in the atmosphere and evaluate atmospheric corrected TSPM using direct Aerosol sampling technique.
[3]. To prepare the graphical representation of wind roses by using AWS data.
[4]. To study the diurnal of number concentration and mass concentration for different size range of the particles[0.3,0.5,1.0,2.5,5.0,and 10.0µm].
[5]. Measurement of relative humidity and pressure draw humidity graph for one month temperature,pressure,relative humidity,windspeed and winddirection data and find out the maximum and minimum wether parameter values.

M.Sc. DEGREE EXAMINATIONS,
I, II, III & IV SEMESTERS

PHYSICS

PHYS 15071 to 25074, 25071 to 25074, 35071 to 35074 &45071 to 45074: <u>TITLE OF THE PAPER</u>

(with effect from the Academic Year 2021-2022)
(No additional sheet will be supplied)

Time: 3 hours **Max. Marks: 75**

PART – A(Marks: **5x3 = 15**)

Answer any **FIVE**questions. Each answer should not exceed ONE (1) Page
All questions carry equal marks

1. From **UNIT - I**
2. From **UNIT - I**
3. From**UNIT - II**
4. From**UNIT - II**
5. From**UNIT - III**
6. From**UNIT - III**
7. From**UNIT - IV**
8. From**UNIT - IV**

PART B(Marks: **4 x 15 = 60**)
Answer **ALL** questions.
Each answer should not exceed SIX (6) Pages

9.
OR **UNIT – I (With internal Choice)**
10.

11.
OR **UNIT – II (With internal Choice)**
12.

13.
OR **UNIT – III (With internal Choice)**
14.

15.
OR **UNIT – IV (With internal Choice)**
16.

YOGI VEMANA UNIVERSITY

VEMANAPURAM, KADAPA, Y.S.R Dist., A.P - 516 005

CURRICULUM FRAME WORK MASTER OF PHYSICAL EDUCATION (M.P.Ed.)

TWO YEAR PROGRAMME

AS PER GUIDELINES OF THE CHOICE BASED CREDIT SYSTEM (CBCS),

NATIONAL COUNCIL FOR TEACHER EDUCATION(NCTE)

&

NATIONAL EDUCATION POLICY-2020

DEPARTMENT OF PHYSICAL EDUCATION & SPORTS SCIENCESYOGI VEMANA UNIVERSITY

KADAPA, A.P.

2021-2022

YOGI VEMANA UNIVERSITY

VEMANAPURAM, KADAPA – 516 005 DEPARTMENT OF PHYSICAL EDUCATION & SPORTS SCIENCES

REGULATIONS, SCHEME AND SYLLABUS FOR THE DEGREE OFMASTER OF PHYSICAL EDUCATION (M.P.Ed.,)

TWO YEARS PROGRAMME (Four Semesters)

(CHOICE BASED CREDIT SYSTEM, NATIONAL COUNCIL FOR TEACHER EDUCATION(NCTE) & NATIONAL EDUCATION POLICY-2020)

(WITH EFFECT FROM THE ACADEMIC YEAR: 2021-22)

REGULATION -1 : INTAKE

The intake into the Master of Physical Education Two Year course shall be as per the NCTE Norms and Standards.

REGULATION -2 : ELIGIBILITY

The Candidates seeking admission into Master of Physical Education (M.P.Ed.) Two Year course should have passed the Bachelor of Physical Education (B.P.Ed.) or (B.P.E) from any recognized University in India, securing a minimum of 55% percent of marks.

REGULATION -3 : ADMISSION INTO THE PROGRAMME

Admission into the Master of Physical Education Two Year course shall be as per the university admission procedure as given below :-

SELECTION PROCEDURE

- Candidates shall be selected through the Y V U P G C E T/ A P P G C E T
- Admission shall be made into M.P.Ed., course on the basis of marks obtained in the entrance examination (Theory) conducted by the University and the achievements in sports during their study at Degree (Graduation) / Post Graduation / B.P.Ed./B.P.E level.
- The entrance examination (Theory) will be conducted by the University for 100 Marks and weightage of marks for sports achievement will be for 100 marks.
- The Entrance examination will be conducted on the syllabus of B.P.Ed.,/ B.P.E., course. The question paper shall be set with 100 questions, either multiple choice questions, match the following, fill up the blanks or one word answers. Each question carries one mark.
- The criteria for awarding marks for sports achievement is furnished below.
- The sports achievement certificates (original) will be verified and the marks will be awarded accordingly. Hence, the candidates should bring their original sports achievement certificates along with evidence documents like **Form-I** for Internationals, **Form-II** for

Nationals and **Form-III** for Inter-university participants etc., on the day of entrance examination.

- The merit list will be prepared basing on the aggregate of 200 marks.

- If there is a tie, the tie will be resolved by giving weightage to the percentage of marks secured in B.P.Ed. Course. If tie persists, a person securing highest marks in the sports achievements is preferred. If the tie still persists, age will be considered for the merit and the elder person will be awarded better rank.
- There shall be reservation of seats for SC/ST/BC/EWS, CAP, NCC, Women, etc. as per the rules of the University/State Government.
- As the course demands vigorous physical activity, **pregnant women** candidates are not eligible for admission. The pregnant women candidates are not eligible to continue the course.
- In-service candidates shall produce **Relieving Certificate** from the concerned Head of Institution along with the **Permission Certificate** from the concerned Authorities.
- Student should produce **Physical Fitness Certificate** from Civil Surgeon or Assistant Surgeon (Govt. Doctor) to get eligibility for admission and to pursue the study.

1	2	3	4
Category	**Sports Distinction / Participation** Athletics & Cross country, Archery, Badminton, Ballbadminton, Baseball, Basketball, Chess, Cricket, Football, Gymnastics, Handball, Hockey, Kabaddi, Kho-Kho, Power lifting, Softball, Netball, Tennis, Table Tennis, Volleyball, Weight lifting, Swimming, Wrestling, Boxing, Cycling, Rowing, Shooting, Fencing, Roller Skating, Sailing/Yatching, Judo, Taekwondo, Best Physique and any other sports added in Sports Reservation GO's.	**Certificate issuing Authority**	**Weightage Marks** **For all the Sports (Individual, Partner and Team) for which Association of Indian University conduct Inter University Tournaments.**
1	Representing the Country in International Meets Approved by the Respective International Sports Federations / Sports Associations / Sports Authorities/FISU	International Sports Association/Federation **Or** Federation affiliated to Indian Olympic Association	100 Marks
2	Medal / Place/ at Senior Nationals, National Games **(OR)** All India Inter-University Meets	All India Sports Federation/ All India Sports Association affiliated to Indian Olympic Association **(OR)** Association of Indian Universities	Gold : 80 Marks Silver: 70 Marks Bronze: 60 Marks
3	Medal / Place/ at Junior National**(OR)**South Zone Inter-University Meets **(OR)** South Zone Nationals	National Federations **(OR)** Association of Indian Universities	Gold : 55 Marks Silver: 45 Marks Bronze: 35 Marks
4	Participation at Senior Nationals, National Games **(OR)**Inter-University Meets **(OR)** South Zone Nationals	All India Sports Federation / All India Sports Associations affiliated to Indian Olympic Association **(OR)** State Association **(OR)** Universities	30 marks
5	Junior National Participation	All India Sports Federation / All India Sports Association affiliated to Indian Olympic Association	20 Marks
6	Inter District Tournaments	State Association	Gold:15 Silver:10 Bronze:5
7	Inter-collegiate tournaments	University	Gold:10 Silver:7 Bronze:5

NOTE:

1. Only the sports (Individual, Partner, Team), which are included in the latest Sports calendar of Association of Indian Universities, will be considered for awarding Weightage marks.
2. Candidate's merit certificates of highest level of participation / achievement will be considered to place them in any one of the above seven categories. Candidate will not be considered for more than one category for award of Weightage marks.
3. Candidate's merit certificate of highest level of participation / achievement in sports will be considered only during their study at Degree (Graduation) / Post Graduation / B.P.Ed./B.P.E, Course.
4. National level meets include National games, Senior Nationals, Junior Nationals, South Zone Nationals.

REGULATION -4 : DURATION

The M.P.Ed programme is of duration of two academic years, that is, four semesters. However, the students shall be permitted to complete the program requirements within a maximum of three years from the date of admission into the program.

REGULATION -5 : MEDIUM OF INSTRUCTIONS

The medium of instruction is in English and the student has to write the examinations only in English.

REGULATION -6 : THE CBCS SYSTEM

All programmes shall run on Choice Based Credit System (CBCS) and National Education Policy-2020. It is an instructional package developed to suit the needs of students, to keep pace with the developments in higher education and the quality assurance expected of it in the light of liberalization and globalization in higher education.

REGULATION -7 : COURSE

The term course usually referred to, as 'paper' is a component of a programme. All courses need not carry the same weight. The courses should define learning objectives and learning outcomes. A course may be designed to comprise Lectures/ Tutorials/Laboratory Work/ Field Work/ Outreach Activities/ Project Work/ Vocational Training/VIVA/ Seminars/ Term Papers/Assignments/ Presentations/ Self-Study etc. or a combination of some of these.

REGULATION -8 : COURSE OF PROGRAMME

The M.P.Ed. programme consists of a number of courses, the term 'Course' applied to indicate a logical part of subject matter of the programme and is invariably equivalent to the

subject matter of a “paper” in the conventional sense. The following are the various categories of courses suggested for the M.P.Ed. Programme.

Theory	
	➢ Core Course
	➢ Foundation Course
	➢ Internal Elective Course
	➢ Open Elective Course Choice Based Course from Outside the Department within the University (Open Elective / Non-Core).
Practicum	
	➢ Compulsory Course
	➢ Elective Course
	➢ Teaching / Coaching Practices
	➢ Internship

REGULATION -9 : SEMESTER

An academic year is divided into two semesters. Each semester will consist of **17-20 weeks** of academic work equivalent to 100 actual teaching days. The odd semester may be scheduled from May/June to November/December and even semester from November/ December to May/June. The institution shall work for a **minimum of 36 working hours in a week** (five or six days a week).

REGULATION -10: WORKING DAYS

There shall be at least 200 working days per year exclusive of admission and examination processes etc.

REGULATION -11: CREDITS

The term 'Credit' refers to a unit by which the programme is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or one and half / two hours of practical work/field work per week. The term 'Credit' refers to the weight given to a course, usually in relation to the

instructional hours assigned to it. The total minimum credits, required for completing M.P.Ed. programme is **90 credits and for each semester 20 credits**

PROVISION OF BONUS CREDITS MAXIMUM 06 CREDITS IN EACH SEMESTER

Sl. No.	Special Credits for the Extra Co-curricular Activities	Credit
1	Sports Achievement at State level Competition (Medal Winner) Sports Achievement at National level Competition (Medal Winner) Sports participation International level Competition	1 2 4
2	Inter University Participation (Any one game)	2
3	Inter College Participation (min. two games)	1
4	National Cadet Corps / National Service Scheme	2
5	Blood donation / Cleanliness drive / Community services /	2
6	Mountaineering – Basic Camp, Advance Camp / Adventure Activities	2
7	News Reporting / Article Writing / book writing / progress report writing	1

Students can earn **maximum 06 Bonus credits** in each semester by his/her participation in the above mentioned activities duly certified by the Head of the institution / Department. This Bonus credit will be used only to compensate loss of credits in academic activities.

REGULATION -12: SCHEME OF EXAMINATION

The number of theory papers, practical in Sports, and maximum marks in each theory paper and each practical are given in semester wise.

❖ In I Semester there shall be Four Theory papers (two core, one Foundation and one Internal Elective Paper) and Four Practical courses. Each Theory shall carry 100 marks out of which 25 marks are allotted for Internal Assessment and 75 marks are allotted for University Semester End Examinations, and Practical shall carry 100 marks which are allotted for University Semester End Examinations only.

❖ In II Semester there shall be Four Theory papers (two core, one Foundation and one Open Elective Paper) and Four Practical courses. Each Theory shall carry 100 marks out of which 25 marks are allotted for Internal Assessment and 75 marks are allotted for University Semester End Examinations, and Practical shall carry 100 marks which are allotted for University Semester End

❖ In III Semester there shall be Four Theory papers (two core, one Foundation and one Open Elective Paper) and Four Practical courses. Each Theory shall carry 100 marks out of which 25 marks are allotted for Internal Assessment and 75 marks are allotted for University Semester End Examinations, and Practical shall carry 100 marks which are allotted for University Semester End Examinations only.

❖ In IV Semester there shall be Four Theory papers (two core, one Foundation and one internal Elective Paper) and Four Practical courses. Each Theory shall carry 100 marks out of which 25 marks are allotted for Internal Assessment and 75 marks are allotted for University Semester End Examinations, and Practical shall carry 100 marks which are allotted for University Semester End Examinations only.

❖ Each Practical Examination in I, II, III and IV Semester shall be conducted as mentioned in the Practical Course.

❖ There shall be two Internal Assessment Tests for each Theory paper and the average of two tests / best of one test shall be considered for the award of internal marks.

❖ Separate internal examination shall be conducted for practical.

REGULATION – 13: ATTENDANCES

a) A candidate shall get 75% attendance in each semester in each course for appearing examinations.

b) Condonation of shortage of attendance for theory classes alone may be recommended by the head of department and head of the institution on medical grounds or other genuine reasons provided the students puts up 62.5% of attendance in all the theory papers.

c) The condonation of shortage of attendance is not allowed in case of practical attendance. However, the student shall put up 75% of attendance by attending extra classes on preparatory holidays/vacation period etc. by paying extra tuition fee. If necessary, such candidate shall be permitted to attend the practical examinations after the fulfillment of the requirements.

REGULATION – 14: PROMOTION

A student shall be eligible for promotion to the next semester, if, he/she satisfies the requirements as stipulated in Regulation-13 in the semester and shall register for the semester and University examinations. The candidate shall register at the beginning of each semester by paying the prescribed fee in the office of the principal and submitting the details in the pro- forma.

Part-A :- M.P.Ed. Format of Question Paper for 5 Units.

Question paper shall have eight questions corresponding to five units of each theory paper.Part-B:- M.P.Ed. Format of Question Paper for 5 Units.

Question paper shall have five questions corresponding to five units of each theory paper.The pattern is as follows:

Question No.	Description	Marks
1	**Part-A** Write short notes: Any Five out of Eight questions. Five questions from five units and Extra Three questions from any Three units.	**5X5=25**
2	**Part-B** Answer in detail (Long Question) or Answer in detail (Long Question) **(From Unit 1)**	**10**
3	Answer in detail (Long Question) or Answer in detail (Long Question) **(From Unit 2)**	**10**
4	Answer in detail (Long Question) or Answer in detail (Long Question) **(From Unit 3)**	**10**
5	Answer in detail (Long Question) or Answer in detail (Long Question) **(From Unit 4)**	**10**
6	Answer in detail (Long Question) or Answer in detail (Long Question) **(From Unit 5)**	**10**
	Total	**75**

QUESTION PAPER SETTING

Question papers are set by the panel of paper setters appointed by the University from the panel of Question paper setters submitted by the Chairman, Board of Studies in Physical Education and Sports Sciences or the person duly authorized by the chairman, Board of Studies in Physical education and sports Sciences, Y.V. University.

REGULATION – 16: EVALUATION

i) Theory: Internal assessment:

a) The performance of a student in each course is evaluated in terms of percentage of marks with a provision for conversion to grade point. Evaluation for each course shall be done by a continuous internal assessment (CIA) by the concerned course teacher as well as by end semester examination and will be consolidated at the end of course.

b) There shall be two internal assessment tests for each theory paper and the better performed of the two shall be considered for the award of internal marks for 25 marks.
c) If any student fails to appear in both the internal assessment tests for whatsoever the reason he/she shall be deemed to have secured Zero and no supplementary internal assessment tests shall be conducted.
d) Separate internal examination shall be conducted for practical for 25 marks.

Attendance shall be taken as a component of continuous assessment, although the students should have minimum 75% attendance in each course. In addition to continuous evaluation component, the end semester examination, which will be written type examination of at least 3 hours duration, would also form an integral component of the evaluation. The ratio of marks to be allotted to continuous internal assessment and to end semester examination is 25:75. The evaluation of practical work, wherever applicable, will also be based on continuous internal assessment and on an end-semester practical examination.

i) Evaluation of theory paper for 75 Marks: All university examination theory papers shall be evaluated by two evaluators (internal and external) appointed by the university from the panel of external examiners.

ii) Practicum Internal evaluation: The internal assessment shall be done for 25 marks in each practicum. If more than one event/game is present under the same practicum, each event/game shall be evaluated separately for 25 marks by the concerned teacher deal the event/ game. The average of the awarded marks of all the teachers shall be taken.

iii) Practicum External evaluation: The External assessment shall be done for 75 marks in each practicum. If more than one event/game is present under the same practicum, each event/game shall be evaluated separately for 75 marks by the external examiner nominated by the university. The average of the awarded marks of all the events/games of that practicum shall be for 75 marks.

REGULATION – 17: MINIMUM PASSING STANDARDS

The minimum passing standard for CIA (Continuous Internal Assessment) and External Examinations shall be 40%, i.e., 10 marks out of 25 marks and 30 marks out of 75 marks respectively for theory courses. The minimum passing standards for both CIA & external examination shall be 50%, i.e. 13 out of 25 marks and 38 out of 75 marks for the practical courses.

REGULATION – 18: GRADING

Once the marks of the CIA (Continues Internal Assessment) and SEA (Semester End Assessment) for each of the courses are available, both (CIA and SEA) will be added. The marks thus obtained for each of the courses will then be graded as per details provided in Regulation-23 from the first semester onwards the average performance within any semester from the first semester is indicated by Semester Grade Point Average (SGPA) while continuous performance (including the performance of the previous semesters also) starting from the first semester is indicated by Cumulative Grade Point Average (CGPA). These two are calculated by the following formula:

$$Semister\ Grade\ points\ average\ (SGPA) = \frac{\sum Ci\ Gi}{\sum Ci}$$

$$Cumilative\ \ Grade\ points\ average\ (CGPA) = \frac{\sum \sum\ Ci\ Gi}{\sum \sum\ Ci}$$

Where ***Ci*** is the Credit earned for the course is in any semester; ***Gi*** is the Grade point obtained by the student for the course and n number of courses obtained in that semester; 1111_1 is SGPA of semester *j* and N number of semester. Thus CGPA is average of SGPA of all the semesters starting from the first semester to the current semester.

REGULATION – 19: CLASSIFICATION OF FINAL RESULTS

For the purpose of declaring a candidate to have qualified for the Degree of Master of Physical Education in the First class with distinction / First Class/ Higher Second Class / Second Class /Pass Class , the marks and the corresponding CGPA earned by the candidate in Core Courses will be the criterion. It is further provided that the candidate should have scored the First / Second Class separately in both the grand total and end Semester (External) examinations.

REGULATION – 20: AWARD OF RANK

There shall be no award of rank at the time of publication of results. However, the names of gold medal awardees, etc., shall be announced at the time of convocation only.

REGULATION – 21: PROVISION FOR IMPROVEMENT

The candidates shall be permitted to improve their marks in any or all the papers of any semester as per the regulations and syllabi in force.

Note:-

a. The candidate fails to improve his/her marks/class, the original marks/class are unaltered.

b. The marks obtained by the candidate in internal assessment/field report/record/seminars etc will continue for subsequent examination for failed/improvement candidates.

REGULATION – 22: AWARD OF THE M.P.ED., DEGREE

A candidate shall be eligible for the award of the degree of the M.P.Ed., only if he/she has earned the minimum required credit including Bonus Credits of the program me prescribed above.

A candidate for the award of M.P.Ed., Degree shall require:

a) To have undergone the course of study in the University College/Affiliated college over a

period of two academic years consisting of four semesters.

b) To have passed the examinations as prescribed above.

c) No Candidate shall be permitted to obtain degree earlier than four semesters.

As per the University Rules which are in vogue.

REGULATION – 24: TRANSITORY REGULATIONS

a) The supplementary candidates who were admitted earlier to the course on the basis of old regulations and syllabi shall be permitted to appear twice in any paper and complete the course in the next two academic years.

b) The University shall have the right to amend or modify any or all of the above regulations whenever necessary.

