

## DEPARTMENT OF MATHEMATICS

### B. SC MATHEMATICS

#### Algebra and Trigonometry

- CO-1 Relations between the roots and coefficients of equations, Transformations of equations. and Important Methods in finding roots.
- CO-2 Expansion of Binomial, exponential and logarithmic series.
- CO-3 Basic concept of matrix, Cayley Hamilton, Eigen value and Eigen vectors
- CO-4 Expansion of  $\cos^n\theta, \sin^n\theta, \sin\theta, \cos\theta, \sin n\theta, \cos n\theta, \tan\theta$  and  $\tan(\theta_1+\theta_2+\dots+\theta_n)$  and Formation of Equation with trigonometry roots
- CO-5 Analyse the relation between circular and hyperbolic functions and Logarithms of complex numbers

#### Differential Calculus

- CO-1 Basic knowledge of differentiation, expansion of functions and their applications. and Leibnitz theorem and its applications
- CO-2 Understand extremum value of functions in different methods
- CO-3 Analyse the curvature to find radius, centre involute and evaluate of the curve
- CO-4 Find the p-r equations, arc length in polar coordinates
- CO-5 To understand different method of finding asymptotes

#### Integral Calculus

- CO-1. Various techniques of integration. Applications of definite integrals
- CO-2. Applications of integration. Various integration formulae
- CO-3. Applications of improper integrals. Techniques of Beta, Gamma integrals
- CO-4. Concepts of gradient, divergence curl and their properties
- CO-5. Evaluation of line, volume and surface integrals and apply them to verify the Gauss Divergence, Greens and stokes theorem

#### Differential Equation

- CO-1. Developing the skills of solving Differential Equation.
- CO-2. Different method of solving Ordinary Differential Equation. Methods of variation Parameter.

- CO-3. Solving Partial Differential Equations of first and second order.
- CO-4. Formation of Partial Differential Equation, Charpits method and solving special types of first order Partial Differential Equation.
- CO-5. Solving the first order linear system.

### **Fourier Series and Integral Transform**

- CO-1. Basic knowledge about solving DE in different transform techniques
- CO-2. Understanding the Laplace Transform and its inverse.
- CO-3. Constructing the Fourier Series Expansion.
- CO-4. Concept of Fourier Transforms and its inverse
- CO-5. Application of DE using Laplace and Fourier Transforms

### **Analytical Geometry**

- CO-1. Introduction of conic section,
- CO-2. Concept of a straight line, sphere and its properties, circles and tangent planes.
- CO-3. Polar equation of circle and straight line
- CO-4. The students are introduced to the concept of a line, sphere and its properties, circles and tangent planes
- CO-5. Concepts of a plane, its various forms, determination of planes under given conditions

### **Mathematical statistics-1**

- CO-1: Measures of Central tendency and measure of dispersion and Introduction of Probability
- CO-2: Concepts of Random Variables and Distributions
- CO-3: Concept of Correlation and Regression and Knowledge of moment generating functions
- CO-4: Properties of Mathematical Expectations and Standard Distributions
- CO-5: Knowledge of continuous and discrete distribution

### **Numerical Methods**

- CO-1. To learn concept of integration and differentiation.
- CO-2. To solve the algebraic and transcendental equations.
- CO-3. To find the solution of ordinary differential equations.

CO-4. To find eigen values through vector of a matrix.

CO-5. To solve the simultaneous equations.

### **Statics**

CO-1. Basic concept of Law of forces and their properties

CO-2. To study the Concept of Couples and equilibrium of forces

CO-3. Problem solving skill of Friction laws and its properties and law of forces.

CO-4. To understand the concept of hangings string.

CO-5. To learn the concept of stability of equilibrium using differentiation.

### **Mathematical statistics-II**

CO-1: Basic concepts of Sampling and testing of Hypothesis.

CO-2: Testing of Hypothesis for large samples.

CO-3: Testing of Hypothesis for small samples

CO-4: Knowledge about various types of Estimators

CO-5: Knowledge t-distribution and F-distribution and Application of Estimation.

### **Algebra-I**

CO-1. Study of algebraic systems with two binary operations.

CO-2. Discuss the importance of cyclic groups.

CO-3. Concepts of the relationships between subgroups and normal subgroups

CO-4. Demonstrate understanding of the importance of homomorphism and isomorphism in groups.