REGULATION – 25: LETTER GRADES AND GRADE POINTS

i. Two methods-relative grading or absolute grading– have been in vogue for awarding grades in a course. The relative grading is based on the distribution (usually normal distribution) of marks obtained by all the students in the course and the grades are awarded based on a cut-off mark or percentile. Under the absolute grading, the marks are converted to grades based on pre-determined class intervals. To implement the following grading system, the colleges and universities can use any one of the above methods.

ii. The grades for each course would be decided on the basis of the percentage marks obtained at the end-semester external and internal examinations as per following table:

Percentage	Grade Point	Letter Grade	Description	Classification of final result
85 & above	8.5-10.0	O	Out standing	First class with distinction
70-84.99	7.0-8.49	A+	Excellent	
60-69.99	6.0-6.99	A	Very Good	First Class
55-59.99	5.5-5.99	B+	Good	Higher Second class
50-54.99	5.0-5.99	B	Above Average	Second Class
40-49.99	4.0-4.99	C	Average	Pass Class
Below 40	0.0	F	Fail / Dropped	Dropped
	0	AB	Absent	

Calculation of **Semester Grade Point Average (SGPA)** and **Credit Grade Point (CGP)** anddeclaration of class for M. P. Ed. Programme.

The credit grade points are to be calculated on the following basis:

EXAMPLE – I

Marks obtained by Student in course MPE-101 = 65/100
Percentage of marks = 65 %

Grade from the conversion table is = A
Grade Point = 6.0 + 5 (0.99/9.99)

= 6.0 + 5x0.1

= 6.0+ 0.5

=6.5

The Course Credits = 04

Credits Grade Point (CGP) = 6.5 × 04 = 26

The semester grade point average (SGPA) will be calculated as a weighted average of all thegrade point of the semester courses.

Semester grade point average (SGPA) = Sum of grade points of all eight courses of the semester

Total credit of the semester

SEMESTER - I

Course Code	Credit	Marks out of 100 (%)	Grade	Grade Point	Credit Grade Point
MPE-101	4	65	A	6.5	26.0
MPE-102	4	60	A	6	24.0
MPEF-103A/ MPEF-103B	4	62	A	6.2	24.8
MPEIE-104A/ MPEIE-104B	4	57	B+	5.7	22.8
MPEP-105	4	55	B+	5.5	22.0
MPEP-106	4	72	A+	7.2	28.8
MPEP-107	4	66	A	6.6	26.4
MPEP-108	4	72	A+	7.2	28.8
	32				203.6

Examples: Conversion of marks into grade points

MPE-101 65 = 60 + 5 = 6.0 + 5 x (0.99 / 9.99) = 6.0 + 5 x 0.1 = 6.0 + 0.5 = 6.5

MPE-102 60 = 6.0

MPEF-103A/MPEF-103B 62 = 60 + 2 =6.0 + 2 x (0.99/9.99) = 6.0 + 2 x 0.1 = 6.0 + 0.2 = 6.2

MPEIE-104A/ MPEIE-104B 57 = 55 + 2 = 5.5 + 2 x (0.49 / 4.99) = 5.5 + 2 x 0.1 = 5.5 + 0.2 = 5.7

MPEP-105 55 = 5.5

MPEP-106 72 = 70 + 2 = 7.0+ 2 x (1.49 /14.99) = 7.0 + 2 x 0.1 = 7.0 +0.2 = 7.2

MPEP-107 66 = 60 + 6 = 6.0 + 6 x (0.99 / 9.99) = 6.0 + 6 x 0.1 = 6.0 + 0.6 = 6.6

MPEP-108 72 = 70 + 2 = 7.0+ 2 x (1.49 /14.99) = 7.0 + 2 x 0.1 = 7.0 +0.2 = 7.2

Semester Grade Point Average (SGPA) = Total Credit Grade Points/ credits

= 203.6/32 = 6.3625

SGPA Sem. I = 6.3625

At the end of Semester-

1Total SGPA = 6.3625

Cumulative Grade Point Average (CGPA) = 6.3625/1 = 6.3625

CGPA = 6.3625, Grade = A, Class = First Class

SEMESTER – II

Course Code	Credit	Marks out of 100 (%)	Grade	Grade Point	Credit Grade Point
MPE-201	4	76	A+	7.6	30.4
MPE-202	4	64	A	6.4	25.6
MPEF-203A/MPEF-203B/ MPEF-203C	4	59	B+	5.9	23.6
MPEOE-204	4	80	A+	8	32
MPEP-205	4	49	C	4.9	19.6
MPEP-206	4	64	A	6.4	25.6
MPEP-207	4	55	B+	5.5	22.0
MPEP-208	4	72	A+	7.2	28.8
	32				207.6

SGPA Sem. II = 207.6/32= 6.4875

At the end of Semester-II

Total SGPA for two Semesters = 12.85

Cumulative Grade Point Average (CGPA) = 12.85/2 = 6.425

CGPA = 6.425, Grade = A, Class = First Class

Course Code	Credit	Marks out of 100 (%)	Grade	Grade Point	Credit Grade Point
MPE-301	4	64	A	6.4	25.6
MPE-302	4	64	A	6.4	25.6
MPEIE-303A/MPEIE-303B/ MPEIE-303C	4	59	B+	5.9	23.6
MPEOE-304	4	81	A+	8.1	32.4
MPEP-305	4	49	C	4.9	19.6
MPEP-306	4	64	A	6.4	25.6
MPEP-307	4	68	A	6.8	27.2
MPEP-308	4	75	A+	7.5	30.0
	32				209.6

SGPA Sem. III = 209.6/32= 6.55

At the end of Semester-III

Total SGPA for three Semesters = 19.4

Cumulative Grade Point Average (CGPA) = 19.4/3 = 6.466667

CGPA = 6.466667, Grade = A, Class = First Class

SEMESTER – IV

Course Code	Credit	Marks out of 100 (%)	Grade	Grade Point	Credit Grade Point
MPE-401	4	83	A+	8.3	33.2
MPE-402	4	76	A+	7.6	30.4
MPEEF-403A/ MPEEF-403B	4	59	B+	5.9	23.6
MPEGE-404A/ MPEGE-404B	4	81	A+	8.1	32.4
MPEP-405	4	49	C	4.9	19.6
MPEP-406	4	78	A+	7.8	31.2
MPEP-407	4	81	A+	8.1	32.4

MPEP-408	4	75	A+	7.5	30.0 23
	32				232.8

SGPA Sem. IV = 232.8/32= 7.275

At the end of Semester-IV

Total SGPA for all the four semesters = 26.675

Cumulative Grade Point Average (CGPA) = 26.675 /4 = 6.66875

CGPA = 6.66875 Grade = A, Class = First Class

NOTE:

1) SGPA is calculated only if the candidate passes in all the courses i.e. get minimum C grade in all the courses.
2) CGPA is calculated only when the candidate passes in all the courses of all the previous and current semesters.
3) The cumulative grade point average will be calculated as the average of the SGPA of all the semesters continuously, as shown above.
4) For the award of the class, CGPA shall be calculated on the basis of:
   (a) Marks of each Semester End Assessment And
   (b) Marks of each Semester Continuous Internal Assessment for each course.

The final Class for M.P.Ed., Degree shall be awarded on the basis of last CGPA (grade) from one to four semester examinations.

REGULATION – 27: GRIEVANCE REDRESSAL COMMITTEE:

The college/department shall form a Grievance Redressal Committee for each Course in each college/department with the course teacher / Principal / Director and the HOD of the faculty as the members. This Committee shall solve all Grievances of the students.

REGULATION – 28: REVISION OF SYLLABI :

Syllabus will be revised from time to time according to the National Council for Teacher Education / University norms.

SYLLABUS

CHOICE BASED CREDIT SYSTEM, **NATIONAL COUNCIL FOR TEACHEREDUCATION (NCTE)**

&

NATIONAL EDUCATION POLICY-2020

M.P.Ed., TWO YEAR COURSE

2021-2022

Semester – I

Components of study	Paper Code	Title of the Papers	No. of hours per Week	Credits	Internal Marks	External Marks	Total Marks
Part A: Theoretical Course							
Core	**MPE-101**	Research Process in Physical Education & Sports Sciences	6	4	25	75	100
	MPE -102	Physiology of Exercise	6	4	25	75	100
Foundation	**MPEF-103A**	Applied Statistics in Physical Education & Sports	6	4	25	75	100
	MPEF-103B	Philosophical and Sociological basis of Physical Education	6	4	25	75	100
Internal Elective	**MPEIE-104A**	Fitness and Life Style Management	6	4	25	75	100
	MPEIE-104B	Adapted Physical Education	6	4	25	75	100
Part- B Practical Course							
Practical -I	**MPEP-105**	Resistance Training & Gym Maintenance (Compulsory) **Any one of the following i.e.** Gymnastics/Swimming/Yoga	6	4	25	75	100
Practical -II	**MPEP-106**	Games Specialization – Badminton/Ball badminton / Baseball / Basketball / Cricket/ Football/ Handball /Hockey/ Kabaddi / Kho-Kho / Softball/ Table Tennis / Tennis / Volleyball **(*Any two games – One Indigenous & one ball game*)**	6	4	25	75	100
Practical -III	**MPEP-107**	Teaching Lessons: Coaching lessons in the events of MPEP- 105 and 106.	6	4	25	75	100
Practical -IV	**MPEP-108**	Class room Teaching Lessons on theory of different Sports.	6	4	25	75	100
	Total		**60**	**32**	**200**	**600**	**800**

NOTE: TOTAL THEORY: 36 HOURS TOTAL PRACTICUM: 24 HOURS TOTAL : 60 HOURS

- **All core papers are mandatory**
- FOUNDATION – CHOOSE ONE PAPER
- **Internal Elective: Choose one Paper**

Components of study	Paper Code	Title of the Papers	No. of hours per Week	Credits	Internal Marks	External Marks	Total Marks
Part A : Theoretical Course							
Core	**MPE-201**	Yogic Sciences	6	4	25	75	100
	MPE-202	Sports Biomechanics and Kinesiology	6	4	25	75	100
Foundation	**MPEF-203A**	Tests, Measurement and Evaluation in Physical Education	6	4	25	75	100
	MPEF-203B	Fitness Assessment and Exercise Prescription	6	4	25	75	100
	MPEF-203C	Communication and Soft Skills	6	4	25	75	100
Open Elective	**MPEOE-204**	Basic Concepts of Yoga	6	4	25	75	100
Part- B Practical Course							
Practical -I	**MPEP-205**	Track and Field: Running Events &Track Marking **(compulsory), Any one of the following** i.e. Gymnastics/Swimming/ Yoga/Roller Skating	6	4	25	75	100
Practical -II	**MPEP-206**	Laboratory Practical in Physiology of Exercise and Sports Bio Mechanics & Kinesiology **(Two practical in each subject)**	6	4	25	75	100
Practical -III	**MPEP-207**	**Any two of the following activities:** Aerobics / Taekwondo / Shooting / Archery.	6	4	25	75	100
Practical -IV	**MPEP-208**	Adventure Activities / Mass demonstration Activities(Any One)	6	4	25	75	100
	Total		**60**	**32**	**200**	**600**	**800**
Audit course	**9**		**0**	**0**	**100**	**0**	

NOTE: TOTAL THEORY: 36 HOURS TOTAL PRACTICUM: 24HOURS TOTAL: 60HOURS

- **All core papers are mandatory**
- FOUNDATION : CHOOSE ONE PAPER
- **Open Elective: Choose one Paper offered by other departments**

Components of Study	Course Code	Title of the Papers	Total Hours	Credit	Internal Marks	External Marks	Total Marks
Part A : Theoretical Course							
Core	**MPE-301**	Scientific Principles of Sports Training	6	4	25	75	100
	MPE-302	Sports Medicine, Athletic Care and Rehabilitation	6	4	25	75	100
Internal Elective	**MPEIE-303A**	Sports Psychology and Sports Sociology	6	4	25	75	100
	MPEIE-303B	Advanced Sports Nutrition	6	4	25	75	100
	MPEIE-303C	Tools, Methods And Testing Procedures In Sports Sciences	6	4	25	75	100
Open Elective	**MPEOE-304**	Fitness and Wellness	6	4	25	75	100
Part- B Practical Course							
Practical -I	**MPEP-305**	Track and Field: Jumping events, Hurdle Events & Field Marking **(compulsory)** Field test for Fitness & Skills	6	4	25	75	100
Practical -II	**MPEP-306**	Laboratory : Sports Psychology and Physiotherapy lab ***(Any two practical in each subject)***	6	4	25	75	100
Practical -III	**MPEP-307**	Games of Specialization – **Any two games other than two games opted in first semester** Games Specialization – Badminton/Ball badminton / Baseball / Basketball / Cricket/ Football/ Handball /Hockey/ Kabaddi / Kho-Kho / Softball/ Table Tennis / Tennis / Volleyball	6	4	25	75	100
Practical -IV	**MPEP-308**	Teaching Lessons: Coaching lessons in the events of MPEP- 305 and 307	6	4	25	75	100
	Total		**60**	**32**	**200**	**600**	**800**

NOTE: TOTAL THEORY: 36 HOURS TOTAL PRACTICUM: 24HOURS TOTAL: 60HOURS

- **All core papers are mandatory**
- INTERNAL ELECTIVE: CHOOSE ONE PAPER
- **Open Elective: Choose one Paper offered by other departments**

Components of Study	Course Code	Title of the Papers	Total Hours	Credit	Internal Marks	External Marks	Total Marks
Part A :Theoretical Course							
Core	**MPE-401**	Information & Communication Technology (ICT) in Physical Education	6	4	25	75	100
	MPE -402	Health Education and Sports Nutrition	6	4	25	75	100
Foundation	**MPEF-403A**	Sports Technology	6	4	25	75	100
	MPEF-403B	Educational Technology in Physical Education	6	4	25	75	100
Internal Elective	**MPEIE-404A**	Sports Management and Curriculum Design in Physical Education	6	4	25	75	100
	MPEIE-404B	Dissertation/Project work/Event Management	6	4	25	75	100
Part- B Practical Course							
Practical -I	**MPEP-405**	Track and Field: Throwing Events, Combined events **(Compulsory).** **Any one of the following i.e.** Fencing/Tug of War	6	4	25	75	100
Practical -II	**MPEP-406**	Game of Specialization – Practical Skills - **any one opted from four games in previous semesters - Record & Viva-voce.**	6	4	25	75	100
Practical -III	**MPEP-407**	Officiating in Track and Field / Gymnastics / Swimming/Yoga/Roller Skating/Tug of War/Fencing	6	4	25	75	100
Practical -IV	**MPEP-408**	Coaching lessons in Game of Specialization	6	4	25	75	100
	Total		**60**	**32**	**200**	**600**	**800**
	Grand Total for Four Semesters		**240**	**128**	**800**	**2400**	**3200**

NOTE: TOTAL THEORY: 36 HOURS TOTAL PRACTICUM: 24HOURS TOTAL: 60HOURS

- **All core papers are mandatory**
- FOUNDATION: CHOOSE ONE PAPER
- **Internal Elective: Choose one Paper**

Master of Physical Education & Sports Sciences

Semester-I

SYLLABUS

Theory and Practicum

Part-A- Theoretical course

Semester – I

MPE-101: RESEARCH PROCESS IN PHYSICAL EDUCATION AND SPORTS SCIENCES

(Core Paper)

UNIT-I: INTRODUCTION

Meaning, Definition, Nature, Scope and importance of research in Physical Education. Classification of Research: Basic, Applied and Action Research, Location of Research Problem, Criteria for selection of a Research problem and Qualities of a good researcher.

UNIT-II: METHODS OF RESEARCH

Descriptive Methods of Research: Survey, Case study. Historical Research, Steps in Historical Research, Sources of Historical Research: Primary Data and Secondary Data, Historical Criticism: Internal Criticism and External Criticism.

UNIT-III: EXPERIMENTAL RESEARCH

Experimental Research: Meaning, Nature and Importance, Variable:

Definition, Types of Variables, Experimental Design: Single Group Design, Reverse Group Design, Repeated Measure Design, Static Group Comparison Design, Equated Group Design and Factorial Design.

UNIT-IV: SAMPLING

Meaning and Definition of Sample and Population. Types of Sampling:

Probability Methods: Systematic Sampling, Cluster sampling, Stratified Sampling, Area Sampling and Multistage Sampling. Non- Probability Methods: Convenience Sampling, Judgment Sampling and Quota Sampling.

UNIT-V: RESEARCH PROPOSAL AND REPORT

Cauterization of Thesis / Dissertation: Front Materials, Body of Thesis, Back materials, Method of Writing Research proposal, Thesis / Dissertation: Method of writing abstract, full paper for presenting in a conference, publishing in journals, Mechanics of writing Research Report, Footnote and Bibliography.

References:

1. Best J. W (1971) Research in Education, New Jersey; Prentice Hall, Inc
2. Clarke David. H & Clarke H, Harrison (1984) Research processes in Physical Education, New Jersey; Prentice Hall Inc.
3. Craig Williams and Chris Wragg (2006) Data Analysis and Research for Sport and Exercise Science, London Rout ledge Press
4. Jerry R Thomas & Jack K Nelson (2000) Research Methods in Physical Activities; Illonosis; Human Kinetics;
5. Sreenivasan & KRS Reddy(2013) Research Methods in Physical Education; Swastik Publications, New Delhi
6. Kamlesh, M. L. (1999) Research Methodology in Physical Education and Sports, New Delhi
7. Moses, A. K. (1995) Thesis Writing Format, Chennai; Poompugar Pathippagam
8. Rothstain, A (1985) Research Design and Statistics for Physical Education, Englewood Cliffs: Prentice Hall, Inc
9. Subramanian, R, Thirumalai Kumar S & Arumugam C (2010) Research Methods in Health, Physical Education and Sports, New Delhi; Friends Publication
10. Moorthy A. M. Research Processes in Physical Education (2010); Friend Publications

(Core Paper)

UNIT-I: INTRODUCTION, SKELETAL MUSCLES AND EXERCISE

Definition of Physiology, Exercise Physiology and importance of Exercise Physiology in sports. Macro & Micro Structure of the Skeletal Muscle, Types of Muscle fibers and their characteristics, Chemical Composition, Chemistry of Muscular Contraction, Sliding Filament theory of Muscular Contraction. Muscle Tone, Heat Production in the Muscle and Effects of exercise and training on the muscular system.

UNIT-II: CARDIOVASCULAR SYSTEM AND EXERCISE

Structure of the Heart, Heart Valves and Direction of the Blood Flow, Conduction System of the Heart, cardiac Circulation, Cardiac Cycle, Heart Rate, Stroke Volume, Cardiac Output and Heart Rate and stroke Volume interactions. Effects of exercise and training on Cardio vascular system.

UNIT-III : RESPIRATORY SYSTEM AND EXERCISE

External and Internal Respiration, Mechanism of Respiration, Respiratory Muscles, Minute Ventilation, Ventilation at Rest and During Exercise. Exchange of Gases in Lungs and Tissues, Control of Ventilation, Ventilation and Anaerobic Threshold, Oxygen recovery, Lung Volumes and Capacities, Anatomical Dead Space. Effects of exercise and training on respiratory system.

UNIT-IV: METABOLISM AND ENERGY TRANSFER

Metabolism: Definition and types- Anabolism and Catabolism, Anaerobic Metabolism: ATP- PC or Phosphagen System, Anaerobic Glycolysis, Aerobic Metabolism: Aerobic Glycolysis, Fat Metabolism. Metabolism during Rest and Exercise (High Intensity and Long Duration Exercises)

UNIT-V: CLIMATIC CONDITIONS AND ERGOGENIC AIDS

Variations in Temperature and Humidity,–Thermoregulation, –Sports performance in hot, Cool and humid Climate, high altitude, acclimatization and circadian rhythm. Ergogenic Aids: Pharmacological, Hormonal, Physiological aspects and their effects on sports performance. Doping and WADA.

Note: Laboratory Practical's in Physiology be designed and arranged internally.

References:

1. Amrit Kumar, R, Moses. (1995). Introduction to Exercise Physiology. Madras: Poompugar Pathipagam.
2. Beotra Alka, (2000) Drug Education Handbook on Drug Abuse in Sports: Sports Authority of India Delhi.
3. Clarke, D.H. (1975). Exercise Physiology. New Jersey: Prentice Hall Inc., Englewood Cliffs.
4. David, L Costill. (2004). Physiology of Sports and Exercise. Human Kinetics.
5. Fox, E.L., and Mathews, D.K. (1981). The Physiological Basis of Physical Education and Athletics. Philadelphia: Sanders College Publishing.
6. Guyton, A.C. (1976). Textbook of Medical Physiology. Philadelphia:
7. W.B. Sanders co. Richard, W. Bowers. (1989). Sports Physiology. WMC: Brown Publishers.
8. Sandhya Tiwaji. (1999). Exercise Physiology. Sports Publishers.
9. Shaver, L. (1981). Essentials of Exercise Physiology. New Delhi: Subject Publications. Vincent,
10. T. Murche. (2007). Elementary Physiology. Hyderabad: Sports Publication.
11. William, D. Mc Aradle. (1996). Exercise Physiology, Energy, Nutrition and Human Performance. Philadelphia: Lippincott Williams and Wilkins Company. John Bullock. et.al., Physiology, 4th Ed. Newyork.
12. Dr. Kovvuru Rama Subba Reddy (2021), Introduction to Physiology of Exercise, Swasthik

Publications, New delhi.

(Foundation)

UNIT-I: INTRODUCTION

Meaning, Definition, types, Functions, need and importance of Statistics. Meaning of the terms Population, Sample, Data and types of data. Variable: Definition and types of Variables, Discrete and Continuous. Parametric and non-parametric statistics.

UNIT-II: MEASURES OF CENTRAL TENDENCY

Construction of frequency table. Meaning, Definition, Importance, Computation, Advantages and Disadvantages of Measures of central tendency – Mean, median and mode.

UNIT-III: MEASURES OF DISPERSIONS AND SCALES

Meaning, Purpose, Calculation and Advantages of Range, Quartile Deviation, Mean Deviation, Standard Deviation, Probable Error. Scales: Meaning, Purpose, Computation and advantages of T scale; 6 Sigma scale, Z Scale and Hull scale.

UNIT-IV: PROBABILITY DISTRIBUTIONS AND GRAPHS

Normal Curve. Principles of normal curve, Properties of normal curve. Meaning of probability,-–. Divergence from normality. Skewness and Kurtosis. Graphical Representations in Statistics: Line diagram, Bar diagram, Histogram.

UNIT-V: INFERENTIAL AND COMPARATIVE STATISTICS

Tests of significance, "T" test, "F" ratio, chi square test, level of confidence and interpretation of data. Meaning of correlation, co-efficient of correlation, calculation of coefficient of correlation by the product moment method and rank difference method. Concept of ANOVA and ANCOVA.

NOTE: IT IS RECOMMENDED THAT THE THEORY TOPICS BE ACCOMPANIED WITH PRACTICAL, BASED ON COMPUTER SOFTWARE OF STATISTICS.

Reference:

1. Best J. W (1971) Research in Education, New Jersey; Prentice Hall, Inc
2. Clark D.H. (1999) Research Problem in Physical Education 2nd edition, Eaglewood Cliffs, Prentice Hall, Inc.
3. Jerry R Thomas & Jack K Nelson (2000) Research Methods in Physical Activities; Illonosis; Human Kinetics;
4. Kamlesh, M. L. (1999) Reserach Methodology in Physical Education and Sports, New Delhi
5. Rothstain A (1985) Research Design and Statistics for Physical Education, Englewood Cliffs:Prentice Hall, Inc
6. Sivaramakrishnan. S. (2006) Statistics for Physical Education, Delhi; Friends Publication
7. Thirumalaisamy (1998), Statistics in Physical Education, Karaikudi, Senthilkumar Publications.

UNIT-I: **Physical Education Profession**- Aims, Objectives, needs, values, ethics and challenges of leadership. Physical Education and Education of whole man. PHYSICAL EDUCATION - Toward a discipline, physical education as an academic discipline. The domain of physical education as a discipline. Academic discipline dealing with human Movement.

UNIT-II: **Philospphical Foundations With Specific Applications To Phyiscal Education And Sports** - Definition and meaning of philosophy, scope of philosophy, need for philosophical study. Traditional schools of philosophy, naturalism, idealism, realism, pragmatism and existentialism.

UNIT-III: **Socialogy** - Definition and meaning of sports, sociology and sports sociology. Sports sociology-its nature, scope and the need for study of sports sociology.

UNIT-IV: **Social Attitudes**- Physical activity and the social attitudes on infants children and adolescents. Culture, sports culture and elements of culture. Sports as a reflection and transmitter of values. Cross cultural differences, political and democratic issues related to sports. **Sports within Educational Institutions** College level, sacondary level, primary grades. Sports participation, academic achievement and social mobility.

UNIT-V: **Mass Media** - Sports and the mass media: The symbolic relationship. The audience, sports and aggression. Collective violence in sports. Sports professionalization and commercialization. **Yoga** Meaning, history and development. Yoga and physical health, yoga and mental health.

References

1. Bucher, Charles A :Dimensions of Physical Education.
2. Willams, J.F. :Principles of Physical Education
3. Zeigler, E.F. :Philosophical foundations of physical, health and recreation education.
4. Lockhart, Allene S & Howard : Contemporary readings in Physical Education
5. Cratty, Bryant. J : Social dimensionof physical activity.
6. Marten, Rainer :Social psychology and physical achieving.
7. Kuppuswamy. B : An introduction to social psychology
8. Dharam. V :Sports and Society

.

MPEIE-104A: FITNESS AND LIFE STYLE MANAGEMENT

(INTERNAL ELECTIVE)

UNIT-I:

Concept of Fitness Definition and meaning of Fitness, Different Kinds of Fitness, Physical Fitness, Skill Related and Health Related Physical Fitness. Relationship of fitness and health fitness to develop health of an individual, Wellness revolution: Life style and Health fitness relationship, Meaning of active life style, Physical Inactivity and associated health risks Diabetes, Hypertension, Atherosclerosis, Arthritis

UNIT-II:

Meaning of Health, Health related fitness components: Body Compositions, Cardio Vascular Fitness, Muscular Endurance, strength, flexibility, benefits of health related fitness. Benefits of Health fitness Components: Meaning of health related and Physical fitness components Exercise protocols for the health fitness components, Body Composition, concepts of body weight and components of body weight, Assessment of body composition, Obesity, Meaning of Obesity and risk factors, of Obesity and over fatness- Muscular and joint flexibility-risk factors Associated with poor muscular and Joint flexibility.

UNIT-III:

Nutrition: base for human performance-Carbohydrates, Fats and Proteins. Recommended intake for Normal persons and exercising individuals. Vitamins, Minerals and Water. Osteoporosis and Calcium, Minerals and performance. Optimal nutrition for exercise, Energy value of different important foods, Food Pyramid, fluid replacement before, during and after exercise for temperature regulation and injury prevention, carbohydrates and electrolytes during exercise.

UNIT-IV:

Stress-meaning and types of stress, Physical and mental stress-Harmful effects of overtraining and excessive exercise on health, -mental stress and painful effects of mental stress on health. Anxiety, Depression, insomnia, Compulsive obsessive behaviors, Stress relief through exercise and stress management protocols.

UNIT-V:

Health behavior, Self-efficacy on health behavior, Behavioral modification for wellness, Social support and health of an individual, Life style and other related aspects of activity during childhood. Facts on childhood obesity and activity.

References:

1. Lifestyle management in Health and Social care, Merinda Thew and Jim McKenna, Blackwell Publishing. United Kingdom.
2. Predicting Health behavior, Mark Connor and Paul Norman, Open University Press, Buckingham, UK.
3. Health Behavior and health education: Theory, research and Practice, Karen Glanz, Barbara Rimer, Viswanath, John wiley and sons, USA. (Free pdf book)
4. Human Body Composition, Steven B Heymstead, Timothy Lohan, Zimian Wang, Scott B Going, Human Kinetics, USA.
5. Science of Flexibility, Michael J Alter, Human Kinetics, USA.
6. Applied Body Composition Assessment, Vivian H Heyward, Dale R Wagner, Human Kinetics, USA.
7. Coping with life stress-the Indian experience, Meena Hariharan, Amazon Books.
8. Stress Management- a Wellness approach, Nanette E Tummers, Human Kinetics, USA.
9. Wellness Workbook: How to achieve enduring health and vitality, John W Travis and Regina S Ryan, Crown publishing, New York.
10. The Soul of Wellness: 12 holistic principles for achieving a healthy body, mind, heart and spirit, Rajiv Parti, Select book incorporation, New York.
11. Wellness coaching for lasting Lifestyle change, Michael Arloski, Whole person associates, Duluth, USA.
12. Staying Healthy with Nutrition: The complete guide to Diet and Nutritional medicine, Elson M Has,.
13. Dr. Kovvuru Rama Subba Reddy (2020), text book of wellness and fitness, Swastik publications, New Delhi India.

(Internal Elective)

UNIT-I: Identification and causes of specific diseases

Attention deficit-hyperactivity disorder : Meaning, Symptoms & Causes and Treatment - Meaning of Autism and its Signs, Symptoms & Causes - Emotional disturbance : Characteristics, Causes and Treatment –

UNIT-II: Specific learning disabilities: Common types of learning disabilities their causes, treatment and intervention - Amputations & its types and dwarfism: types, causes, diagnosis and treatment.

UNIT-III: Class organization

Class organization strategies: identifying the cause, embrace special needs, setting high expectations and goals. - Managing individual programs: specially designed instructions, programme modifications, classroom accommodations, supplementary aids and services, transportation.- Monitoring students performances: Purpose and Implementation - Organizing the instructional environment.

UNIT-IV: Paralympics Sports

History of Paralympics- Paralympics events: list of IPC summer and winter sports.- Rules and regulations.- Eligibility criteria: medical classification & functional classification.

UNIT-V: Organization & Administration

Individual education program: meaning and its need. - Role of the physical education.- Communicating with parents - Public relations.

REFERENCES:

1. Auxter David- pyfer jean, Huettig carol-" Principles &. Methods of Adapted physical education"
2. Fait. F. Hollis "Education : adapted corrective developmental"
3. Winnick .P Joseph " Adapted Physical education"
4. Clarke Harrison. H, Clarke David H developmental and Adapted Physical Education.

Part-B, Practal Course

Semester - I

MPEP- 105: Resistance Training & Gym Maintenance

Resistance Training: Body Building Exercise for all parts of the body, Six-pack, Expose Physique.

Gym Maintenance: Maintenance of Gym Machineries/Equipments and other Fitness Gadgets.

Gymnastics: Floor Exercise, Pyramids, Parallel bars and Balancing beam.

Swimming: Float, Free style, and Breast stroke.

Yoga: Yoga postures in standing, sitting, prone, supine and balancing Asanas.

MPEP- 106: Game of Specialization

Badminton / Ball badminton/Baseball / Basketball/Cricket/ Football/ Handball /Hockey/ Kabaddi / Kho-Kho / Softball/ Table Tennis / Tennis / Volleyball A candidate has to learn and perform proficiency and officiating in any two games – One Indigenous & one ball game.

MPEP- 107: Teaching Lessons: Coaching lessons in the events of MPEP- 105 and 106.

Student has to take Coaching lessons of each 45 mins in the activities and games mentioned above MPEP- 105 and 106. 5 lessons (4 Internal and 1 External)

MPEP- 108: Class room teaching Lessons on theory of different Sports & Games

Student has to take Teaching lessons on theory of each 45 mins in different sports of the above MPEP-105 and 106. 4 lessons (3 Internal and 1 External)

Master of Physical Education & Sports Sciences

Semester-II

SYLLABUS

Theory and Practicum

Semester-II

MPE-201: YOGIC SCIENCES

(CORE PAPER)

UNIT-I: Introduction

Meaning, Definition, Scope and importance of Yoga, Essentials For Yoga Practices; Age, Diet, Stomach Emptying bowels, bathing, Clothes, Sun Bathing, Place, Time, Awareness, Sequence. Contra indication, Counter Pose, Inverted Asana, Breathing, and Relaxation. Basic Systems of Yoga and their importance - Astanga Yoga: Yama, Niyama, Aasna, Pranayama, Prathyahara, Dharana, Dhyana, Samadhi. Streams of Yoga: Hatha Yoga, Raja Yoga, Karma Yoga, Bhakti Yoga and Gnana Yoga.

UNIT-II: AASANAS , KRIYAS, BANDHAS AND MUDRAS

Asana: Definition, Classification: Sitting, Standing, Lying, & Inverted ASanas. Benefits of Asanas, Asanas and Loosening Exercises, Surya Namaskara- Description and Benefits. Kriyas **:** Meaning, Neti, Nauli, Dhauti, Kapalabhati, Trataka, Bhastrika and their Benefits. Bandhas**:** Jalandhara, , Udyana, Mula and their Importance. Mudras: Definition, Purpose, Benefits of Hastamudras, Asamyuktahasta, Samyuktahasta, Manamudra, Kayamudra, Bandha Mudra, Adharamudra.

UNIT-III : PRANAYAMA

Definition, Tradition, Types, Importance & Impact of Pranayama on naadis. Chakras: Definition and types, Effects of Pranayama on major chakras.

UNIT-IV: MEDITATION

Meaning, definition and benefits of meditation. Types of Meditation: Passive, active, Saguna and Nirguna Meditation. Meditation and Health, Meditation and stress Management.

UNIT-V: YOGA AND SPORTS

Effects of Yoga on Physiological Systems: Respiratory, Circulatory, Digestive, Nervous and Excretory Systems. Place of Yoga as Supplementary, Compensatory, Regenerative and Yogic Power. Role of Yoga in Sports: Promotion of Mental Wellbeing, Self-Actualization, Concentration, Suppression of Anxiety and depression. Role of Yoga in Making out a Sports Person.

NOTE: LABORATORY PRACTICUM SHOULD BE DESIGNED AND ARRANGED FOR STUDENTS INTERNALLY.

Reference:

1. George Feuerstein, (1975). Text Book of Yoga. London: Motilal Bansaridass Publishers (P) Ltd.
2. Gore, (1990), Anatomy and Physiology of Yogac Practices.
3. Lonavata: Kanchan Prashant. Helen Purperhart (2004), The Yoga Adventure for Children. Netherlands: A Hunter House book.
4. Iyengar, B.K.S. (2000), Light on Yoga. New Delhi: Harper Collins Publishers.
5. Karbelkar N.V.(1993) Patanjal Yogasutra Bhashya (Marathi Edition) Amravati: Hanuman Vyayam Prasarak Mandal
6. Kenghe. C.T. (1976). Yoga as Depth-Psychology and para-Psychology (Vol-I): Historical Background, Varanasi.
7. Bharata Manishai. Kuvalyananada Swami & S.L. Vinekar, (1963), Yogic Therapy – Basic Principles and Methods. New Delhi: Govt. of India, Central Health Education and Bureau.
8. Moorthy A.M. & Alagesan. S. (2004) Yoga Therapy. Coimbatore: Teachers Publication House.
9. Swami Kuvalayanda, (1998), Asanas. Lonavala: Kaivalyadhama.
10. Swami Satyananada Sarasvati. (1989), Asana Pranayama Mudra Bandha. Munger: Bihar School of Yoga.

11. Swami Satyananda Saraswathi. (1984), Kundalini and Tantra, Bihar: Yoga Publications Trust.
12. Swami Sivananda, (1971), The Science of Pranayama. Chennai: A Divine Life Society Publication.
13. Thirumalai Kumar. S and Indira. S (2011) Yoga in Your Life, Chennai: The Parkar Publication.
14. Tiwari O.P. (1998), Asanas-Why and How. Lonavala: Kaivalyadham.
15. Satya Murty.K, Elements of Yoga,Vedadri Brahma Gnana Kendra, Pedakakani, Guntur, India,(2015)

UNIT-I: INTRODUCTION

Meaning, nature, importance and scope of applied kinesiology and Sports Biomechanics. Meaning of Axis and Planes, Dynamics, Statics, Kinematics, Kinetics, gravity, Center of Gravity, Line of gravity and base of the body. Vectors and Scalars.

UNIT-II: MUSCLE ACTION

Origin, Insertion and action of Muscles around shoulder, Elbow, Hip, Knee and muscles of Abdomen & Trunk.

UNIT-III : MOTION AND FORCE

Meaning and definition of Motion. Types of Motion: Linear motion, angular motion and General motion. Uniform & Non Uniform motion. Laws of Motion: law of Inertia, Law of acceleration and law of reaction. Force: Definition and types of force: Centripetal Force, Centrifugal Force, Sources of force, components of Force, Factors of Force. Pressure, friction, Buoyancy and Spin.

UNIT-IV: PROJECTILES AND LEVERS

Freely falling bodies, Projectiles: Principles of Projectiles: Stability, equilibrium and its Types. Factors Effecting on Equilibrium. Definition of Work, Power and Energy. Mechanical Energy: kinetic energy, potential energy and strain energy. Levers: Definition and Types of Levers and their practical applications. Mechanical Advantage. Fluid Resistance, Aerodynamics.

UNIT-V: MOVEMENT ANALYSIS

Analysis of Movement: Types of analysis: Kinesiological, Biomechanical. Video Analysis.
Methods of analysis – Qualitative, Quantitative, Predictive methods.

NOTE: LABORATORY PRACTICUM SHOULD BE DESIGNED AND ARRANGED FOR STUDENTS INTERNALLY.

Reference:

1. Deshpande S.H.(2002), Manav Kriya Vigyan – Kinesiology (Hindi Edition) Amravati :Hanuman Vyayam Prasarak Mandal.
2. K Rama Subba Reddy & Sreenivasan (2014),Biomechanics And Applied Kinesiology, Navayug Books Internationals,Delhi.
3. Hoffman S.J(2005), Introduction to Kinesiology (Human Kinesiology publication Inc..
4. Steven Roy, & Richard Irvin. (1983), Sports Medicine. New Jersery: Prentice hall.
5. Thomas. (2001), Manual of structural Kinesiology, New York: Me Graw Hill.
6. Uppal A.K (2004), Lawrence Mamta MP Kinesiology (Friends Publication India)
7. Uppal, A.K (2004), Kinesiology in Physical Education and Exercise Science, Delhi Friends publications.
8. Williams M (1982) Biomechanics of Human Motion, Philadelphia; Saunders Co.
9. Peter.M.Mc.Ginnis (1999), Biomechanics of Sport and Exercise, Human Kinetics, U.S.A, 1999

(Foundation)

UNIT-I: INTRODUCTION

Meaning and Definition of Test, Measurement and Evaluation. Need and Importance of Measurement and Evaluation. Criteria for Test Selection: Scientific Authenticity, Administrative Considerations and Educational Applications. Scientific Authenticity: Validity, Reliability, Objectivity, Norms, Duplicate Forms and Standard Directions.

UNIT-II: PHYSICAL FITNESS TESTS

Physical Fitness: Meaning and Definition, Physical Fitness Tests: AAHPER, JCR Tests. Roger's physical fitness Index. Cardio vascular test: Harvard step test, Cooper's 12 minutes run / walk test.

UNIT-III : MOTOR FITNESS TESTS

Meaning and Definition of Motor Fitness, Motor Fitness Tests; Indian Motor Fitness Test, Motor Ability: Meaning, Definition. Motor Ability Test: Barrow Motor Ability Test, Newton Motor Ability Test. Muscular Fitness: Kraus Weber Minimum Muscular Fitness Test.

UNIT-IV: ANTHROPOMETRIC AND AEROBIC-ANAEROBIC TESTS

Physiological Test - Aerobic Capacity: Bruce Treadmill Test Protocol, Beep test. Anaerobic Capacity: Margaria-Kalamen test, Anthropometric Measurements: Method of Measuring Height: Standing Height, Weight Sitting Height. Girth: Arm, Waist, Hip, Thigh. Skin Folds: Chest, Abdomen, Mid-thigh, Triceps, Iliac Crest.

UNIT-V: SKILL TESTS

Specific Sports Skill Test: Badminton: French Stalter Short Service Test, Miller Wall Volley Test. Basketball: Knox, Johnson Basketball Test. Hockey: Henry Friedel Field Hockey Test, Schmithal's Field Hockey Test, Volleyball: Russel Lange Volleyball Test, Brady Volleyball Test. Football: Johnson Soccer Test, Mc-Donald Volley Soccer Test. Tennis: Dyer Tennis Test, Broer Miller Test.

Note: Practicum of indoor and out-door tests should be designed and arranged internally.