CO-5. Concept of Homomorphism of rings and their properties and Abstract ideas of Ideals-Prime Ideals and study their properties

### **Real Analysis –I**

CO-1. Understanding the behavior of monotonic functions.

CO-2. Knowing limits and Cauchy sequences.

CO-3. Behaviour of divergent sequences

CO-4. Studying the behaviour of convergence of series by using tests.

CO-5. Solving the problems related to sequence and series and Concept of metric space

## **Dynamics**

- Co 1: Knowledge of motion of objects in plane and vertical line under gravity. motion along in inclined plane
- Co 2: Applications of Simple harmonic motion under gravity
- Co 3: Projectile and it's applications with smooth sphere on a plane
- Co 4: Applications of circular motion and conical pendulum with type of orbits
- Co 5: concept of moment of inertia with theory of dimensions

## **GRAPH THEORY**

- CO-1. To understand the fundamental concepts in graph theory.
- CO-2. To apply graph theory-based tools in solving problems, to improve the proof writing skills.
- CO-3. Use mathematical definitions to identify and construct examples and to distinguish examples.
- CO-4. Define how graphs serve as models for many standard problems.
- CO-5. To know the applications of graphs in science, business and industry.

## **DISCRETE MATHEMATICS**

- CO-1. To understand the fundamental concepts of discrete mathematics and graph theory.
- CO-2. To know the concept of Boolean Algebra and to know how to differentiate DNF and CNF.
- CO-3. Able to know the switching circuits
- CO-4. To analyse the concept of Recurrence Relation.
- CO-5. To know the applications of discrete mathematics in networks, computer science and graph theory in science, business and industry.

## **Algebra – II**

- Co 1: Introduction to vector space
- Co 2: Concept of the dual space of vector space
- Co 3: Understand inner product space and their properties
- Co 4: Basic concept of characteristics root and Eign value, Eign vector
- Co 5: concept of canonical form and triangular forms

## **Real Analysis II**

- CO-1. Basic Concepts of Functions and real number system.
- CO-2. Understanding of Continuous functions, Connected, Complete, Compact in Metric Spaces
- CO-3. To learn Concepts of Limits, Concepts of Metric Spaces
- CO-4. Introduction and Properties of Riemann Integral and Derivatives and their properties
- CO-5. Concept of Point wise and Uniform Convergence and its applications

## **Complex Analysis**

- CO-1. Basic concept of complex-valued functions
- CO-2. To study the Properties of Bilinear Transformations, Cauchy's theorem and its consequences.
- CO-3. Problem solving skill of Series Expansions and singularities.
- CO-4. Evaluation of Definite Integrals.
- CO-5. Understanding concepts Foundations of Complex Analysis

## **Operations Research**

- CO-1: Learning Linear Programming Problems.
- CO-2: Obtaining Optimal Solutions.
- CO-3: Basic concept of Queuing theory
- CO-4: Computation of CPM and PERT
- CO-5: Use mathematical software to solve the proposed model.

## **ASTRONOMY**

- CO-1: Introducing the exciting world of astronomy to the students
- CO-2: Helping the students to study about the celestial objects
- CO-3: Understanding the effects of refractions geocentric parallax
- CO-4: Compiling solar and lunar ellipses
- CO-5: Understanding kepler's laws of planetary motion, the planets, sun, moon and stellar universe

## **M. SC MATHEMATICS**

### **Algebra – I**

- CO-1 To analyse the concept Sylows theorem and its application
- CO-2 To understand the concept of Direct Product and Modules
- CO-3 Able to learn Different types of transformations
- CO-4 To understand the concept of Jordan and Canonical form
- CO-5 Depth Knowledge of matrix and its applications

### **Mathematical Analysis**

- CO-1. Construction of real numbers.
- CO-2. Fundamentals of pure mathematics fundamental of differential functions.
- CO-3. Inherits the knowledge of set theoretical approach.
- CO-4. properties of real valued continuous function
- CO-5. Basic knowledge of topology..

### **Ordinary Differential Equation**

- CO-1. Give an in-depth knowledge of solving differential equations
- CO-2. Introduce existence and uniqueness theorems in Differential equations. Analysis the analytical properties of a solution of an initial value problem.
- CO-3. Different methods of solving ordinary differential equations.
- CO-4. Understand the existence of special functions and their properties.
- CO-5. Method of solving Bessel's and Legendre differential equations.

### **Graph Theory**

- CO-1. Understand basic concepts of graph theory.
- CO-2. Introduction of Eulerian and Hamiltonian graphs
- CO-3. Concepts of Connectivity and vertex and edge connectivity and its applications
- CO-4. Concept of colouring and its implication in planar graphs
- CO-5. To introduce to advance topics in Graph Theory

## **Advance Discrete Mathematics**

- CO-1. Basic Knowledge of lattices and its applications
- CO-2. Design and application of switching circuits
- CO-3. Concept of finite fields and polynomials
- CO-4. Understand the concept of linear codes and cyclic codes
- CO-5. Introduce the coding theory

## **Algebra – II**

- CO-1. To introduce the Algebraic structures like Ring and Field. Introduction to advance concepts in algebra.
- CO-2. To study Polynomial Rings and its effect in Galois theory and properties of finite field.
- CO-3. To give foundation in group theory
- CO-4. To train the students in problem-solving as a preparatory to NET/SET.
- CO-5. Theoretic Background of Algebraic concepts and problem solving technique in algebra

## **Measure theory and integration**

- CO-1. To generalize the concept of integration using measures.
- CO-2. To understand the concepts of measurable function.
- CO-3. To learn the concept of Riemann integral.
- CO-4. Knowledge of measurable sets and its properties.
- CO-5. To learn the concept of lebesgue integral.

## **Partial Differential Equations**

- CO-1. Give detailed knowledge about the integrals of equations.
- CO-2. Give an in-depth knowledge of solving Partial Differential equations
- CO-3. Introduction of existence and uniqueness theorems in Differential Equations
- CO-4. Understand different methods of solving various first order and second order partial differential equations.

CO-5. The applications of second order and higher order partial differential equations in physics.

### **Probability Theory**

CO-1. Understand the notion of a random variable, results on random variables.

CO-2. Discrete and continuous random variables, their probability functions,

CO-3. Concept Of Some Distribution functions and expectations.

CO-4. Analyse the construction of moment generating functions and understand different.

CO-5. Concept of some probability distributions and limit functions

### **FUZZY THEORY**

Co-1 : Introduction of fundamental notation of Fuzzy theory

Co-2 : Concept of Fuzzy graph

Co-3 : Under stand the concept of Relations in Fuzzy

Co-4 : Knowledge of Fuzzy logic and their application

Co-5 : Laws of fuzzy composition

### **Complex Analysis - I**

CO-1. To learn the various intrinsic concepts and the theory of complex analysis

CO-2. To study the concept of Analyticity, complex integration, , Partial functions Entire fractions in depth.

CO-3. To learn the knowledge of Infinite products, knowledge of Residues

CO-4. Advance concepts in complex analysis

CO-5. To be familiar with Cauchy's Integral Formula to apply Contour Integration

### **TOPOLOGY**

CO-1. Understand the meaning of a topology, different topological spaces and continuous functions and their properties in topological spaces.



- CO-2. Analyse the existence of certain real-valued continuous functions on a topological space
- CO-3. Train the students to develop analytical thinking and the study of continuity and connectivity
- CO-4. Understand compactness in topological space and separation axioms.
- CO-5. Analyse the concept of Hausdroff spaces and problem solving techniques in topology.

### **Operation Research**

- CO-1: Methods of using Operations Research techniques in decision theory
- CO-2: Introduce the concept of PERT/CPM and Decision Making under uncertainly Risk
- CO-3: Concept of Inventory control and Queuing theory in depth
- CO-4: Concept of Replacement and maintenance models
- CO-5: Enlighten the students in the field of Operations Research

### **Calculus of variation and integral calculus**

- CO-1: Know the functionals and the construction of Euler's equation.
- CO-2: Understand variational methods for solving differential equations.
- CO-3: Analyse variational problems with moving boundaries.
- CO-4: Understand different integral equations and methods of solving them.
- CO-5: Understand Green's function in reducing boundary value problems to integral equations and Concept of Classical Fredholm theory and its application

### **Java Programming**

- CO-1. To understand the basic concepts of Java Tokens and also to learn how to implement object oriented designs with Java
- CO-2. To know the concept of Data Types, Operators, Arrays and Strings
- CO-3 Have the ability to write a computer program to solve specified problems.
- CO-4. To learn how to read and write files in Java.
- CO-5. To learn Java is useful for the design of desktop and web applications.