REFERENCES :

1. Authors Guide (2013) ACSM's Health Related Physical Fitness Assessment Manual, USA: ACSM Publications Collins.
2. R.D., & Hodges P.B. (2001) A Comprehensive Guide to Sports Skills Tests and Measurement (2nd edition) Lanham: Scarecrow Press
3. Cureton T.K. (1947) Physical Fitness Appraisal and Guidance, St. Louis: The C. Mosby Company
4. Getchell B (1979) Physical Fitness A Way of Life, 2nd Edition New York, John Wiley and Sons, Inc
5. Jenson, Clayne R and Cynt ha, C. Hirst (1980) Measurement in Physical Education and Athletics, New York, Macmillan Publising Co. Inc
6. Kansal D.K. (1996), "Test and Measurement in Sports and Physical Education, New Delhi: DVS Publications
7. Krishnamurthy (2007) Evaluation in Physical Education and Sports, New Delhi; Ajay Verma Publication
8. Vivian H. Heyward (2005) Advance Fitness Assessment and Exercise Prescription, 3rd Edition, Dallas TX: The Cooper Institute for Aerobics Research
9. Wilmore JH and Costill DL. (2005) Physiology of Sport and Exercise: 3rd Edition. Champaign IL: Human Kinetics
10. Yobu, A (2010), Test, Measurement and Evaluation in Physical Education in Physical Education and Sports. New Delhi; Friends Publications

MPEF-203B: FITNESS ASSESSMENT AND EXERCISE PRESCRIPTION

Unit-I: (Foundation)

Preliminary Health Screening and Risk Classification - Preliminary Health Evaluation- Testing Blood Pressure, Heart Rate, Principles of Assessment, Prescription and exercise Adherence Program Adherence,Physical Fitness testing, Basic principles of Exercise program design.

Unit-II:

Assessment of Cardiorespiratory fitness and Designing Cardio respiratory exercise programs. Exercise Prescription. guidelines and procedures, Maximal Exercise, Test Protocals, Sub maximal Exercise Test protocols, Field tests for assessing aerobic fitness, Exercise testing for children, exercise prescription, aerobic training methods.

Unit-III:

Assessment of strength and muscular endurance, strength and muscular endurance testing, Designing resistance training programs, types of resistance training, developing resistance training programs, muscular misconceptions on resistance training, assessing flexibility and Designing stretching programs, Basics of flexibility, assessment of flexibility, designing flexibility programs, designing low back care exercise programs.

Unit-IV

Assessment of body composition, Classification and uses of body composition, measures of body composition, Laboratory methods for assessing body composition, Field methods for assessing body composition.

Unit-V:

Designing weight management and body composition programs. Obesity: Types and causes overweight and underweight, Weight management principles and practices, well balanced nutrition, Designing weight loss programs, Designing weight gain programs, Designing programs to improve Body/Composition.

References:

1. Advanced Fitness assessment and Exercise Prescrtption, Vivian Heyward, Human Kinetics Publishing, USA.
2. Applied Body composition assessment, Vivian Heyward, Human Kinetics, USA.
3. Fitness professional's handbook, Edward T Howley and Don Franks, Human Kinetics, USA.
4. Health fitness instructors handbook, Edward T Howley, Human Kinetics, USA.

(Foundation)

Unit-I: Fundamental and Advanced Grammar

Basic sentence patterns, parts of speech, Articles, Prepositions, Tenses, Voice, Reported Speech and Question Tags.

Unit-II: Speaking Skills

Meaning and Definition of Communication, Self introduction, Greetings, invitations, permissions, suggestions, complaints, compliments, apologize, thank you.

Unit-III: Reading Skills & Vocabulary

Reading for main idea, Techniques of Skimming &Scanning Vocabulary – Phrasal Verbs, One Word substitutes, synonyms and Antonyms.

Unit-IV: **Writing Skills:**

Letter writing, Resume writing, E-Mail Writing.

Unit-V: Soft skills

Non- Verbal Communication, stress management, Time management, Positive Attitude, Interview Skills.

Reference:

1. Jermey Harmer the Practice of English language teaching, Longman 1983.
2. O' connor, Better English Pronunciation.
3. Board of Editors 2007 written & spoken communication in English Universities press, Hyderabad.
4. Madhavi Apte-2007- A course of English communication, New Delhi prenetic Hall.
5. Harmby- A.S Oxford Advanced learners Dictionary of current English (ELBS)
6. Central University, Pandicherry Developing reading skills-Book I&II
7. Freeman, Sarah, Written communication in English Bombay: Orient Longman 1977.

MPEOE-204: BASIC CONCEPTS OF YOGA

(Open Elective)

UNIT I: INTRODUCTION

Meaning and Definition of Yoga, Concepts, Objectives, Benefits and misconceptions of Yoga, Yoga and its relevance to Physical Education.

UNIT II: STREAMS OF YOGA

Jnana Yoga, Raja Yoga, Bakthi Yoga, Karma Yoga and their Concepts.

UNIT III: LIMBS OF YOGA

Limbs of Yoga-Yama, Niyama, Asana, Pranayama, Prathyahana, Dharana, Dhyana Samadhi, Suryanamaskara-Introduction, Objectives, Twelve stepped solution to Sun God, Vajrasana, Pascimottanasana, Bujangasana, Salabhasana, Sarvangasana and Halasana and their Benefits.

UNIT IV: MEDITATION

Meaning of Meditation, types of Meditation, Role of Meditation in Relaxation, Kriyas, Kapalabhati, Neti, Dhouti and their Benefits-Mudras-Facts about Mudras-Anjali Mudra, Aswini Mudra, Yoga Mudra and their Benefits.

UNIT V: EFFECT OF YOGA ON DIFFERENT SYSTEMS

Effects of Yogic practices on different systems- Digestive System, Circulatory System, Respiratory System, Endocrine System, Nervous System.

REFERENCE:

1. Swamy Kuvalayanand - **Asanans**
2. Swamy Kuvalayanand - **Pranayama**
3. B.K.S Lyendar - **Light on yoga**
4. Sri Yogendra Yoga Institute -**Yoga Personal Hygiene**
5. S.N. Das Guptha - **Yoga In Relation to other Systems of Indian thought.**
6. M.P. Pandit - **Kundalini Yoga**

7. Jaimini - **The Science of Yoga**
8. Harihara Nanda Arayan - **Yoga Sutra of Patanjali**
9. Kaivalyadhra - **Hath yoga Pradipika**
10 .M.M.Gore - **Anatomy and Physiology Yogic Practice**

11. Vivekananda Kendra Prakashan Trust-**Yoga-An instruction Booklet**
12. Rajendar Menen - **The Healing Power of mudras**

Part-B, Practical course

Semester - II

MPEP- 205: Track and Field - Running Events, Track marking (compulsory)

Any one of the following i.e. Gymnastics/ Swimming / Yoga/Roller Skating .

Running

Fundamental techniques –Short and Middle distance.

Use of Starting blocks- stance on the blocks.

Running ABC, Body position at the start- starting technique, change in body position during running, movements of the arms, stride length and frequency, position of torso while running and at finish. Drills.

Advanced techniques various techniques of sprint start: Bullet, Medium and Elongated, Laying out of Standard Track with staggers

Track marking: Methods of Marking the standard track and their measurements and equipments

Gymnastics: Floor Exercise, Pyramids, Parallel bars and Balancing beam.

Swimming Float, Free style, and Breast stroke.

Yoga: Yoga postures in standing, sitting, prone, supine and balancing Asanas.

Roller Skating: Skating with Quadra skates and Skating with Inline Skates in indoor and on road.

MPEP- 206: Laboratory Practical in Physiology of Exercise and Sports Bio mechanics and Kinesiology

Student has to learn at least two practical in Exercise Physiology and Sports Biomechanics and Kinesiology in the laboratory and prepare work book on practical.

MPEP-207: Any two of the following activities:

Aerobics/Taekwondo/ Shooting/Archery.

Student has to learn at least two activities from the above and exhibit proficiency in examination.

MPEP- 208: Adventure Activities (Trucking, rock climbing and cycling) / Mass demonstration Activities (Bharathiyam, Pyramids, Calisthenics and light apparatus)

Student has to learn any one of the activity from the above and exhibit demonstration and show proficiency during examination.

Master of Physical Education & Sports Sciences

Semester-III

SYLLABUS

Theory and Practicum

Semester III

MPE-301: SCIENTIFIC PRINCIPLES OF SPORTS TRAINING

(Core Paper)

UNIT-I: INTRODUCTION

Sports training: Definition – Aims, Characteristics, Principles of Sports Training. Load: Definition, Components of load. Over Load: Definition, Causes of Over Load, Symptoms of Overload, and Remedial Measures for over load – Super Compensation. Recovery. Detraining and Retraining.

UNIT-II: COMPONENTS OF PHYSICAL FITNESS

Strength: Meaning, types - Isometric, Isotonic and Isokinetic exercises – Factors determining strength – Methods to improve strength. Speed: Meaning – types - Factors determining speed – Methods to improve speed. Endurance: Meaning – types - Factors determining endurance – Methods to improve Endurance.

UNIT-III : FLEXIBILITY AND COORDINATION

Flexibility: Meaning – types - Factors determining flexibility – Methods to improve flexibility. Coordination: Meaning, types - Factors determining coordination – Methods to improve coordination.

UNIT-IV: METHODS OF SPORTS TRAINING

Aerobic training, Anaerobic training, Resistance training, Fartlek Training, Interval training, Plyometric training, Pressure training, High Altitude training, Functional training, Repetition method of training, and Transfer of training effects.

UNIT-V: PERIODIZATION

Training Plan: Micro, Meso and Macro Cycles. Short Term Plan and Long Term Plans Periodization: Meaning, Single, Double and Multiple Periodization, Phases of Periodization, Preparatory Period, Competition Period and Transition Period. Top form, Tapering performance. Training schedules.

REFERENCES:

1. Beotra Alka, (2000), Drug Education Handbook on Drug Abuse in Sports. Delhi: Sports Authority of India.
2. Bunn, J.N. (1998) Scientific Principles of Coaching, New Jersey Engle Wood Cliffs, Prentice Hall Inc.
3. Cart, E. Klafs &Daniel, D. Arnheim (1999) Modern Principles of Athletic Training St. Louis C. V. Mosphy Company
4. Sreenivasan & K.R.S Reddy(2013) Sciences of Sports Training, Swatik Publications, New Delhi
5. Daniel, D. Arnheim (1991) Principles of Athletic Traning, St. Luis, Mosby Year Book
6. David R. Mottram (1996) Drugs in Sport, School of Pharmacy, Liverpool: John Moore University
7. Gary, T. Moran (1997) – Cross Training for Sports, Canada : Human Kinetics
8. Hardayal Singh (1991) Science of Sports Training, New Delhi, DVS Publications
9. Jensen, C.R. & Fisher A.G. (2000) Scientific Basic of Athletic Conditioning, Philadelphia
10. Ronald, P. Pfeiffer (1998) Concepts of Athletics Training 2nd Edition, London: Jones and
11. Bartlett Publications
12. Yograj Thani (2003), Sports Training, Delhi : Sports Publications
13. Michael; J.Alter(1988) , Sciences of stretching Human Kinetics.
14. Fox, Bruisesr and Foss,The Physiology basis of Physical Education and Athletics, 4th Edition.
15. Larry G. Shaver : Essentials of Exercise Physiology.
16. Stwven J. Flack & WIllam J. Kraemer (1997), Designing resistance training programmeHuman Kinetics.

MPE-302: SPORTS MEDICINE, ATHLETIC CARE AND REHABILITATION

(Core Paper)

UNIT-I: INTRODUCTION

Meaning, definition and importance of Sports Medicine, Definition and Principles of therapeutic exercises. Injuries: acute, sub-acute, and chronic. Advantages and Disadvantages of PRICE, PRINCE (Protection, Rest, Ice, NSAIDS (Non-Steroidal anti-inflammatory drugs), Compression & Elevation) therapy, Aquatic therapy.

UNIT-II: POSTURE

Posture, Values of Good posture, Causes of Bad posture, Normal curve of the spine and its utility, Deviations in posture: Kyphosis, lordosis, flat back, Scoliosis, round shoulders, Knock Knees, Bow legs, Flat foot. Causes for deviations and treatment including exercises. Posture test, Gait and types.

UNIT-III: REHABILITATION EXERCISES

Passive, Active, Assisted, Resisted exercise for Rehabilitation, Stretching, PNF techniques and principles. Gait training, Swiss ball exercises.

UNIT-IV: MASSAGE

Brief history of massage – Massage as an aid for relaxation, Principles of massage, Physiological , Chemical, Psychological effects of massage, Contra indications of Massage, Classification of Massage , Stroking manipulation: Effleurage , Pressure manipulation: Petri sage Kneading (Finger, Kneading, Circular) ironing Skin Rolling, Percussion manipulation: Tapotement, Hacking, Clapping, Beating, Pounding, Slapping, Cupping, Poking, Shaking Manipulation: Vibration and shaking.

UNIT-V: SPORTS INJURIES CARE, TREATMENT AND SUPPORT

Principles pertaining to the prevention of Sports injuries – care and treatment of exposed and unexposed injuries in sports, Therapeutics modalities: Cryo, thermo, Hydro, Electro Therapy. Taping and Bandages, supporting, Aiding techniques for equipment for upper extremities and Lower extremities and spine.

Note: Each student shall submit Physiotherapy record of attending the Clinic and observing the cases of athletic injuries and their treatment procedure.(To be assessed internally)

REFERENCES:

1. Dohenty. J. Meno.Wetb, Moder D (2000) Track & Field, Englewood Cliffs, Prentice Hal Inc.
2. Lace, M. V. (1951) Massage and Medical Gymnastics, London: J & A Churchill Ltd.
3. Mc Ooyand Young (1954) Tests and Measurement, New York: Appleton Century.
4. Naro, C. L. (1967) Manual of Massage and, Movement, London: Febra and Febra Ltd.
5. Rathbome, J.l. (1965) Corrective Physical education, London: W.B. Saunders & Co.
6. Stafford and Kelly, (1968) Preventive and Corrective Physical Education, New York.

(Internal Elective)

UNIT-I: INTRODUCTION

Meaning, Definition, History, Need and Importance of Sports Psychology. Present Status of Sports Psychology in India. Motor Learning: Basic Considerations in Motor Learning, Motor Perception, Factors Affecting Perception–Perceptual Mechanism. Personality: Meaning, Definition, Structure, Measuring Personality Traits. Effects of Personality on Sports Performance.

UNIT-II: MOTIVATION, EMOTION

Meaning and Definition, Types of Motivation: Intrinsic, Extrinsic. Achievement Motivation: Meaning, Goal Setting. Anxiety: Meaning and Definition, Nature, Types, Causes, Method of Measuring Anxiety. Competitive Anxiety and Sports Performance. Stress: Meaning, Definition, Causes of Stress and Sports Performance. Aggression: Meaning, Definition and Types of Aggression, Aggression and Sports Performance. Relaxation: Meaning, Definition and Types of relaxation. Methods of measuring, Motivation, Anxiety, Stress and Aggression.

UNIT-III: PSYCHOLOGICAL TEST

Types of Psychological Test: Instrument based tests: Reaction timer, Finger dexterity board, Depth perception box, Kinesthesiometer board. Questionnaire: Sports Achievement Motivation tests, Sports Anxiety test, Sports aggression tests, stress test.

UNIT-IV: SPORTS SOCIOLOGY

Meaning and Definition – Sports and Socialization of Individual. Sports as Social Institution, National Integration through Sports. Fans and Spectators: Meaning and definition, Advantages and disadvantages on Sports Performance. Violence in Sports.

UNIT-V: GROUP COHESION

Group: Definition and Meaning, Groups on Composition, Group Cohesion, Group Interaction, Group Dynamics, Competition and cooperation. Current Problems in Sports and Future Directions, Sports Social Crisis Management, Women in Sports: Sports Women in our Society, Gender inequalities in Sports.

Practicum at least five experiments related to the topics listed in the above Units should be conducted by the students in laboratory internally.

References:

1. Authors Guide (2013), National Library of Educational and Psychological Test (NLEPT) Catalogue of Tests, New Delhi: National Council of Educational Research and Training Publication.
2. Authors Guide (2013), National Library of Educational and Psychological Test (NLEPT) Catalogue of Test, New Delhi: National Council of Educational Research and Training Publication.
3. Jain. (2002), Sports Sociology, Heal Sahety Kendre Publishers.
4. Jay Coakley. (2001), Sports in Society –Issues and Controversies in International Education, Mc-Graw 7thEd.
5. John D Lauther (2000), Psychology of Coaching. Ner Jersy: Prenticce Hall Inc.
6. John D. Lauther (1998), Sports Psychology. Englewood, Prentice Hall Inc.
7. Miroslaw Vauks & Bryant Cratty (1999),Psychology and the Superior Athlete. London: The Macmillan Co.
8. Richard, J. Crisp. (2000), Essential Social Psychology. Sage Publications.
9. Robert N. Singer (2001), Motor Learning and Human Performance. New York: The Macmillan Co.
10. Robert N. Singer. (1989), The Psychology Domain Movement Behaviour. Philadelphia: Lea and Febiger.
11. Thelma Horn. (2002), Advances in Sports Psychology. Human Kinetics.
12. Whiting, K, Karman.,. Hendry L.B & Jones M.G. (1999), Personality and Performance in Physical Education and Sports. London: Hendry Kimpton Publishers.
13. Marten, Rainer ; Social Psychology and Physical achieving.

UNIT I: INTRODUCTION

Definition of carbohydrates, protein and fat. Intake Amount of carbohydrates, protein and fats on athletics performance. Recommended intake of carbohydrates, protein and fats. Definition of vitamin and mineral. Best ways to ensure adequate vitamins and mineral intakes. Possible outcomes of excessive intake.

UNIT II: FLUIDS AND ELECTROLYTES

Importance of fluids and electrolytes on sports performance. Hydration: hydration and its variations. Balancing fluid loss and intake- concentration of electrolytes in sweat, plasma and intra cellular fluids- factors effecting on fluid loss and fluid intake. Gastric emptying and fluid delivery to working muscles.

UNIT III : ATHLETE CONDITIONING AND ADAPTATION

Intestinal absorption –fluid related issues- dehydration-heat cramps heat exhaustion-heat stroke-hyponatremia. Hydration strategies - Fluid intake before, Fluid intake during and Fluid intake after exercise. Sports gels

UNIT IV: GASTROINTESTINAL FUNCTIONS AND ENERGY DELIVERY

Gastro intestinal tract GI- mouth and esophagus- stomach-small intestine- large intestine- factors influencing on food consumption. Factors influencing on digestion and absorption of nutrients. Gastro intestinal recommendations for athletes. Sports beverages.

UNIT V: NUTRIENTS AND FLUIDS TIMINGS

Intake of nutrients and fluid for performance enhancement. Nutrient timing and immune system- Content and timing of food and fluids- considerations for fluid intake and Considerations for energy intake - Carbohydrates ingestion before exercises - Carbohydrates maintenance during exercise- Carbohydrates replenishment after exercise – Seven day tamper - Carbohydrate loading- one to seven days before competitions. Diet plan for elite athletes. Factors effecting on nutrition needs: Travel – General guidelines eating on the road, minimizing JET LAG. Dietary requirements for female athletes, general recommendations for Female Athletes, General recommendations for Young athletes.

REFERENCE:

1. Dan Benardot (2012), Advanced Sports Nutrition, Human Kinetics, US.
2. Roger Eston et. Al.(2009), Kinanthropometry and Exercise Physiology Laboratory Manual, Tests, procedures and data, Routledge taylor & francis group, London and newyork.
3. David, L Costill. (2004). Physiology of Sports and Exercise. Human Kinetics.
4. Nutrition Encyclopedia, edited by Delores C.S. James, The Gale Group, Inc.
5. JE Park & K. Park (2015), Text book of Preventive and Social Medicine, 23rd edition, Banarsidas Bhanot publishers.

(Internal Elective)

UNIT I: INTRODUCTION

Definition of tool and testing procedure. Importance of testing procedures in Sports sciences. Physical Variable, Physiological variable, Psychological variables, Biochemical variables and Anthropometric variables.

UNIT II: SPORTS TRAINING

Definition of science of sports training, Definition of Heart rate: Tools to measure Heart rate, Bio monitor and its testing procedure, Pulse Oximeter and its testing procedure, Maximum heart rate: Karvonen method of measuring maximum Heart Rate. Definition of acceleration speed- Method of testing acceleration Speed-30mtr flying start; testing procedure of speed; 50 mtr dash. Definition of strength, tools and Testing procedure of strength; Grip strength dynamometer, back strength dynamometer, leg strength dynamometer. Definition of power; Margarine column test. Definition of flexibility, Trunk flexibility- Sit and reach test and its testing procedure. Definition of agility, Simo agility test and its testing procedure.

UNIT III: PHYSIOLOGY OF EXERCISE

Definition of blood pressure, systolic and diastolic blood pressure, sphygmomanometer and bio monitor and their testing procedures. Measuring Heart rate by radial artery, brachial artery, carotid artery, temporal artery and their testing procedures. Body temperature-Thermometer and digital thermo meter and their testing procedures. Lactic acid concentration and its testing procedures; Definition of Respiratory rate and measuring resting Respiratory rate, Measurement of vital capacity, Peak expiratory flow rate, Lung volume, forced vital capacity, forced expiratory volume, Determination of Breath holding time. cardiac out, stroke volume and their testing procedures, Cardio Pulmonary Resuscitation (CPR) and its procedures-manual method (holgar-nielson (BPAL) method, Mouth to mouth respiration, mechanical respirators.

UNIT IV: ANTHROPOMETRY

Height measurement- Stadiometer, Measuring Body Weight – weighing machine and Hydrostatic weighing (Hydro densitometry) and their testing procedures. Definition of body composition- Assessment of body Fat: Skin fold caliper and its testing procedure – Karada Scan body composition monitor and its testing procedure. Estimation of muscle mass and fat.

UNIT V: SPORTS PSYCHOLOGY

Problem solving Test (Pyramid) – Habit interference test – Eye and Hand coordination test (Transfer of learning) – Image Learning (Slot) – Span of Attention – Pass along test (Alexander)(Intelligence Test) – Steadiness Test – Color deficiency test – Raven progressive matrices (R.P.M Test)

Reference:

1. Dan Benardot (2012), Advanced Sports Nutrition, Second Edition Human Kinetics, US.
2. Roger Eston et. Al.(2009), Kinanthropometry and Exercise Physiology Laboratory Manual, Tests, procedures and data, Third Edition , Routledge taylor & francis group, London and newyork.
3. C.L Ghai (2013), A Text book of Practical Physiology, Eighth Edition,Jaypee Brothers Medical Publishers (P) ltd., New Delhi.
4. K. Rama Subba Reddy (2021), Physiology of Exercise, Swasthik publication, New Delhi.
5. Kansal D.K (1996), "Test and Measurement in Sports and Physical Education", New Delhi:DVS Publications
6. Wilmore JH and Costill DL(2005) Physiology of sport and Exercise:3rd Edition. Champaign IL:Human Kinetics

MPEOE-304: FITNESS AND WELLNESS

(OPEN ELECTIVE)

UNIT-I: PHYSICAL FITNESS

Meaning and Definition of Fitness-Competitive Fitness-Health related Fitness-Facts about Physical Fitness -Physical Fitness Components-Speed-Strength- Endurance - Flexibility-Methods of developing Fitness - Resistance Training - Fartlek Training - Skipping - Hiking and Back Packing-Swimming - Walking - Facts to be consider before beginning physical activity-Importance of Physical Fitness in Life- FIT Formula- Six Pack- Training Schedule to develop six pack.

UNIT-II: HEALTH AND WELLNESS

Definition of Health and Wellness- Facts about Health and Wellness-Brief introduction on Emotional Health- Emotional Wellness- Physical Health-Physical Wellness-Healthy Life- Facts about Healthy life style - **HELP Philosophy**.

UNIT-III : HYPO-KINETISM AND AGEING

Meaning of Hypo-Kinetism and its impact on health - Ageing and Physiological Changes-Body Composition-Body weight Loss-Principles of Body Weight Loss-Devine formula to Predict Body Weight-BMI and its Classification-Obesity-Hypertension-Diabetes Mellitus-Exercise to Control Obesity Hypertension-Diabetes Mellitus.

UNIT-IV: NUTRITION

Definition of Nutrition-Constituents of Nutrition-Carbohydrates-Proteins Fat -Vitamins-Nutritional Supplements-Importance of Nutrition in Life.

UNIT-V: STRESS AND TRAINING

Stress-meaning and types of stress, Physical and mental stress-Harmful effects of overtraining and excessive exercise on health, -mental stress and painful effects of mental stress on health. Anxiety, Depression, insomnia, Compulsive obsessive behaviors, Stress relief through exercise and stress management protocols.

REFERENCE

1. Dan Benardot- Advanced Sports Nutrition.
2. Charles B.Corbin /Ruth Lindsey/Greg Welk - Concepts of Fitness and Wellness.
3. Jack H.Wilmore/David L.Costill - Physiology of Sports and Exercise.
4. Haradayal Singh - Science of Sports Training.
5. Daryl Siedentop -- Introduction to Physical Education, Fitness and Sports.
6. Midland College Kinesiology Department - Your Fitness and Wellness guide
7. Bengt.o.Eriksson and Others - - Sports Medicine-Health & Medication.
8. P.K.Pande & S.K. Gangopandhyay - Health Education for School Children
9. Dr.S.K.Mangal - Health and Physical Education
10. **Dr. kovvuru Rama Subba Reddy (2020),** Text book of Wellness and Fitness, Swastik publications, New Delhi, India.

Semester - III

MPEP- 305: Track and Field - Jumping Events and Hurdle Events, Field marking (compulsory)Field Test for Fitness & Skills

Jumping

Fundamental techniques –Broad jump, High jump, Triple jump and Pole vault Advanced techniques in jumps and Drills. Laying out of Jumping Sectors

Hurdles

Fundamental techniques of jumping over hurdle, advanced techniques and drills

Field Marking: Method of Marking Throwing events sectors, Jumping events sectors and their measurements and equipments.

Field Test for Fitness and Skills

Student has to learn testing procedures to test any two fitness variables and skills related to sports on ground and prepare practical work book on practical done.

MPEP- 306: Laboratory Practical in Sports Psychology and Physiotherapy

Student has to learn at least two practical in Psychology and Physiotherapy in the laboratory and prepare work book on practical done.

MPEP- 307: Game of Specialization – Badminton / Ball badminton/Baseball / Basketball/Cricket/ Football/ Handball /Hockey/ Kabaddi / Kho-Kho / Softball/ Table Tennis / Tennis / Volleyball

A candidate has to learn and perform proficiency and officiating in any two games – other thantwo games opted in the First Semester.

MPEP- 308: Teaching Lesson – Coaching lessons in the Track and Field of this Semester and opted games under game of specialization of MPEP- 305 and 307

Student has to take Coaching lesson on the above of each 45 mins. 4 lessons (3 Internal and 1 External)

Master of Physical Education & Sports Sciences

Semester-IV

SYLLABUS

Theory and Practicum

Semester - IV

MPE-401: INFORMATION & COMMUNICATION TECHNOLOGY (ICT) IN PHYSICAL EDUCATION

(Core Paper)

UNIT-I: Communication & Classroom Interaction

Concept, Elements, Process & Types of Communication, Communication Barriers & Facilitators of communication, Communicative skills of English. Listening, Speaking, Reading & Writing Concept & Importance of ICT, challenges in integrating ICT in Physical Education, Scope of ICT: Teaching Learning Process, Publication Evaluation, Research and Administration.

UNIT-II: FUNDAMENTALS OF COMPUTERS

Characteristics, Types & Applications of Computers, Hardware of Computer: Input, Output & Storage Devices, Software of Computer: Concept & Types, Computer Memory: Concept & Types ,Viruses & its Management, Concept, Types & Functions of Computer Networks, Internet and its Applications, Web Browsers & Search Engines, Legal & Ethical Issues.

UNIT-III: MS OFFICE APPLICATIONS

MS Word: Main Features & its Uses in Physical Education, MS Excel: Main Features & its Applications in Physical Education, MS Access: Creating a Database, Creating a Table, Queries, Forms & Reports on Tables and its Uses in Physical Education, MS Power Point:
Preparation of Slides with Multimedia effects, MS Publisher: Newsletter & Brochure

UNIT-IV: ICT INTEGRATION IN TEACHING LEARNING PROCESS

Approaches to Integrating ICT in Teaching Learning Process, Project Based Learning (PBL), Co-Operative Learning, Collaborative Learning, ICT and Constructivism: A Pedagogical Dimension

UNIT-V: E-LEARNING & WEB BASED LEARNING

E-Learning
Web Based Learning Visual Classroom

References:

1. B. Ram (2006), New Age International Publication, Computer Fundamental, Third Edition. Brain under IDG Book. India (p) Ltd
2. Teach Yourself Office (2000), Fourth Edition- 2001
3. Douglas E. Comer (2005), The Internet Book, Purdue University, West Lafayette inc.
4. Heidi Steel, Low price Edition, Microsoft Office Word 2003- 2004
5. ITL Education Solution Ltd. Introduction to information Technology, Research and Development Wing(2006)
6. Pradeep K. Sinha & Priti; Sinha(2006), Foundations computing BPB Publications .
7. Rebecca Bridges(1999), Power point for window.
8. Sanjay Saxena(2006), Microsoft Office for ever one, Second Edition, Vikas Publication House, Pvt. Ltd.

MPE-402: HEALTH EDUCATION AND SPORTS NUTRITION

(Core Paper)

UNIT-I: HEALTH EDUCATION

Meaning, Definition of Health, Health Education. Concept, Dimensions, and Determinants of Health. Health Instructions, Aims, objectives and Principles of Health Education. Health Service, Health supervision.

UNIT-II: HEALTH PROBLEMS IN INDIA

Communicable: Tuberculosis, Measles, Mumps, Rabbis, Corona, Hepatitis, Ebola, Swine flu, Dengue, Malaria and STD: Gonorrhea, HIV/Aids, and Syphilis. and Non Communicable Diseases: Cancer, Osteoporosis, Hyper tension, Diabetes.

Malnutrition, Adulteration in food, Environmental sanitation,

Personal and Environmental Hygiene in schools

Objective of school health service, Role of health education in schools

Nutritional service, Healthful school environment, first- aid and emergency care. Health Agencies: Red cross, WHO, St.John Ambulance, UNICEF, UNESCO.

UNIT-III: HYGIENE AND HEALTH

Meaning of Hygiene, Types of Hygiene, dental Hygiene, Effects of Alcohol on Health, Effects of Tobacco on Health, Life Style Management, Management of Hypertension, Management of Stress.

UNIT-IV: INTRODUCTION TO SPORTS NUTRITION

Meaning and Definition of Sports Nutrition, Role of nutrition in sports, Basic Nutrition guidelines, Nutrients: Carbohydrate, Protein, Fats, Vitamins, Minerals, Water Dehydration and fluids replacement, Classification of food, organic food, Carbohydrate loading, Hyponatremia, Role of carbohydrates, Fat and protein on Sports Performance.

UNIT-V: NUTRITION AND WEIGHT MANAGEMENT

Concept of BMI (Body mass index), Obesity and its hazard, Dieting versus exercise for weight control, maintaining a Healthy Lifestyle, Weight management program for sporty child, Role of diet and exercise in weight management, Design diet plan and exercise schedule for weight gain and loss.

REFERENCES:

1. Bucher, Charles A. "Administration of Health and Physical Education Programme".
2. Delbert, Oberteuffer, et. al." The School Health Education".
3. Ghosh, B.N. "Treaties of Hygiene and Public Health".
4. Hanlon, John J(2003), "Principles of Public Health Administration".
5. Turner, C.E. "The School Health and Health Education".
6. Moss etd.,. "Health Education" (National Education Association of U.T.A.)
7. Nemir A. 'The School Health Education" (Harber and Brothers, New York).
8. Nutrition Encyclopedia, edited by Delores C.S. James, The Gale Group, Inc.
9. Boyd-Eaton S. et. Al. (1989) The Stone Age Health Programme: Diet and Exercise as Nature Intended.
10. Angus and Robertson.Terras S. (1994) Stress, How Your Diet can Help: The Practical Guide to Positive Health Using Diet, Vitamins, Minerals, Herbs and Amino Acids, Thorons.
11. JE Park & K. Park (2015), Text book of Preventive and Social Medicine, 23rd edition, Banarsidas Bhanot publishers

(FOUNDATION)

UNIT-I: SPORTS TECHNOLOGY

Meaning, definition, Importance of technology in Sports, General Principles and purpose of instrumentation in sports, Technological impacts on sports.

UNIT-II: SCIENCE OF SPORTS MATERIALS

Adhesives- Nano glue, Nano moulding technology, Nano turf. Foot wear production, Factors and applications in sports, constraints. Foams- Polyurethane, Polystyrene, Styrofoam, closed cell and open-cell foams, Neoprene, Foam. Smart Materials: Shape Memory Alloy (SMA), Thermo chromic film, High-density modeling foam.

UNIT-III : SURFACES OF PLAYFIELDS

Modern surfaces for playfields, construction and installation of sports surfaces. Types of materials: synthetic, wood, polyurethane. Artificial turf. Modern technology in the construction of indoor and outdoor facilities. Use of computer and software in Match Analysis and Coaching.

UNIT-IV: MODERN EQUIPMENT

Playing Equipments: Balls ,Types, Materials and Advantages, Bat/Stick/ Racquets: Types, Materials and Advantages. Clothing and shoes: Types, Materials and Advantages. Measuring equipments: Running, Throwing and Jumping Events. Protective equipments: Types, Materials and Advantages. Sports equipment with Nano technology, Advantages.

UNIT-V: TRAINING GADGETS

Basketball: Ball Feeder, Mechanism and Advantages. Cricket: Bowling Machine, Mechanism and Advantages, Tennis: Serving Machine, Mechanism and Advantages, Volleyball: Serving Machine, Mechanism and Advantages. Lighting Facilities: Method of erecting Flood Light and measuring luminous. Video Coverage: Types, Size, Capacity, Place and Position of Camera in Live coverage of sporting events. Use of computer and software in mater analysis and coaching.

NOTE: STUDENTS SHOULD BE ENCOURAGED TO VISIT SPORTS TECHNOLOGY FACTORY/ SPORTS GOODSMANUFACTURERS.

Reference:

1. Charles J.A. Crane, F.A.A. and Furness, J.A.G. (1987), “Selection of Engineering Materials” UK: Butterworth Heiremann.
2. Finn, R.A. and Trojan P.K. (1999) “Engineering Materials and their Applications” UK: Jaico Publisher.
3. John Mongilo, (2001), “Nano Technology 101 “New York: Green wood publishing group.
4. Walia, J.S(1999), Principles and Methods of Education (Paul Publishers, Jalandhar).
5. Kochar, S.K.(1982), Methods and Techniques of Teaching (New Delhi, Jalandhar, Sterling Publishers Pvt. Ltd.)
6. Kozman, Cassidy and Jackson (1952),. Methods in Physical Education (W.B. Saunders Company, Philadelphia and London).

UNIT I – NATURE AND SCOPE

Educational technology: concept, Nature and Scope. Forms of educational technology: teaching technology, instructional technology, and behavioral technology; Transactional usage of educational technology: integrated, complementary, supplementary stand-alone (independent); programmed learning stages; media application stage and computer application stage.

UNIT II – SYSTEMS APPROACH TO PHYSICAL EDUCATION AND COMMUNICATION

Systems Approach to Education and its Components: Goal Setting, Task Analysis, Content Analysis, Context Analysis and Evaluation Strategies; Instructional Strategies and Media for Instruction. Effectiveness of Communication in instructional system; Communication: Modes, Barriers and Process of Communication.

UNIT III- INSTRUCTIONAL DESIGN

Instructional Design: Concept, Views. Process and stages of Development of Instructional Design, Overview of Models of Instructional Design. Instructional Design for Competency Based Teaching: Models for Development of Self Learning Material.

UNIT IV – AUDIO VISUAL MEDIA IN PHYSICAL EDUCATION

Audio-visual media: meaning, importance and various forms Audio/Radio: Broadcast and audio recordings,- strengths and Limitations, criteria for selection of instructional units, script writing, pre-production, post-production process and practices. Audio Conferencing and Interactive Radio Conference. Video/Educational Television: Telecast and Video recordings Strengths and limitations, Use of Television and CCTV in instruction and Training, Video Conferencing, SITE (Satellite Instructional, Television, and Experiment) experiment, countrywide classroom project and Satellite based instructions. Use of animation films for the development of children's imagination.

UNIT V – NEW HORIZONS OF EDUCATIONAL TECHNOLOGY

Recent innovations in the area of ET interactive video - Hypertext, video-texts, optical fiber technology, laser disk, computer conferencing. Procedure and organization of Teleconferencing/Interactive video-experiences of institutions, schools and universities. Recent experiments in the third world countries and pointers for India with reference to Physical education. Recent trends of Educational Technology in Physical Education.

REFERENCE:

1. Amita Bhardwaj(2003), New Media of Educational Planning".Sarup of Sons, New Delhi.
2. Bhatia and Bhatia(1959), The Principles and Methods of Teaching (New Delhi : Doaba House).
3. Communication and Education, D. N. Dasgupta, Pointer Publishers
4. O. P. Dahama, O. P. Bhatnagar, Oxford, IBH Publishing company, New Delhi Education and Communication for development.
5. Madan Lal, Anmol Publications, Essentials of Educational Technology.
6. K. Sampath, A. Pannirselvam and S. Santhanam(1981), Introduction to Educational Technology (New Delhi: Sterling Publishers Pvt. Ltd.).
7. Kochar S.K(1982), Methods and Techniques of Teaching (New Delhi, Jalandhar, Sterling Publishers Pvt. Ltd.).
8. Kozman, Cassidy and Jackson(1952) Methods in Physical Education (W.B. Saunders Company,Philadelphia and London).

(Internal Elective)

UNIT I – INTRODUCTION TO SPORTS MANAGEMENT

Definition, Importance. Basic Principles and Procedures of Sports Management. Functions of Sports Management. Personal Management: Objectives of Personal Management, Personal Policies, Role of Personal Manager in an organization, Personnel recruitment and selection.

UNIT II – PROGRAM MANAGEMENT

Importance of Programme development and the role of management, Factors influencing programme development. Steps in programme development, Competitive Sports Programs, Benefits, Management Guidelines for School, Colleges Sports Programs, Management Problems in instruction programme, Community Based Physical Education and Sports program.

UNIT III – EQUIPMENT AND PUBLIC RELATION

Purchase and supplies of Equipment: Guidelines for selection of Equipment and Supplies, Purchase of equipment and supplies, Equipment Room, Equipment and supply Manager. Guidelines for checking, storing, issuing, care and maintenance of supplies and equipment. Public Relations in Sports: Planning the Public Relation Programme – Principles of Public Relation, Public Relations in School and Communities, Public Relation and the Media.

UNIT IV – CURRICULUM

Meaning and Definition of Curriculum. Principles of Curriculum Construction: Students centered, Activity centered, Community centered, Forward looking principle, Principles of integration, Theories of curriculum development, Conservative (Preservation of Culture), Relevance, flexibility, quality, contextually and plurality. Approaches to Curriculum; Subject centered, Learner centered and Community centered, Curriculum Framework.

UNIT V – CURRICULUM SOURCES

Factors affecting curriculum: Sources of Curriculum materials, text books, Journals, Dictionaries, Thesis, Encyclopedias, Micropaedias, Magazines, Internet.
Integration of Physical Education with other Sports Sciences, Curriculum research: Objectives of Curriculum research, Importance of Curriculum research. Evaluation of Curriculum, Methods of evaluation.