## **COMPLEX ANALYSIS II**

CO-1. To understand the fundamental concepts of Riemann theta function, Normal families and Riemann mapping theorem.

CO-2. To analyse the concept of boundary behavior.

CO-3. Able to learn Harmonic function and Mean value property are used in applications.

CO-4. To understand the properties of elliptic functions and weierstrass theory.

CO-5. To comprehend the local and global properties of analytic functions.

## **FUNCTIONAL ANALYSIS**

CO-1: Introduce the concept of Functional analysis

CO-2: Learn Hahn Banach theorem and its applications

CO-3: Introduction of Inner product space

CO-4: To understand the operator theory in Hilbert space, spectrum of a bounded

CO-5: To understand the spectral theory and the importance of its establishment

## **DIFFERENTIAL GEOMETRY**

CO-1: Concept of curves in plane and curve, surface in space

CO-2: Analyse the curvature of surface, geodesics and its applications

CO-3: To understand the concept of theorem egregium of Gauss Isometries of surface and Gaussian curvature

CO-4: The student will be able to solve the problems about tangent.

CO-5: Used to process and analyse data on non-flat surface

## **MECHANICS**

- CO -1.** Give a detailed knowledge about the mechanical system of particles.
- CO- 2.** The applications of Lagrange's equations and Hamilton's equations as well as the theory of Hamilton-Jacobi theory.
- CO- 3.** Learn Separable Theory and Integrals of Motion.
- CO- 4.** Give a details knowledge about Canonical transformation.
- CO- 5.** It gives detailed knowledge about Variational principles.

## **FLUID DYNAMICS**

- CO -1.** Understand the kinematics of a fluid through equations of motion of the fluid.
- CO- 2.** Analyse some two dimensional and three dimensional flows.
- CO- 3.** Understand the importance of complex analysis in the analysis of flow of fluids.
- CO- 4.** Understand Navier-Stokes equations of motion of a viscous fluid and some solvable problems in viscous flow.
- CO- 5.** Understand Rate of strain quadric and principle stresses.

## **STOCHASTIC PROCESSES**

- CO -1.** Understand various elements of Stochastic Processes.
- CO- 2.** Learn the transition probabilities and its classifications.
- CO- 3.** Understand queuing processes and know methods of deriving the programme measures of queuing models.
- CO- 4.** . Learn the well known models like birth-death and queuing to reorient their knowledge of stochastic analysis.
- CO- 5.** Understand renewal processes and their applications.

## **DEPARTMENT OF PHYSICS**

### **B. SC PHYSICS**

#### **MECHANICS AND PROPERTIES OF MATTER (UPHM11D)**

- CO1: This course provides the student to realize the force, impulse and impact on different shape of the objects.
- CO2: A student can realize the forces on linear motion and angular motional objects.
- CO3: The course demonstrates the completeness of Newtonian Mechanics of any shape of object, which demonstrate the concepts of centripetal, centrifugal and moment of inertia.
- CO4: Provides a fundamental understanding of physical properties of materials.
- CO5: Course can provide the application of force under liquid such as fluid dynamics.

#### **THERMAL PHYSICS AND ACOUSTICS (UPHM21D)**

- CO1: This course offers student to acquire fundamental knowledge on basic concept of heat, temperature dependent state of mater and laws governing temperatures
- CO2: From this course students can able to estimate the heat, temperature and decode the application of laws of thermodynamics.
- CO3: This course provides the completeness of the physical properties based on temperature and underlying laws by studying the physical properties.
- CO4: The student can understand the nature of ideal gas, kinetic theory of gases, second law of thermodynamics and thermodynamic temperatures.
- CO5: This course provides the knowledge of entropy, thermo-dynamical potentials, and basic concepts of statistical mechanics from view point of Maxwell's thermodynamic.

#### **OPTICS (UPHM31D)**

- CO1: Understanding of the essence of light as beam, its behaviors interference, diffraction and polarization of light beams. Further, to analyze mathematically diffraction of single and double slits.
- CO2: Establish the concept of total internal reflection and propagation of light through optical fibers.
- CO3: Explains the concept of LASER, and types of laser from spectroscopic aspect.