REFERENCE:

1. Aggarwal, J.C (1990), Curriculum Reform in India – World overviews, Doaba World Education Series – 3 Delhi: Doaba House, Book seller and Publisher.
2. Arora, G.L. (1984), Reflections on Curriculum, New Delhi: NCERT.
3. Bonnie, L. (1991),The Management of Sports. St. Louis: Mosby Publishing Company, Park House.
4. Bucher A. Charles, (1993), Management of Physical Education and Sports (10th ed.,) St. Louis: Mobsy Publishing Company.
5. Carl, E, Willgoose. (1982), Curriculum in Physical Education, London: Prentice Hall.
6. Chakraborthy & Samiran. (1998), Sports Management. New Delhi: Sports Publication.
7. Charles, A, Bucher & March, L, Krotee. (1993), Management of Physical Education and Sports. St. Louis: Mosby Publishing Company.
8. Chelladurai, P. (1999), Human Resources Management in Sports and Recreation. Human Kinetics.
9. John, E, Nixon & Ann, E, Jewett. (1964), Physical Education Curriculum, New York: The Ronald Press Company.
10. McKernan, James (2007), Curriculum and Imagination: Process, Theory, Pedagogy and Action Research,. U.K. Routledge
11. NCERT (2000), National Curriculum Framework for School Education, New Delhi: NCERT.
12. NCERT (2005). National Curriculum Framework, New Delhi: NCERT. Williams.
13. J.F. (2003). Principles of Physical Education. Meerut: College Book House.
14. Yadvnider Singh. Sports Management, New Delhi: Lakshay Publication.

MPEIE-404B: PROJECT WORK

(Internal elective)

1. Students shall go outside and conduct tests related to Physical/Physiological/ psychological/Bio chemical variables during intramural/extramural/Inter collegiate/Inter University tournaments or they can visit school and conduct tests on different variables as mentioned above. They have to submit a record with data and attend vivo-voce on the work done by the student.
2. Further the student has to submit the project work report at least 10 days before his/her fourth semester end theory examinations.

Semester - IV

MPEP- 405: Track and Field – Throwing Events , Combined Events

(compulsory) Throwing Events

Fundamental techniques in Shot-put, Discuss, Javelin and Hammer Advanced techniques in throws and Drills. Laying out of Throwing Sectors.

Combined Events

Pentathlon – Order of events, Heptathlon – Order of events, Octathlon- Order of events, Decathlon- Order of events. Rules regarding Track and Field and Officiating.

Fencing: Epee, Saber and Foil , Techniques and tactics rules and regulations of the event

Tug of war: techniques and tactics and rules of the event.

MPEP- 406: Game of Specialization

- A student has to choose any one of the games learned in the previous semesters as a Game of Specialization and exhibit the proficiency, and officiating ability.
- Student has to prepare a detailed Record with the following guidelines and attend for viva-voce.

1. Origin, History and development of game
2. Technical terms related to the game
3. Fundamental Skills
4. Techniques and Tactics
5. Advanced Skills / drills
6. Game strategies / set play
7. Lead up games
8. Training Schedules for six weeks.
9. Skill tests
10. Talent identification
11. Selection criteria
12. Rules of the game, laying of court, advanced gadgets,
13. Officiating and signals
14. Mechanics of officiating
15. Major Tournaments, Trophies and the results
16. Awards and Awardees in the respective game/event.
17. Paper cuttings and latest articles

MPEP- 407: Officiating in Track and Field / Gymnastics / Swimming/Yoga/Roller Skating/Tug ofWar/ Fencing.

Student has to learn the system of officiating in any one of the above events, participate in the intramural or extramural as official and show his abilities during the examinations.

MPEP- 408: Coaching lessons in Game of Specialization (Internship)

Student has to take 4 coaching lessons of each 45 mins duration in his/her game of specialization. (3 internal 1 external).

MASTER OF PHYSICAL EDUCATION
DEGREE EXAMINATIONS – 2022 FIRST
SEMESTER

MPE-101: RESEARCH PROCESS IN PHYSICAL EDUCATION AND SPORTS SCIENCES

(No additional sheet will be supplied)

Time: 3 hours Max. Marks: 75

PART – A

Answer **ANY FIVE** Questions Each
question carries **FIVE (5)** marks

All Answers should be written at **ONE PLACE** continuouslyEach
answer should not exceed **TWO (2)** page

5x5 =25 Marks

1. Qualities of good researcher.
2. Write the meaning and definition of Research.
3. Formulation of Hypothesis.
4. Explain limitation and delimitation.
5. Foot notes and Bibliography.
6. Explain the types of variables.
7. Cluster sampling.
8. Historical criticism.

5x10 = 50 Marks

PART – B

Answer All Questions

Each question carries **TEN (10)** MARKS Each
answer should not exceed **FOUR (4)** pages

9. Explain the nature, characteristics and importance of Research in Physical Education.

(OR)

10. Explain Location of Research problem.

11. Define Questionnaire. Explain the development and administration of Questionnaire.

(OR)

12. Explain the types of research in physical education.

13. Discuss in detail on sampling techniques with suitable examples.

(OR)

14. Explain in detail about the importance of research in physical education.
15. a) Merits and demerits of Interview.
    b) Skimming.

(OR)

16. Explain the steps involved in research report.

17. Write about the method of writing Research Proposal.

(OR)

18. Explain the terms a) Front Material b) Back Material.

MASTER OF PHYSICAL EDUCATION
DEGREE EXAMINATIONS – 2022 FIRST
SEMESTER

MPE-102: PHYSIOLOGY OF EXERCISE

(No additional sheet will be supplied)

Time: 3 hours Max. Marks: 75

PART – A

Answer **ANY FIVE** Questions Each
question carries **FIVE (5)** marks

All Answers should be written at **ONE PLACE** continuously
Each answer should not exceed **TWO (2)** pages

5x5 =25 Marks

1. Write the function of muscles.
2. Fast and slow twitch muscle fibers.
3. Explain cardiac cycle.
4. Minute ventilation.
5. Carbohydrates.
6. Vitamins.
7. Water and electrolytes.
8. Blood doping.

5x10 = 50 Marks

PART – B

Answer All Questions

Each question carries **TEN (10)** MARKS Each
answer should not exceed **FOUR (4)** pages

9. a) Types of muscle contractions.
   b) Cardiovascular responses to exercise.

(OR)

10. Define exercise physiology and explain the importance of exercise physiology in sports performance.

11. A) Methods of measuring fat.
    b) Explain carbohydrate loading.

(OR)

12. What is athlete diet? Explain the diet before, during and after the activity.

13. A) Discus on body composition and aging.
    b) WADA conduct of dope test.

(OR)

14. Explain the sources of energy for aerobic and anaerobic metabolism.
15. a)Explain anabolic and androgenic steroids.
    b) Energy balance and weight control.

(OR)

16. Explain structural and functional classification of muscles with suitable examples.
17. Draw a neat diagram of Heart and explain the structure of the heart.

(OR)

18. Define Cardiac Output and explain the effects of exercise and training on Cardio Vascular System.

MASTER OF PHYSICAL EDUCATION
DEGREE EXAMINATIONS – 2022 FIRST
SEMESTER

MPEF-103A: APPLIED STATISTICS IN PHYSICAL EDUCATION AND SPORTS

(No additional sheet will be supplied)

Time: 3 hours Max. Marks: 75

PART – A

Answer **ANY FIVE** Questions Each
question carries **FIVE (5)** marks

All Answers should be written at **ONE PLACE** continuouslyEach
answer should not exceed **TWO (2)** pages

5x5 =25 Marks

1. Importance of statistics in physical education.
2. Meaning and definition of measures of central tendency.
3. Calculate standard deviation for the given data.
   20, 25, 16, 18, 17, 26.
4. What is quartile deviation?
5. Standard error.
6. Level of confidence.
7. Write the meaning of correlation and explain coefficient of correlation.
8. uses of correlation .

5x10 = 50 Marks

PART – B

Answer All Questions

Each question carries **TEN (10)** MARKS Each
answer should not exceed **FOUR (4)** pages

9. Calculate co-efficient of correlation for the given data by employing product movement method.

X:	30	35	40	32	37	39	42
Y:	40	29	36	38	41	45	40

(OR)

10. Calculate Rank order correlation for the given raw scores.

X:	70	75	76	80	69	85	70	76
Y:	72	69	82	72	82	70	72	81

11. a) What is Chi-square and explain its characteristics.
    b) Calculate‘t’ ratio for the given data.

Group I:	70	75	78	74	80
Group II:	80	81	79	75	76

(OR)

Calculate Chi-square for the given data.

fo:	15	20	35	30
fe:	25	25	25	25

13. a) What is normal curve and explain its principles.
    b) Skewness and Kurtosis.

(OR)

14. What is measures of variability and explain Hull scale.
15. a) Kinds of data.

b) Parametric and non-parametric statistics.

(OR)

16. Calculate mean for given data.

C.I:	10-20	20-30	30-40	40-50	50-60	60-70	70-80
f:	15	14	17	18	16	12	10

17. Explain the advantages and disadvantages of Mean and Median.

(OR)

18. Explain the Quartile Deviation and Standard Deviation.

MASTER OF PHYSICAL EDUCATION
DEGREE EXAMINATIONS – 2022 FIRST
SEMESTER

MPEF-103B: PHILOSOPHICAL AND SOCIOLOGICAL BASIS OF PHYSICALEDUCATION

(No additional sheet will be supplied)

Time: 3 hours Max. Marks: 75

PART – A

Answer **ANY FIVE** Questions Each
question carries **FIVE (5)** marks

All Answers should be written at **ONE PLACE** continuouslyEach
answer should not exceed **TWO (2)** pages

5x5 =25 Marks

1. Objectives of leadership
2. Physical education as an academic discipline, Explain.
3. Scope of Phylosophy
4. Existentialism
5. Sports Sociology
6. Sports participation
7. Cross cultural differences in Sports.
8. Write a note on audience in Sports.

5x10 = 50 Marks

PART – B

Answer All Questions

Each question carries **TEN (10)** MARKS Each
answer should not exceed **FOUR (4)** pages

9. Write Aims, Objectives and Challenges of Leadership?

(Or)

10. Briefly Explain the domain of Physical Education as a discipline.
11. Define phylosophy. Write the scope of philosophy in detail.

(or)

12. Write about Naturalism, idealism and pragmatism.

13. What is Sports? Write a note on sociology and Sports sociology.

(or)

14. Explain nature, scope and need of sports sociology.
15. Physical activity and the social attitudes on infants, children and adolescents.

(or)

16. Write about sports within Educational Institutions?
17. Explain sports professionalization and commercialization.

(or)

18. Define Yoga. Write history and development of Yoga.

MASTER OF PHYSICAL EDUCATIONDEGREE
EXAMINATIONS – 2022 FIRST SEMESTER

MPEIE-104A: FITNESS AND LIFE STYLE MANAGEMENT

(No additional sheet will be supplied)

Time: 3 hours Max. Marks: 75

PART – A

Answer **ANY FIVE** Questions Each
question carries **FIVE (5)** marks

All Answers should be written at **ONE PLACE** continuously
Each answer should not exceed **TWO (2)** pages

5x5 =25 Marks

1. Write the meaning and definition of Fitness.
2. Components of body weight.
3. What is physical and mental stress?
4. Energy Values of different important foods.
5. Obesity and its risk factors.
6. Relationship between Life Style and Health Fitness.
7. Harmful Effects of Overtraining.
8. Cardiovascular Fitness.

5x10 = 50 Marks

PART – B

Answer All Questions

Each question carries **TEN (10)** MARKS Each
answer should not exceed **FOUR (4)** pages

9. Explain different Types of Fitness.

(OR)

10. How will you develop Health Fitness of an individual and Write exercise protocols?

11. Describe the intake of nutrition for normal persons and exercising individuals.

(OR)

12. Describe Vitamins, Minerals and Water.

13. Describe stress relief through exercise and stress management protocols.

(OR)

14. Describe mental stress and painful effects of mental stress on health.
15. What is health behavior? Describe self-efficacy on health behavior.

(OR)

16. Describe facts on childhood obesity and activity.
17. Discuss fluid replacement before, during and after exercise.

(OR)

18. Describe health related fitness components.

MASTER OF PHYSICAL EDUCATION
DEGREE EXAMINATIONS – 2022 FIRST
SEMESTER

MPEIE-104B: ADAPTED PHYSICAL EDUCATION

(No additional sheet will be supplied)

Time: 3 hours Max. Marks: 75

PART – A

Answer **ANY FIVE** Questions Each
question carries **FIVE (5)** marks

All Answers should be written at **ONE PLACE** continuously
Each answer should not exceed **TWO (2)** pages

5x5 =25 Marks

1. Hyperactivity disorder.
2. Autism and its signs.
3. Amputations
4. Types of learning disabilities
5. Class organization
6. Supplementary aids and services of programs
7. Paralympics sports
8. Public relations

5x10 = 50 Marks

PART – B

Answer All Questions

Each question carries **TEN (10)** MARKS Each
answer should not exceed **FOUR (4)** pages

9. Explain the process of identification and causes of specific diseases.

(or)

10. Explain the characteristics of Emotional disturbance.
11. Explain the common types of learning disabilities and their causes.

(Or)

12. Explain the causes and treatment procedure of dwarfism.
13. Explain the strategies of class room organization.

(or)

14. Explain the steps to be taken to maintain transportation.
15. Write the Brief History of Paralympics.

(Or)

16. Describe Eligibility criteria for participating in Paralympics sports.
17. Explain the role of Physical Education in organization and administration.

(or)

18. What are the steps will you take for institutional growth through Organization & Administration?

MASTER OF PHYSICAL EDUCATION
DEGREE EXAMINATIONS – 2022 SECOND SEMESTER

MPE-201: YOGIC SCIENCES

(No additional sheet will be supplied)

Time: 3 hours Max. Marks: 75

PART – A

Answer **ANY FIVE** Questions Each question carries **FIVE (5)** marks

All Answers should be written at **ONE PLACE** continuously
Each answer should not exceed **TWO (2)** pages

5x5 = 25 Marks

1. Meaning and Definition of Yoga.
2. Bhakti Yoga.
3. Benefits of Asanas.
4. Benefits of Kriyas.
5. Importance of Surya Namaskara.
6. Importance of Pranayama.
7. Uses of Meditation.
8. Role of Yoga in Sports.

5x10 = 50 Marks

PART – B

Answer All Questions

Each question carries **TEN (10)** MARKS Each answer should not exceed **FOUR (4)** pages

9. Describe Astanga Yoga.

(OR)

10. Scope and Importance of Yoga.

11. Explain the Importance of Neti, Kapalabhati and Dhauti Kriyas.

(OR)

12. Explain the Importance of Jaladhara, Udyana and Mula Bandhas.

13. Impact of Pranayama on Naadis.

(OR)

14. Effect of Pranayama on Major Chakras.
15. Describe types of Meditation and their Importance.

(OR)

16. Effect of Yoga on Respiratory System.
17. Role of Yoga in Making out a Sports Person.

(OR)

18. Effect of Yoga on Digestive System.

MASTER OF PHYSICAL EDUCATION
DEGREE EXAMINATIONS – 2022 SECOND SEMESTER

MPE-202: SPORTS BIOMECHANICS AND KINESIOLOGY

(No additional sheet will be supplied)

Time: 3 hours Max. Marks: 75

PART – A

Answer **ANY FIVE** Questions Each question carries **FIVE (5)** marks

All Answers should be written at **ONE PLACE** continuously
Each answer should not exceed **TWO (2)** pages

5x5 = 25 Marks

1. Importance of Biomechanics.
2. Center of Gravity.
3. Muscles around Knee Joint.
4. Friction.
5. Projectiles.
6. Aerodynamics.
7. Qualitative Method.
8. Predictive Method.

5x10 = 50 Marks

PART – B

Answer All Questions

Each question carries **TEN (10)** MARKS Each answer should not exceed **FOUR (4)** pages

9. Explain the importance of Kinesiology in Sports.

(OR)

10. Explain the role of Center of Gravity in the improvement of Sports Performance.
11. Draw a neat diagram of Shoulder Joint and Explain the origin, insertion of muscles around Shoulder Joint.

(OR)

12. Draw a neat diagram of Hip Joint and Explain the Muscles around Hip Joint.

13. Explain the Newton Laws of Motion and their importance in Sports.

(OR)

14. Explain the types of Human motions with suitable examples.
15. Define Lever and explain the types of Lever with suitable examples.

(OR)

16. Define Equilibrium and describe the factors effecting on Equilibrium.

17. Explain the mechanism of Video analysis of Sports movements.

(OR)

18. Describe various methods of Movements analysis.

MASTER OF PHYSICAL EDUCATION
DEGREE EXAMINATIONS – 2022 SECOND
SEMESTER

MPEF-203A: TEST, MEASUREMENT AND EVALUATION IN PHYSICAL EDUCATION

(No additional sheet will be supplied)

Time: 3 hours Max. Marks: 75

PART – A

Answer **ANY FIVE** Questions Each
question carries **FIVE (5)** marks

All Answers should be written at **ONE PLACE** continuously
Each answer should not exceed **TWO (2)** pages

5x5 = 25 Marks

1. Meaning and Definition of Test.
2. Importance of Measurement in Physical Education.
3. Meaning and Definition of Physical Fitness.
4. Cooper's 12 minutes run/walk Test.
5. Meaning and Definition of Motor Fitness.
6. Newton Motor Ability Test.
7. French Stalter Short Service Test.
8. Johnson Basketball Test.

5x10 = 50 Marks

PART – B

Answer All Questions

Each question carries **TEN (10)** MARKS Each
answer should not exceed **FOUR (4)** pages

9. Explain the importance of Test, Measurement and Evaluation in Physical Education.

(OR)

10. Explain the Criteria of Test Selection.

11. Explain about AAHPER Test.

(OR)

12. Explain JCR Test.

13. Explain Indian Motor Fitness Test.

(OR)

14. Explain Oregon Motor Fitness Test.
15. Explain the Test for measuring Aerobic Capacity.

(OR)

16. Explain the Test for measuring Anaerobic Capacity.
17. Explain the Skill Test for Volleyball.

(OR)

18. Explain the Dyer Skill Test of Tennis.

MPEF-203B: FITNESS ASSESSMENT AND EXERCISE PRESCRIPTION

(No additional sheet will be supplied)

Time: 3 hours Max. Marks: 75

PART – A

Answer **ANY FIVE** Questions Each
question carries **FIVE (5)** marks

All Answers should be written at **ONE PLACE** continuously
Each answer should not exceed **TWO (2)** pages

5x5 = 25 Marks

1. Heart rate and Blood pressure.
2. Health screening
3. Types of Resistance training.
4. Testing Protocals
5. Basics of Flexibility
6. Assessment of Body composition
7. Obesity
8. Balanced nutrition.

5x10 = 50 Marks

PART – B

Answer All Questions

Each question carries **TEN (10)** MARKS Each
answer should not exceed **FOUR (4)** pages

9. Describe Field tests for assessing aerobic fitness and exercise testing for children.

(or)

10. Testing procedures to measure resting heart rate and blood pressure.
11. Describe Guidelines and procedures for maximal exercise.

(or)

12. Procedure for assessing cardio respiratory fitness and design its exercise program.
13. Explain how to assess Flexibility and design stretching programs.

(or)

14. Define Muscular endurance and explain the assessment of strength and muscular endurance.
15. What is body composition? Explain its assessment, classification and uses of body composition

(or)

16. Describe the field methods for body compositions
17. Define Obesity. Explain its types and write the causes of overweight and underweight.

(or)

18. Design weight loss and weight gain program.

MASTER OF PHYSICAL EDUCATION
DEGREE EXAMINATIONS – 2022 SECOND
SEMESTER

MPEF-203C: COMMUNICATION AND SOFT SKILLS

(No additional sheet will be supplied)

Time: 3 hours Max. Marks: 75

PART – A

Answer **ANY FIVE** Questions Each
question carries **FIVE (5)** marks

All Answers should be written at **ONE PLACE** continuously
Each answer should not exceed **TWO (2)** pages

5x5 = 25 Marks

1. What is question tag and give five examples?
2. What is parts of speech and give five examples?
3. Self introduction
4. Greetings and invitations
5. Explain phrasal verbs and give five examples
6. E-mail writing.
7. Explain stress management
8. Write about interview skills

5x10 = 50 Marks

PART – B

Answer All Questions

Each question carries **TEN (10)** MARKS Each
answer should not exceed **FOUR (4)** pages

9. Describe the basic sentence patterns, articles, prepositions.

(or)

10. Meaning and definition of Tense, explain its types.
11. Meaning and definition of communication, explain the types of communication.

(or)

12. Explain suggestions, complaints, complements and apologies.
13. Elucidate the structure of verbal communications

(or)

14. Define the strategies of Interview skills effectively.
15. For sake of interview make a Resume.

(or)

16. Write a letter to your principal for institutional development.
17. Write a brief note on the process of reading and its sub-skills.

(or)

18. Depict the strategies of Reading and suggestions.

MASTER OF PHYSICAL EDUCATION
DEGREE EXAMINATIONS – 2022 SECOND
SEMESTER

MPEOE-204: BASIC CONCEPTS OF YOGA (Open Elective)

(No additional sheet will be supplied)

Time: 3 hours Max. Marks: 75

PART – A

Answer **ANY FIVE** Questions Each
question carries **FIVE (5)** marks

All Answers should be written at **ONE PLACE** continuously
Each answer should not exceed **TWO (2)** pages

5x5 = 25 Marks

1. Meaning and Definition of Yoga.
2. Bhakti Yoga.
3. Benefits of Asanas.
4. Benefits of Kriyas.
5. Importance of Surya Namaskara.
6. Importance of Pranayama.
7. Uses of Meditation.
8. Role of Yoga in Sports.

5x10 = 50 Marks

PART – B

Answer All Questions

Each question carries **TEN (10)** MARKS Each
answer should not exceed **FOUR (4)** pages

9. Describe about Jnana Yoga.

(OR)

10. Scope and Importance of Yoga.

11. Explain the Importance of Neti , Kapalabhati and Dhauti Kriyas.

(OR)

12. Explain the benefits of Mudras.
13. Impact of Pranayama on Sports Performance.

(OR)

14. Describe about the effects of yogic practices on personality development.
15. Describe types of Meditation and their Importance.

(OR)

16. Effects of Yoga on Respiratory System.
17. Role of Yoga in Making out a Sports Person.

(OR)

18. Effects of Yoga on Digestive System.

MASTER OF PHYSICAL EDUCATION
DEGREE EXAMINATIONS – 2022 THIRD
SEMESTER

MPE-301: SCIENTIFIC PRINCIPLES OF SPORTS TRAINING

(No additional sheet will be supplied)

Time: 3 hours Max. Marks: 75

PART – A

Answer **ANY FIVE** Questions Each
question carries **FIVE (5)** marks

All Answers should be written at **ONE PLACE** continuously
Each answer should not exceed **TWO (2)** pages

5x5 = 25 Marks

1. What are the aims of Sports Training?
2. What are the causes of Overload?
3. Write the method to improve Speed.
4. Write the method to Improve Flexibility.
5. Factors determining Coordination.
6. Resistance Training.
7. Define Training Cycles.
8. Factors determining Endurance.

5x10 = 50 Marks

PART – B

Answer All Questions

Each question carries **TEN (10)** MARKS Each
answer should not exceed **FOUR (4)** pages

9. Explain the Principals of Sports Training.

(OR)

10. Define Load and Explain the Components of Load.

11. Define Strength and explain about the methods to improve strength.
.

(OR)

12. Define Endurance and explain the methods to improve endurance.

13. Define Flexibility and explain the types of Flexibility.

(OR)

14. Define Coordination and explain the types of Coordination.

15. Explain the importance of Aerobic and Anaerobic training in Sports.

(OR)

16. Describe the importance of Resistance and Pressure training in sports.

17. Explain the process of Periodization in Sports.

(OR)

18. Define Overload and explain the symptoms of Overload.

MASTER OF PHYSICAL EDUCATION
DEGREE EXAMINATIONS – 2022 THIRD
SEMESTER

MPE-302: SPORTS MEDICINE, ATHLETIC CARE AND REHABILITATION

(No additional sheet will be supplied)

Time: 3 hours Max. Marks: 75

PART – A

Answer **ANY FIVE** Questions Each
question carries **FIVE (5)** marks

All Answers should be written at **ONE PLACE** continuously
Each answer should not exceed **TWO (2)** pages

5x5 = 25 Marks

1. Meaning and Definition of Sports medicine.
2. What is Aquatic Therapy?
3. What are the causes of Bad Posture?
4. Kyphosis .
5. Causes of deviation in Posture.
6. PNF techniques and their Principles.
7. Principles of massage.
8. Thermotherapy.

5x10 = 50 Marks

PART – B

Answer All Questions

Each question carries **TEN (10)** MARKS Each
answer should not exceed **FOUR (4)** pages

9. Explain the importance of Sports Medicine.

(OR)

10. Define Therapeutic exercises and explain the Principles of Therapeutic exercises.

11. Define Posture and explain Normal curve of the spine and its Utility.

(OR)

12. Define Scoliosis and explain causes for Scoliosis.

13. Define Rehabilitation and explain assisted and resisted exercises for Rehabilitation.

(OR)

14. Explain Physiological and Psychological effects of Massage.

15. Explain various techniques of Pressure manipulation.

(OR)

16. Describe the classification of Massage.

17. What are the Sports Injuries and Explain Preventive Measures in Detail.

(OR)

18. Define PRICE and explain the Advantages and Disadvantages of PRICE..

MASTER OF PHYSICAL EDUCATION
DEGREE EXAMINATIONS – 2022 THIRD
SEMESTER

MPEIE-303A: SPORTS PSYCHOLOGY AND SPORTS SOCIOLOGY

(No additional sheet will be supplied)

Time: 3 hours Max. Marks: 75

PART – A

Answer **ANY FIVE** Questions Each
question carries **FIVE (5)** marks

All Answers should be written at **ONE PLACE** continuously
Each answer should not exceed **TWO (2)** pages

5x5 = 25 Marks

1. Meaning and definition of Sports Psychology.
2. Factors effecting on Perception?
3. Meaning and definition of Personality.
4. Stress and Aggression in sports.
5. Violence in Sports.
6. Meaning and Definition of Sports Sociology.
7. Meaning and Definition of Group Interaction and Group Dynamics.
8. Competition and Cooperation.

5x10 = 50 Marks

PART – B

Answer All Questions

Each question carries **TEN (10)** MARKS Each
answer should not exceed **FOUR (4)** pages

9. Explain the effects of Personality on Sports Performance.

(OR)

10. Explain the present status of Sports Psychology in India.

11. Define Motivation and Explain the Types of Motivation with suitable examples.
.

(OR)

12. Define Anxiety and explain the method of measuring Anxiety.
13. Explain the Reaction timer Psychology Test.

(OR)

14. Explain the Sports Anxiety Test.

15. Explain the influence of fans and spectators on Sports Performances.

(OR)

16. Explain the current problems in Sports and future directions.

17. Explain Women in Sports.

(OR)

18. Explain Social Crisis Management in Sports.

MASTER OF PHYSICAL EDUCATION
DEGREE EXAMINATIONS – 2022 THIRD
SEMESTER

MPEIE-303B: ADVANCED SPORTS NUTRITION (Internal Elective)

(No additional sheet will be supplied)

Time: 3 hours Max. Marks: 75

PART – A

Answer **ANY FIVE** Questions Each
question carries **FIVE (5)** marks

All Answers should be written at **ONE PLACE** continuously
Each answer should not exceed **TWO (2)** pages

5x5 = 25 Marks

1. Carbohydrates.
2. Protein & Fats.
3. Hydration and its variations.
4. Benefits of Electrolytes.
5. Intestinal absorption.
6. Hyponatremia
7. Factors influencing on food consumption.
8. Draw a neat diagram of gastrointestinal tract and name the parts of it.

5x10 = 50 Marks

PART – B

Answer All Questions

Each question carries **TEN (10)** MARKS Each
answer should not exceed **FOUR (4)** pages

9. Define carbohydrates and explain the intake of carbohydrates, protein and fats on athletics performance.

(OR)

10. Describe the recommended intake of Macro nutrients for an elite athlete.
11. Define Electrolytes and write the Importance of fluids and electrolytes on Sports Performance.

(OR)

12. List down the Factors effecting on fluid loss and fluid intake
13. Describe the fluid related issues among sports men.

(OR)

14. Explain fluid intake before, during and after exercise in detail.
15. Explain about Gastrointestinal system.

(OR)

16. What is digestion? Explain the factors influencing on food consumption.
17. Prepare a Diet plan for elite athletes

(OR)

18. Explain Carbohydrate loading in detail.

MASTER OF PHYSICAL EDUCATION
DEGREE EXAMINATIONS – 2022 THIRD
SEMESTER

MPEIE-303C: TOOLS, METHODS AND TESTING PROCEDURES IN SPORTS

SCIENCES (Internal Elective)

(No additional sheet will be supplied)

Time: 3 hours Max. Marks: 75

PART – A

Answer **ANY FIVE** Questions Each
question carries **FIVE (5)** marks

All Answers should be written at **ONE PLACE** continuously
Each answer should not exceed **TWO (2)** pages

5x5 = 25 Marks

1. Define Tool and Testing Procedure.
2. Pulse Oximeter and its testing Procedure.
3. Definition of Heart Rate and Explain the testing procedures.
4. Thermometer
5. Define Blood Pressure.
6. CPR
7. What is the procedure for measuring Blood Pressure?
8. Skinfold caliper

5x10 = 50 Marks

PART – B

Answer All Questions

Each question carries **TEN (10)** MARKS Each
answer should not exceed **FOUR (4)** pages

9. Explain the Importance of testing procedures in Sports Sciences.

(OR)

10. Define Variables and Explain streams of Variables.

11. Define Sports Training and explain any five testing procedures for physiological variables.

(OR)

12. Define Strength; write about its tools and testing procedures.
13. Define lactic acid concentration and explains its testing procedure

(OR)

14. Define Respiratory rate and explain testing procedures of pulmonary variables.

15. Define Anthropometry and explain anthropometric variables.

(OR)

16. Define body composition and explain assessment of body composition and body Fat.
17. Write the Definition of Sports psychology and explain the procedure of Problem solving test.

(OR)

18. Explain the procedure of span of attention tests.

MASTER OF PHYSICAL EDUCATION
DEGREE EXAMINATIONS – 2022 THIRD
SEMESTER

MPEOE-304 FITNESS AND WELLNESS (Open Elective)

(No additional sheet will be supplied)

Time: 3 hours Max. Marks: 75

PART – A

Answer **ANY FIVE** Questions Each
question carries **FIVE (5)** marks

All Answers should be written at **ONE PLACE** continuously
Each answer should not exceed **TWO (2)** pages

5x5 = 25 Marks

1. Meaning and Definition of Competitive Fitness.
2. Speed.
3. Benefits of Swimming.
4. Facts about Healthy Life Style.
5. Importance of Nutrition in Life.
6. Stress and their types.
7. Health and Wellness.
8. Impact of Hypo-Kinetism on Health in Sports.

5x10 = 50 Marks

PART – B

Answer All Questions

Each question carries **TEN (10)** MARKS Each
answer should not exceed **FOUR (4)** pages

9. Explain the Physical Fitness Components.

(OR)

10. Explain the Methods to develop Fitness.

11. Define Health and Wellness and explain about HELP Philosophy.

(OR)

12. Explain the facts about Health and Wellness.

13. Explain the Physiological changes occur due to Hypo-Kinetism .

(OR)

14. Describe the state of Obesity and exercises to control Obesity.
15. Describe the constituents of Nutrition..

(OR)

16. Explain the role of nutrition in sports performance.
17. Describe the effects of over training and excessive exercise on Health.

(OR)

18. Explain the stress relaxation exercises.

MASTER OF PHYSICAL EDUCATION
DEGREE EXAMINATIONS – 2022 FOURTH
SEMESTER

MPE-401: INFORMATION & COMMUNICATION TECHNOLOGY IN PHYSICAL

EDUCATION

(No additional sheet will be supplied)

Time: 3 hours Max. Marks: 75

PART – A

Answer **ANY FIVE** Questions Each
question carries **FIVE (5)** marks

All Answers should be written at **ONE PLACE** continuously
Each answer should not exceed **TWO (2)** pages

5x5 = 25 Marks

1. Types of Communication.
2. Importance of ICT.
3. Hardware of Computer.
4. Uses of Internet.
5. Features of MS Word.
6. Uses of MS Word in Physical Education.
7. Virus in Computer.
8. Web Browsers and Search Engines.

5x10 = 50 Marks

PART – B

Answer All Questions

Each question carries **TEN (10)** MARKS Each
answer should not exceed **FOUR (4)** pages

9. Explain the challenges in integrating ICT in Physical Education.

(OR)

10. Explain the scope of ICT in Physical Education.

11. Define a computer and explain the types and applications of Computer in Sports.
. (OR)

12. Define a Software and explain the types of software in Computer.
13. Describe the Communications Barriers.

(OR)

14. Explain the features and applications of MS Excel in Physical Education.

15. Explain the features and applications of MS PowerPoint in Physical Education.

(OR)

16. Explain the importance of E-Learning.

17. Explain the approaches for integrating ICT in Teaching Learning Process.

(OR)

18. Define a Computer network and explain about preparation of slides by MS Power Point.

MASTER OF PHYSICAL EDUCATION
DEGREE EXAMINATIONS – 2022 FOURTH
SEMESTER

MPE-402: HEALTH EDUCATION AND SPORTS NUTRITION

(No additional sheet will be supplied)

Time: 3 hours Max. Marks: 75

PART – A

Answer **ANY FIVE** Questions Each
question carries **FIVE (5)** marks

All Answers should be written at **ONE PLACE** continuously
Each answer should not exceed **TWO (2)** pages

5x5 = 25 Marks

1. Meaning and Definition of Health.
2. Principles of Health Education.
3. Causes of AIDS?
4. Effects of Tobacco on Health.
5. Role of Carbohydrates on Sports Performance.
6. Types of Hygiene?
7. Meaning and Definition of Sports Nutrition.
8. Concept of BMI.

5x10 = 50 Marks

PART – B

Answer All Questions

Each question carries **TEN (10)** MARKS Each
answer should not exceed **FOUR (4)** pages

9. Explain the aims and Objectives of Health Education.

(OR)

10. Explain the causes and disadvantages of Hypertension in Sports.

11. Define Hygiene write the effects of alcohol on Health..
. (OR)

12. What are the causes of Obesity and its management?
13. Define Sports Nutrition and explain the types of nutrients.

(OR)

14. Define Lipids and role of fats on Sports Performance.

15. Explain the role of diet and exercise in Weight Management.

(OR)

16. Explain the diet design and exercise schedule for Weight Gain and Loss.

17. Define Carbohydrates and explain the process of Carbohydrate Loading in Sports.

(OR)

18. Define Nutrition and explain the guidelines of Nutrition.

MASTER OF PHYSICAL EDUCATION
DEGREE EXAMINATIONS – 2022 FOURTH
SEMESTER

MPEF-403A: SPORTS TECHNOLOGY

(No additional sheet will be supplied)

Time: 3 hours Max. Marks: 75

PART – A

Answer **ANY FIVE** Questions Each
question carries **FIVE (5)** marks

All Answers should be written at **ONE PLACE** continuously
Each answer should not exceed **TWO (2)** pages

5x5 = 25 Marks

1. Meaning and Definition of Technology.
2. Footwear production.
3. Nano moldings technology
4. Construction and Installation of Sports Surfaces.
5. Types of Materials.
6. Uses of Computer in Match analysis.
7. Advantages of Clothing and Shoes.
8. Advantages of Bowling Machine.

5x10 = 50 Marks

PART – B

Answer All Questions

Each question carries **TEN (10)** MARKS Each
answer should not exceed **FOUR (4)** pages

9. Explain about the importance of technology in Sports.

(OR)

10. Explain the impact of Technology on Sports.

11. Explain about modern technology in the construction of indoor and outdoor facilities.
. (OR)

12. Write about the types of protective equipment their advantages in Sports.
13. Explain about the mechanism and advantages of Ball feeder in Basketball.

(OR)

14. Explain the mechanism and advantages of serving machine in Tennis.

15. Explain the video coverage of Sporting Events.

(OR)

16. Explain the measuring equipment of Running, Throwing and Jumping Events.

17. Explain the general principles and purpose of instrumentation in Sports.

(OR)

18. Explain the types of modern surfaces for playfields.

MASTER OF PHYSICAL EDUCATION
DEGREE EXAMINATIONS – 2022 FOURTH
SEMESTER

MPEF-403B: EDUCATION TECHNOLOGY IN PHYSICAL EDUCATION

(No additional sheet will be supplied)

Time: 3 hours Max. Marks: 75

PART – A

Answer **ANY FIVE** Questions Each
question carries **FIVE (5)** marks

All Answers should be written at **ONE PLACE** continuously
Each answer should not exceed **TWO (2)** pages

5x5 = 25 Marks

1. Concept of Educational Technology.
2. Goal Setting.
3. What is Instructional design?
4. Meaning of Audio-Visual Media.
5. Innovations in the area of Educational Technology.
6. Nature and scope of Educational Technology.
7. Importance of Audio.
8. Conference.

5x10 = 50 Marks

PART – B

Answer All Questions

Each question carries **TEN (10)** MARKS

Each answer should not exceed **FOUR (4)** pages

9. Explain about Teaching Technology, Instructional Technology and Behavioral Technology.

(OR)

10. Explain about Media Application Stage and Computer Application Stage.

11. Explain about Instructional Strategies and media for Instructions.

(OR)

12. Explain about Modes, Barriers and Process of Communication.

13. Explain the Concepts, Views and Process of Communication.

(OR)

14. Explain Models for the Development of Self Learning Material.

15. Describe Broadcasting and Audio Recordings..

(OR)

16. Describe Script Writing, Pre-Production and Post-Production Process.
17. Discuss on Uses of Animation Films.

(OR)

18. Explain the Procedure and Organization of Tele Conference ,Video-Experiences of Institution, Schools and Universities.

MASTER OF PHYSICAL EDUCATION
DEGREE EXAMINATIONS – 2022 FOURTH
SEMESTER

MPEIE-404A: SPORTS MANAGEMENT AND CURICULLUM DESIGN IN PHYSICAL

EDUCATION (Internal Elective)

(No additional sheet will be supplied)

Time: 3 hours Max. Marks: 75

PART – A

Answer **ANY FIVE** Questions Each
question carries **FIVE (5)** marks

All Answers should be written at **ONE PLACE** continuously
Each answer should not exceed **TWO (2)** pages

5x5 = 25 Marks

1. Meaning and Definition of Sports Management.
2. Role of personal manager in an organization.
3. Steps involved in the programme development.
4. What are the factors influencing programme development.
5. Guidelines for selection of Equipment.
6. Principles of public relations in schools and communities?
7. Meaning and Definition of Curriculum.
8. Factors effecting curriculum.

5x10 = 50 Marks

PART – B

Answer All Questions

Each question carries **TEN (10)** MARKS Each
answer should not exceed **FOUR (4)** pages

9. Explain the Objectives of Personal Management in an organization.

(OR)

10. Explain the functions of Sports Management.

11. Explain the guidelines for checking, storing, issuing, care and maintenance of Equipment.

(OR)

12. Explain the influence of media on public relation.
13. Explain the principles of curriculum construction in Sports.

(OR)

14. Explain the principles of integration in sports.

15. Explain the theories of curriculum development.

(OR)

16. Explain the approaches to curriculum framework .

17. Define Curriculum and explain the sources of curriculum.

(OR)

18. Define curriculum research and explain the importance of curriculum research in sports.

MASTER OF PHYSICAL EDUCATION

DEGREE EXAMINATIONS – 2022 FOURTH

SEMESTER

MPEIE-404B: PROJECT WORK IN PHYSICAL EDUCATION & SPORTS SCIENCES

Record Submission and viva-voce on the project work.

YOGI VEMANA UNIVERSITY

Department of Physical Education & Sports Sciences

Syllabus for Pre Ph.D. Examination

==========

PAPER-I: **Research and Statistics in Physical Education and Sports Sciences**

Name of the Research Supervisor : **Dr. K. Rama Subba Reddy.**

UNIT-I:

Meaning, Definition, Nature, Scope and Importance of research in Physical Education.

Classification of research: Basic, Applied and Action Research. Qualities of a good researcher, Data and its types.

UNITE- II:

Location of research problem, Criteria for selection of a Research problem. Research proposal, introduction, Review of related literature, Hypothesis, limitations, Delimitations, significance of the study. Foot note and Bibliography.

UNITE-III

Methods of Research: Descriptive Research- survey and case study. Historical research. Experimental Research: Meaning Nature and Importance. Experimental Design and its types. Degree of freedom, Errors: Type I and Type II errors.