CO4: Apply the basic knowledge of Mechanics, Optics, Thermal physics and Electronics to explain the natural physical processes and related technological advances.

CO5: Design the experiments and assess the contributions of physics concepts for everyday life.

### **ATOMIC PHYSICS (UPHM41C)**

CO1: Understand the concepts of atomic and molecular Physics based on mathematics.

CO2: Analyze the fundamental principles governing the structure of the both atom and molecules and their interaction with electric and magnetic field.

CO3: Analyze the molecular structure from the knowledge of X-ray diffraction techniques.

CO4: Understand the characterization of materials (crystals and NANO materials) by the molecular spectroscopic tools.

CO5: Apply the photo electric principle to fabricate photo electric cells.

### **ELECTRICITY AND ELECTROMAGNETISM (UPHM51C)**

CO1: Acquire knowledge on the Gauss theorem, Coulomb's inverse square law for the electromagnetic field, for the application of capacitors.

CO2: Analyze physical situations involving static electric charges, alternating current circuits and direct current circuits.

CO3: Understand the electric current through different current elements and their applications.

CO4: Acquire the knowledge of Faraday's laws of electromagnetic induction, Anderson method and Absolute Mutual Induction and also to calibrate the Ballistic Galvanometer (BG).

CO5: Understand the knowledge of Maxwell's equation for the application of electromagnetic theory.

### **NUCLEAR PHYSICS AND PARTICLE PHYSICS (UPHM52A)**

CO1: Understanding on nucleus size, charge, mass and different nuclear models.

CO2: Provide necessary understanding of natural radioactivity and various decay process

CO3: Acquire the knowledge of different types of radiation detectors and the particle accelerators

CO4: Realize the mechanism of different nuclear reactions involved in nuclear reactor and cosmos.

CO5: Learn about the concept of elementary particle and classification, Quark model.

### **SOLID STATE PHYSICS (UPHM53A)**

CO1: Understand the clear concept of seven classes of crystal system and different types of crystal structure.

CO2: Calculate the bragg's conditions for X –ray diffraction in crystal and analysis the defect in solids.

CO3: Understand the different types of chemical bonds and gain basic knowledge of superconductivity.

CO4: Acquire the basic knowledge of dielectric and evaluate different types of polarization, Clausis – Mossoti relation.

CO5: Learn the Basics of the magnetic behavior of various types of Magnetic materials.

### **BASIC ELECTRONICS (UPHM54C)**

CO1: Acquire the basic knowledge on working of various semiconductor devices like transistor, Field effect transistor (FET), SCR and so on.

CO2: Can develop analyses capability in UJT amplifier circuits.

CO3: Acquire the basic knowledge on digital electronic circuits.

CO4: Study the different meters and instruments for measurements of electrical quantity.

CO5: Study the linear and non-linear characteristics of different types of potential divider circuits.

### **NUMERICAL METHODS (UMSA51A)**

CO1: can understand the three dimensional system to correlate matrix form and its diagonalization methods based on the Gauss elimination methods.

CO2: Provide the consequences of finite precision and the inherent limits of the numerical methods for solving various physical problems

CO3: Demonstrate good understanding and implementation of numerical solution algorithms applied to the algebraic equations, Curve fitting and Interpolation.

- CO4: Can acquire the knowledge for deriving the numerical methods for various mathematical operations and tasks such as interpolation, differentiations, and integrations, solution of linear and non-linear equations.
- CO5: Apply numerical analysis which enormous application in the field of science and some fields of engineering.

### **RELATIVITY AND QUANTUM MECHANICS (UPHM61A)**

- CO1: This course provides the student to realize frame of reference and elementary idea of relativity.
- CO2: Gain the basic knowledge on phase and group velocity and expression for de – Broglie's Wavelength.
- CO3: From this course students can able to estimate the Schrödinger equations.
- CO4: Apply the basic knowledge of angular momentum in quantum.
- CO5: Remember the Schrödinger equation to solvable program in one dimension like particle in a box,  
linear harmonic oscillator.

### **MATHEMATICAL METHODS IN PHYSICS (UPHM62A)**

- CO1: Can acquire good knowledge of the basic elements and important theorems of vector, and complex analysis.
- CO2: Can acquire the knowledge of the basic concepts of classical mechanics like generalized coordinates, Lagrangian's equations, and Hamilton functions for a dynamical system.
- CO3: Can acquire the knowledge of the complex number system, complex functions and also to map function from complex function to other complex function, which is need for the application of electronic circuits.
- CO4: From the course student can understand the fundamental knowledge to distinguish the classical behavior (particle) from quantum behavior (particle).
- CO5: Student uses either Fermi-Dirac or Bose-Einstein statistics according to the spin of the particles.

### **INTEGRATED ELECTRONICS (UPHA61A)**

- CO1: Understand the common number systems like binary, decimal, hexadecimal, octal, and internal conversion of BCD code, Gray code.
- CO2: Can acquire the basic knowledge of Boolean algebra, K-map.

- CO3: Can model and design the adder and subtracter circuits
- CO4: Can acquire the knowledge about the constructional details and principle of Flip-Flop and counter circuits.
- CO5: Acquire the knowledge of designing, testing and application of OP-AMP circuits.

#### **MICROPROCESSOR FUNDAMENTALS (UPHA62A)**

- CO1: The student can understand the working of architecture of 8085.
- CO2: From the course students can manipulate the basic logical operations using 8085.
- CO3: Can analyze the assembly language of 8085.
- CO4: Can discuss the input/ out-put /memory interface devices.
- CO5: From the course, student can acquire the knowledge of interfacing different devices like stepper motor, digital clock, and traffic signal control.



## **M. SC PHYSICS**

### **MATHEMATICAL PHYSICS (PPHM12D)**

- CO1: On the completion of this course, the students will acquire a sound knowledge in linear vector space which will be necessary to pursue other areas in physics.
- CO2: Introducing concept of operator for vectors, operators for matrix, basic tensors, complex variables and special functions, in order to familiarizing the theorems and basic approach of problem solving from theoretical aspect.
- CO3: On the completion of this course, the students will able to model real life phenomena in terms of differential equations.
- CO4: Demonstrate the utility and limitations of a variety of calculation concepts such as Fourier series, differential equation and Laplace transformation to periodic functions in Physics especially in Electronics.
- CO5: On completion of this course, students can formulate theoretical function which can model atomic system from different reducible/ irreducible representation.

### **CLASSICAL MECHANICS AND RELATIVITY (PPHM22D)**

- CO1: Understands Lagrangian and Hamiltonian formulation Apply the mechanics to analysis the total energy of the dynamical system
- CO2: Gain the knowledge of motion in central force field Small oscillations, transformation to normal coordinates and frequencies of normal modes
- CO3: Analyze and solve the theoretical concept of Euler angles, Euler's equations of motion, torque-free motion, symmetrical top.
- CO4: Learn to write Hamilton's principle of least action and Lagrangian and Hamiltonian equations of motion, Poisson brackets, Canonical transformations and their generators.
- CO5: Learning of Relativity, Lorentz transformations on space-time, relativistic Lagrangian and Hamiltonian for a free particle and four vectors.

### **ELECTROMAGNETIC THEORY AND PLASMA PHYSICS (PPHM13D)**

- CO1: On the completion of this course, the students can establish fundamental of electrostatics or manipulate electrostatic forces based on technological advancement.
- CO2: On completion of this course, student can demonstrate effect of magnetic field on the electric charges from theoretical point of view.

CO3: The course provides the complete knowledge of electromagnetic forces demonstrated from theoretical view point.

CO4: On completion of the course, the student can validate the wave propagation applies in communication technologies or radio wave technology.

CO5: Up on completing the course, student understands the concept of plasma and can manipulate the plasma on different conditions based on technology required.

### **INTEGRATED CIRCUITS AND MICROPROCESSOR 8085 (PPHM14C)**

CO1: Create electronic systems, from 'building block' to timing in circuits, interfacing in mixed- signal electronic systems, power, and filters.

CO2: Analyze the simple circuits containing active elements such as bipolar and MOS transistors, and Op-amps

CO3: Appreciate the practical limitations of such devices

CO4: Apply links between mathematical concepts to a range of electrical problems

CO5: Student can realize the communications of 8085 with different peripheral devices and its utilizations.

### **QUANTUM MECHANICS-I (PPHM21D)**

CO1: Provide the knowledge of Interpretation and condition on the wave function and prove the Ehrenfest's theorem.