UNITE- IV

Meaning and Definition of Sample- Types of sampling: Probability methods Simple random sampling, stratified sampling, systematic random sampling and Cluster sampling. Nonprobability Sample: Convenience sampling, judgement sampling and Quota sampling. matched or equated sample size of sample. Style of writing research report, Mechanics of writing research report, Measures of Central Tendency: Mean, Median and Mode. Measures of Variability: Range, Mean deviation, Quartile deviation, Standard deviation.

UNITE-V

Graphical representation: Bar Diagram, Histogram, Ogive curve Characteristics of normal curve- Corelation: Rank Order Corelation and Pearson Product movement Corelation. Test of Significance: T- test, ANOVA, ANACOVA, Chi- square, Level of confidence. Post hoctest.

Refferences:

1. Clarke David. H & Clarke H. Harrison (1984), research process in physical education, New Jersey, Prentice Hall Inc.
2. Craig Williams and Chris Wragg (2006), data Analysis and research for sports and exercise sciences, London, Routledge press.
3. Sreenivasan & KRS Reddy (2003), research methods in physical education, Swastik

publication, New Delhi.
4. Kamlesh M. L. (1999), Research Methodology in physical education and sports, New Delhi.
5. Moses A.K. (1995), theses writing format, Chennai, poompugar pathippagam.
6. Best J. W (1971), Research in Education, New Jersey, Prentice Hall, Inc
7. Clark D. H. (1999), Research Problem in Physical Education, 2nd edition, Eaglewood Cliffs, Prentice Hall, Inc.
8. Kamlesh M. L. (1999), Research Methodology in Physical Education and Sports, New Delhi.
9. Sivaramakrishnan. S. (2006), Statistics for Physical Education, Friends publication, Delhi.

Department of Physical Education & Sports Sciences Model Question paper for Pre Ph.D.-Examination - 2022PAPER-I

Research and Statistics in Physical Education and Sports Sciences

[Time: 3 Hrs] [Max. Marks: 100]

Answer any Five of the following question

All questions carry equal marks

5x 20= 100

1. Meaning, Definition of Research and explain need and importance of research in physical education and sports sciences.

Or

2. List down the qualities of a good researcher
3. Describe the criteria in the selection of research problem

Or

4. Prepare a research proposal on research problem of your choice
5. What is Historical research? Explain internal and external criticism

Or

6. What is design? Explain any three designs with suitable examples in physical education and sports sciences

7. Calculate Measures of Central Tendency for the given data

C.I	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
F	2	5	13	20	15	6	1	3	5

(Or)

8. Calculate Measures of Variability Quartile deviation and Standard deviation for given data

C.I	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79
F	8	10	11	15	16	12	8	6

9. Calculate 'T' Ratio for the given data

X	15	20	25	22	30
Y	30	32	34	38	26

(Or)

10. Calculate 'F' ratio for the given data

X	10	20	15	25	20
Y	35	20	30	10	25
Z	15	10	30	20	35

PANEL OF EXAMINERS for M.P.Ed. Course

(Theory, Practical and Question Paper Setting)

w.e.f 2021-2022

1. Dr. P.C. Krishna Swamy Professor University College of Phy. Edn. Bangalore University BANGALORE Ph.: 0 - 9449958295	2. Dr. S. Chan Basha Assistant Director (Rtd.) Dept. of Phy. Edn&sports Sci Yogi Vemana University KADAPA Ph. : 9676880786	3. Dr. K.V. Rajasekhar Head Department of Phy. Education University of Hyderabad HYDERABAD Ph.: 99495 13504
4. Dr. P. Johnson Principal University College of Phy. Edn. Acharya Nagarjuna University GUNTUR Ph. : 9440221334	5. Dr. D. Krishna Murthy Director Incharge (Rtd.) Dept. of Physical Education S.V. University TIRUPATI Ph.: 94414 08123	6. Dr. S.M. Prakash Director and Head (Rtd) Department of Phy.l Education Kuvempu University SHIMOGGA, Karnataka Ph. : 0-94482 60114
7. Dr. K. Rama Subba Reddy Head & Secretary, Sports Board Dept. of Phy. Edn. & Sports Sci. Yogi Vemana University KADAPA Ph. : 94403 06035	8. Dr. P.P.S. Paul Kumar Director Incharge Vice-Principal, UCPESS Acharya Nagarjuna University Nagarjuna Nagar, GUNTUR Ph.: 98493 76146	9. Dr. M.V. Sreenivasan Co-ordinator M.P.Ed., Course S.K.University Ananthapuram Ph. 9440287878 mvsnivas@gmail.com
10. Prof. M. Sivasankar Reddy Director Department of Physical Edn. S.V. University TIRUPATI Ph.: 94412 96125	11. Dr. A. Pallavi Assistant Professor Dept. of Phy.Edn.&Sports Sci. Andhra University VISAKAPATNAM Ph. 9666545735	12. Dr. G. Syam Kumar Associate Professor Department of Phy. Education JNT U Kakinada. KAKINADA Ph.: 7702594555
13. Prof. Syed Kareemulla (Rtd) Advisor and Secretary, Sports Board, Dept. of Physical Education Dravidian University KUPPAM, Chittoor (Dst.) Ph. : 94404 29205	14. Dr. N. Srinivasa Rao Asst. Professor Department of Phy. Education Govt.Degree College Avanigadda, Krishna Dist Ph.: 9490794025 dr.nallurisreenivasrao@gmail.com	15. Sri B. Joji Reddy Associate Professor Department of Phy. Education JNT U Anantapur ANANTAPUR Ph.: 9959030144
16. Dr. Y. Gopi Krishna (Rtd) Professor Dept. of Physical Education JNTU.H.College of Engineering SULTANPUR (Vil.) Sangareddy (Dst),TS Ph. : 98494 78230	17. Prof. N. Vijaya Mohan Head Dept.of Phy. Edn.&Sports Sci. Andhra University Visakhapatnam -530 003 Ph.: 9703831117	18. Dr. Sai Kumar Principal Maruthi College of Phy. Edn. Ramakrishna Mission Vidhyalaya COIMBATTORE Tamil Nadu Ph.9443294170
19. Dr. N.S. Dilip Professor Dept. of Physical Education J.N.T. U.H Kukatpalli HYDERABAD, Telangana State Ph. : 98493 59474	20.Prof. Elaya Raja Dept. of Physical Education Central University Pondichery Ph. 91-9488979000 E.id: elaya.cricket@gmail.com	21. Dr. Kalidasan Professor & Head Dept. of Phy. Education &Yoga Bharatidasan University Chirunapath, Coimbatore,TN Ph.: 91-9442525773 kalidasanbdu@gmail.com
22. Prof. A. Prathap Reddy (Rtd.) ANGR Agricultural University S.V. Agricultural College TIRUPATI Ph.: 7893216959	23. Prof. V. Gopinath Dept. of Phy. Edn &Sports Sci. Annamalai University Annamalai Nagar Chidambaram, Tamil Nadu Ph. 09443184750	24. Dr. Madialagan Reader & Director of Sports Dept. of Physical Education Sports Pavilion Mysore University MYSORE Ph.: 91-9449040903

25. Dr. A. Kaleemulla Deputy Director Dept. of Physical Education Maulana Azad National Urdu University, HYDERABAD. Ph: 9177475299	26. Dr. Rajesh Kumar Professor University Coll of Phy. Edn. Osmania University HYDERABAD Ph.: 92465 29013	27. Dr. Sara Sarojini Professor& Head Dept. of Physical Education S P Mahila Viswa Vidhyalayam TIRUPATI Ph.: 8897907806
28. Dr. A. Pasodi Principal University College of Phy. Edn. Gulbarga University GULBARGA Ph.: 0-9448140078	29. Dr. Ramakrishna Yoga Trainer SVYASA BANGALORE Ph.: 9490821950	30. Dr. T. Prabhakar Reddy Director of Physical education Kakatiya Medical College Hanumakonda Warangal Ph. 9848831131 drprabhakarreddypdkmc@gmail.com
31. Dr. Ramesh Reddy Assistant Professor Kakatiya Institute of Technology WARANGAL Ph.:	32. Dr. B.K. Deepika Assistant Professor NTR College of Vet. Science GANNAVARAM Krishna District Ph.: 8121447701	33. Dr. Palani Swamy Professor Dept. of Phy.Edn Bharathidasan University Thiruchirapalli, TN Ph. 9842053777
34. Dr. K. Rami Reddy Principal (Rtd) Government College of Phy.Edn. Domalguda HYDERABAD Ph.: 9010292258	35. Dr. G. Hari Priya Assistant Professor College of Veterinary Science S.V. Veterinary University PRODDATTUR Ph.: 9492313304	36. Dr. P. Murthaiah Sr. Lecturer in Physical Education Sri Bala Siva Yogendra Maharaj Degree College, KURNOOL Ph.: 9440759262 murthypasam@gmail.com
37. Dr. B. Ramasubba Reddy Senior Lecturer Rayalaseema College of Phy. Edn. PRODDATUR, YSR dist Ph.: 9491515159	38. Dr. S. Ranganatha Reddy Yoga Trainer Mythra Yoga Centre KADAPA Ph.: 9440074773	39. Dr. P. Sathyanarayana Reddy Lecturer in Physical Education Govt. Degree College for Men Srikalahasti, Tirupati Ph.: 94411 51599
40. Dr. S. Ravi Sankar Principal Rayalaseema College of Phy. Edn. PRODDATUR, YSR Dist Ph.: 9493904343	41. Dr. Kalpana Yoga Trainer Mythra Yoga Centre KADAPA Ph.: 7013238986	42. Dr. A. Sankar Reddy Senior Lecturer Rayalaseema College of Phy. Edn. PRODDATUR,YSR dist, Ph.: 9866867063
43. Dr. P. Bhaskara Reddy Senior Lecturer Rayalaseema College of Phy. Edn. PRODDATUR,YSR dist. Ph.: 9949042088	44. Smt. Radika Yoga Co-Ordinator Department of Yoga College of Physical Education Acharya Nagarjuna University Guntur – 522510, A.P. Ph.: 7396458123	45. Prof. Rajasekhar Professor Dept. of Physical Education Annamalai University Annamalai Nagar CHIDAMBARAM Ph.:
46. Dr. B. Veera Kumar Reddy Senior Lecturer Rayalaseema College of Phy. Edn. PRODDATUR, YSR dist. Ph.: 7386555858	47. Dr. I Devi Vara Prasad Coordinator, DPESS Acharya Nagarjuna University Ongole Campus, Ongole Ph.9885799506 idvprasadjyothsna@gmail.com	48. Dr. M. Ramajayam Assistant Professor Ramajaym1985@gmail.com Ph. 7639467490

49. Dr. Madhusudhan Babu Senior Lecturer Rayalaseema College of Phy. Edn. PRODDATUR Ph.: 9491515157	50.Prof. P. Ravi Kumar Professor Dept. of Phy. Education National Institute of Tech. WARANGAL Ph.: 98496 39229	

MEMBERS **SIGNATURE**

Dr. K. Rama Subba Reddy - Chairman, BOS, Physical Education & Sports Sciences

Dr. P. Johnson - External Member

Dr. M.V. Srinivasan - External member

Mr. M. Venkata Siva Reddy - External Member, Institutions related to the department

Mr. R. Vignesh **-** Member, P.G. Meritorious student

Dr. K. Rama Subba Reddy - Convener

w.e.f 2021-2022

1. Prof. Y. Khishore Professor (Rtd.) UCPESS Acharya Nagarjuna University Nagarjuna Nagar, GUNTUR Ph. : 94411 44447	2. Dr. P. Johnson Principal University College of Physical Edn. Acharya Nagarjuna University GUNTUR Ph. : 9440221334	3. Dr. P.C. Krishna Swamy Professor University College of Phy. Edn. Bangalore University BANGALORE Ph.: 91 - 9449958295
4. Dr. N.S. Dilip Professor Dept. of Physical Education J.N.T. U.H Kukatpalli HYDERABAD, TS Ph. : 98493 59474 dilnelli@gmail.com	5. Dr. Y. Gopi Krishna Professor (Rtd.) Department of Physical Education J.N.T. U. H. College of Engineering SULTANPUR (Vil.) Sangareddy (Dst.), TS Ph. : 98494 78230 gopikrishnayarlagadda@yahoo.co.in	6. Prof. Sundar Raj Urs Professor (Rtd.) University College of Phy. Edn. Bangalore University BANGALORE Ph. : 91-94484 54872
7. Dr. K. Ramasubba Reddy Head & Secretary, Sports Board Dept. of Phy. Edn and Sports Sci. Yogi Vemana University KADAPA Ph. : 9059990999	8. Prof. Sara Sarojini Professor & Head Dept. of Physical Education S P Mahila Viswa Vidhyalayam TIRUPATI Ph.: 8897907806	9. Prof. N. Vijaya Mohan Head Dept.of Phy. Edn.&Sports Sci. Andhra University Visakhapatnam -530 003 Ph.: 9703831117
10 .Prof. M. Sivasankar Reddy Deputy Director Department of Physical Education S.V. University Tirupati Ph. 9441296125	3. Prof. K. Deepla Chairman BOS University college of Physical Edn. Osmania University Hyderabad-500 007 Ph: 9912522470 Email: kdeepla.ou@gmail.com	4. Prof. V. Gopinath Dept. of Phy. Edn &Sports Sci. Annamalai University Annamalai Nagar Chidambaram, Tamil Nadu Ph. 09443184750
5. Dr. M.V. Sreenivasan Co-ordinator M.P.Ed., Course S.K.University Ananthapuram Ph. 9440287878 mvsnivas@gmail.com	6. Dr. Sheela Stephen Principal YMCA College of Physical Education Namdanam,Chennai-35 Tamil Nadu Ph. 09884403817	15. Dr. C. Ramesh Deputy Director Dept.of Physical Education Madhurai Kamaraj University Madhurai Tamil Nadu Ph.
16. Prof. K. Vidyanathan Director Department of Physical Education S.R.M. University Chennai Tamil Nadu Ph.91-9443440445	17. Dr. P.P.S. Paul Kumar Director Incharge Vice-Principal, UCPESS Acharya Nagarjuna University Nagarjuna Nagar, GUNTUR Ph.: 98493 76146	18. Dr. K.V. Rajasekhar Head Department of physical Education University of Hyderabad Hyderabad Ph. 9949513504
19. Prof. N.S. Dilip Department of Physical Education J.N.T. University Kukatpalli Hyderabad Ph. 9849359474	20. Prof. Ravindran Director and Head (Rtd.) Dept. of Phy. Edn. & Sports Sci. Annamalai University Annamalai Nagar Chidambaram Tamil Nadu	21. Prof. V. Gopinath Dept. of Physical Education & Sports Sciences Annamalai University Annamalai Nagar Chidambaram, Tamil Nadu Ph. 09443184750
22. Prof. Selvam Professor and Director Dept. of Phy. Edn. and Sports Scier Annamalai University, CHIDAMBARAM Tamil Nadu Ph. : 91-9790085085	23. Dr. T. Prabhakar Reddy Director of Physical education Kakatiya Medical College Hanumakonda Warangal Ph. 9848831131 drprabhakarreddypdkmc@gmail.com	24. Prof. Grace Halena Professor & Former Vice-Chancellor Department of Exercise Physiology Tamil Nadu Sports University College road, Sampath Maligai Chennai,Tamil Nadu Ph. 09841832928

25. Dr. Jyothi Dayanandan Reader YMCA College of Physical Education Ramakrishan Mission Vidhyalaya Coimbatore Tamil Nadu Ph.	26. Dr. Sai Kumar Principal Maruthi College of Phy. Edn. Ramakrishna Mission Vidhyalaya COIMBATTORE Tamil Nadu Ph.9443294170	27. Prof. Rajesh Kumar Professor University College of Physical Edn. Osmania University Hyderabad Ph. 9246529013,9885911520
28. Dr. J. Rama Mohan Rao (rtd) University College of Physical Edn. Acharya Nagarjuna University Nagarjuna Nagar Guntur	29. Dr. P. Ravi Kumar Head Department of Physical Education National Institute of Technology Warangal Ph. 9849639229	30. Dr. Madialagan Reader & Director of Sports Dept. of Physical Education Sports Pavilion Mysore University MYSORE Ph.: 91-9449040903,9740231972
31. Dr. Kalidasan Professor & Head Dept. of Phy. Education &Yoga Bharatidasan University Chirunapath, Coimbatore,TN Ph.: 91-9442525773 kalidasanbdu@gmail.com	32. Dr. P. Murthaiah Sr. Lecturer in Physical Education Sri Bala Siva Yogendra Maharaj Degree College, KURNOOL Ph.: 9440759262 murthypasam@gmail.com	33. Dr. G. Syam Kumar Associate Professor Department of Physical Education JNT University Kakinada Kakinada Ph. 7702594555
34. Dr. Rajashekaran Professor Madhurai Kamaraj University Madhurai Tamil Nadu Ph.	32. Prof. Sunil Kumar.B Secretary, Sports Board Osmania University Hyderabad Ph.7032479481,8639669492 Email: drbsk.sports@gmail.com	33. Dr. S.M. Prakash Director and Head (Rtd) Department of Physical Education Kuvempu University SHIMOGGA Karnataka Ph. : 91-94482 60114
34. Dr. I Devi Vara Prasad Coordinator, DPESS Acharya Nagarjuna University Ongole Campus, Ongole Ph.9885799506 idvprasadjyothsna@gmail.com	35. Dr. K.K. Amarnath Professor University College of Physical Edn. Bangalore University BANGALORE Ph.: 91-9449751141	36. Prof. Venkatesh Professor D.O.S. in Phy. Edn.& Sports Sciences Mysore University MYSORE Ph.: 0-9901203647
37. Dr. A. Kaleemulla Deputy Director Department of Physical Edn. Maulana Azad National Urdu University HYDERABAD. Ph: 9177475299	38. Dr. Gajanana Prabhu Associate Professor University College of Phy. Edn. Kuvempu University Shankaragatta, B.R. Project SHIMOGA Ph.: 91-9845311458	39. Prof. Elaya Raja Dept. of Physical Education Central University of Pondichery Pondichery Ph. 91-9488979000 Email: elaya.cricket@gmail.com
40. Dr. Palani Swamy Professor Dept. of Phy.Edn Bharathidasan University Thiruchirapalli, TN Ph. 9842053777	41. Dr. C.R. Bhai Reddy Director Incharge Department of Physical Education Gulbarga University Gulbarga Ph.09902838759	42. Dr. Santosh Gerold Desoza Deputy Director Department of Physical Education Mangalore University Mangala Gangothri Mangalore 0-343572023
43. Dr. Chandra Sekharan Director of Physical Education Madhurai Kamaraj University Madhurai Tamil Nadu Ph. 9443574296	44. Dr. A. Pasodi Deputy Director University College of Physical Edn. Gulbarga University Gulbarga Ph. 09448140078	45.Dr. D. Krishna Murthy Director of Physical Edn (Rtd.) S.V. University TIRUPATI Ph.: 94414 08123

46. Prof. P. K. Subramannyam Professor (Rtd.) Department of Physical Education Pondicherry University PONDICHERRY . Ph. : 91-9443634506	47. Prof. Elangovan Head (Rtd) Department of Phy. Edn. Savitha University CHENNAI. Ph.: 0-9443121920	48. Dr. A. Manjunatatha Director of Physical Education Thumkur University Thumkur Ph. 9448180513
49. Dr. B.K. Deepika Assistant Professor NTR College of Veterinary Science Gangavaram Krishna District Ph. 8121447701	50. Prof. Lakshmikanth Rathod V.C. Palamur University, Mahaboob Nagar, TS Dean, Faculty of Education& Principal, Nizam College of Education, Hyderabad.	51. Dr. Rajasekhar Reader Department of Physical Education Annamalai University Annamalai Nagar Chadambaram
52. Dr. G. Hari Priya Assistant Professor College of Veterinary University Proddatur Ph. 9492313304	53.Prof. Syed Kareemulla Advisor and Secretary, Sports B oard (Rtd) Department of Physical Education0 Dravida University KUPPAM Chittoor (Dst.) Ph. : 94404 29205	

MEMBERS **SIGNATURE**

Dr. K. Rama Subba Reddy - Chairman, BOS, Physical Education & Sports Sciences

Dr. P. Johnson - External Member

Dr. M.V. Srinivasan - External member

Mr. M. Venkata Siva Reddy - External Member, Institutions related to the department

Mr. R. Vignesh - Member, P.G. Meritorious student

Dr. K. Rama Subba Reddy - Convener