CO2: By apply the postulates of quantum mechanics to understand the commutation relations and about the uncertainty principle, symmetry and asymmetry wave functions.

CO3: Remember the Schrödinger equation to solve the solvable problem in one dimension like particle in a box, simple harmonic oscillator and barrier penetration.

CO4: Apply the technique of separation of variable to solve the problem in three dimensions such as spherical well, Hydrogen atom and reduction of two body problem for central force.

CO5: Understand the concept of spin; Pauli spin matrices evaluate the addition of angular moment and C.G coefficient.

### **STATISTICAL MECHANICS (PPHM22D)**

CO1: This course explains the concept of phase transformation.

CO2: This course established the concepts of statistical mechanics and thermodynamics.

CO3: This course gives the basic knowledge of canonical and grand canonical ensembles.

CO4: After this course the students can be able to implement concepts of classical and quantum statistics.

CO5: This course gives the analytical idea of real gas Ising model and fluctuation.

### **SPECTROSCOPY (PPHA21D)**

On completion of this course the students can be able to

CO1: Utilize the microwave spectroscopy.

CO2: gain the knowledge of normal coordinate analysis.

CO3: able to handling the infrared spectroscopy.

CO4: able to handling the instruments of Infra-Red & Raman Spectroscopy.

CO5: Able to handling the instruments NMR and ESR spectroscopy.

### **NANO SCIENCE (PPHE22D)**

CO1: Students will learn about the fundamentals of NANO scale systems and its physical, chemical and electrical properties

CO2: Students may gain knowledge on the synthesis of NANO materials and their merits

CO3: Provide instrumental skills to study the structure of crystalline materials and phase purity.

CO4: Students would gain perception of characterization techniques, optical and electron transport properties of NANO materials

CO5: provides the broad knowledge of application from energy conversion system like solar cell, fuel cell to energy storage system like battery, capacitors. They would be able to expand their knowledge on applications of NANO materials and design of new materials for next generation applications.

### **BASIC MATERIALS SCIENCE (PPHE21D)**

CO1: On completion of the course, student gain complete understanding of conceptual physics of materials.

CO2: Introducing concept of theoretical knowledge of temperature dependent melting point.

CO3: End of the course, the student understands the temperature dependent materials properties based on composition with theoretical view point.

CO4: On completion of the course, the student understands the fundamental properties of electron at nuclear level.

CO5: On completion of the course, the students gain the broad knowledge on the application of properties materials in data storage device development.

### **QUANTUM MECHANICS-II (PPHM31D)**

CO1: Gain the knowledge of Hilbert space, Dirac notation, different types of pictures and conservation laws.

CO2: To predict approximation methods (WKB), variational methods and connection formula by applying the principle of quantum mechanics.

CO3: Analysis and predict the properties of system through equation of wave function in time dependent perturbation theory and harmonic perturbation.

CO4: calculate scattering amplitude, cross section, born approximation and effective range theory for S wave by learning and imply the quantum scattering theory.

CO5: Acquire an extended knowledge about relativistic wave equation like Klein Gordon equation, Dirac equation, gamma matrices and their properties

### **CONDENSED MATTER PHYSICS (PPHM32D)**

CO1: Offer extensive ideas in arrangement of atoms in solids and dynamics of atoms from basic knowledge of crystal systems and symmetries

CO2: course offers skills like to distinguish the concepts of regular lattice to reciprocal lattice and Brillouin zones from band structure point of view.

CO3: student can understand the phonons; estimate the thermal properties, and electrical properties using the free-electron model. Students could know Bloch's theorem and what energy bands are and know the fundamental principles of semiconductors.

CO4: know the fundamentals of dielectric and ferroelectric properties of materials and also can distinguish the basic difference of magnetic materials from Dia, Para, Ferro and Anti-Ferro magnetism.

CO5: Student can understand superconductivity using BCS theory

### **COMPUTATIONAL METHODS AND PROGRAMMING (PPHM33C)**

- CO1: Establish the capacity for mathematical reasoning through analyzing, proving and explaining concepts from mathematical physics.
- CO2: Apply matrices and special functions to solve simultaneous linear equations arising from physical problems
- CO3: Understand Arrays and matrices and enables data visualization.
- CO4: Gets a wide knowledge of numerical methods in computational Physics that can be used to solve many problems which does not have an analytic solution
- CO5: acquire strong base in C/FORTRAN languages, known to be scientific languages, regarding different data type such as list, sets, to simulate/solve the given mathematical function through programming skills.

### **CRYSTAL GROWTH (PPHA31C)**

- CO1: From this course students can able to establish the nucleation kinetic parameters
- CO2: This course provides the completeness of theory and concepts of crystal growth.
- CO3: This course can help to grow single crystals from solution
- CO4: This course can help to growth single crystal from melt growth and vapour growth.
- CO5: This course can help to growth single crystal from flux and gel growth.

### **ADVANCED MATERIALS SCIENCE (PPHA32D)**

On gone through the course the students can

- CO1: Acquire knowledge on ceramics and composites.
- CO2: Analyze the physical, chemical and mechanical properties of polymers.
- CO3: Get basic understanding of dielectric materials
- CO4: Understand the knowledge of growth and characterization of electronic materials.
- CO5: Understand the knowledge of magnetic materials.

### **NUCLEAR AND PARTICLE PHYSICS (PPH41D)**

- CO1: Understand the various nuclear models like liquid drop mode, shell model and evaluate magnetic moments and Schmidt lines.
- CO2: Develop the Understanding of Nuclear interactions, Meson theory of nuclear forces, nucleon – nucleon scattering.

- CO3: Acquire the knowledge on types of Nuclear reaction, Q value equation, compound and direct nucleus reactions and solve Breit – Wigner one level formula.
- CO4: Study the different types of decay (Beta decay, Gamma decay) Neutrino physics, internal conversion and Nuclear Isomerism.
- CO5: Learn about the concept of elementary particle, classification of hadrons – SU(2) and SU(3) multiples, Quark model.

### **MICROPROCESSOR 8086 AND MICROCONTROLLER 8051 (PPHA41D)**

On completion of this course, the students can

- CO1: Study the internal architecture and organization of the Microprocessor 8086, and Microcontroller 8051.
- CO2: learn assembly language programming for arithmetic operations.
- CO3: Acquire the knowledge of Memory interfacing, and different Data transfer schemes, mainly for interfacing peripheral I/O devices.
- CO4: Design the microprocessor and microcontroller based systems particularly for the Analog to Digital convert, and 7 segment LED displays.
- CO5: Apply the interfacing system in applications. Plan the internal organization of microprocessor and microcontroller.

### **ENERGY PHYSICS (PPHA42D)**

On completion of this course, the students can

- CO1: the students to realize the renewable and non-renewable energy sources.
- CO2: Provides a fundamental understanding of tidal energy.
- CO3: A student can realize wind energy.
- CO4: Understanding of essence of energy from biomass.
- CO5: Establishes the concepts of solar energy conversion and its boost in efficiency of utilizations.

## **DEPARTMENT OF CHEMISTRY**

On completion of this course, students will be able

CO1 – To explain the formation of different types of bonds, hybridisation and vander waals forces.

CO2 -- To learn about various fuels, fertilisers, silicones and have an idea about hardness of water and its purification methods.

CO3 – To have basic understanding of classification of organic compounds, hybridisation, polar effects, tautomerism, optical activity and electrophilic substitution.

CO4 – To inculcate knowledge on concepts of thermodynamics.

CO5 – To enable the students to learn about the kinetics of the reaction and photochemistry.

### **Allied Chemistry (For Biochemistry)**

#### **Course Outcomes:**

On completion of this course, students will be able

CO1 – To study the bonding in coordination compounds and applications of coordination compounds.

CO2 – To learn about the carbohydrate, amino acids and proteins.

CO3 – To acquaint knowledge on chemotherapy.

CO4 – To familiarise about electrolytes, galvanic cell and corrosion.

CO5 – To develop a knowledge about volumetric analysis and various chromatographic techniques.

### **Allied Chemistry (For Biochemistry) (Practical)**

#### **Course Outcomes:**

On completion of this course, students will be able to-

CO1 learn about types of neutralization, redox and complexometric titrations.

CO2 learn the identification for various organic compounds like carbohydrate, carboxylic acid, aldehyde, phenol, amine, ketone and amide.

## **Allied Chemistry (For Physics)**

### **Course Outcomes:**

On completion of this course, students will be able

CO1 – To explain the formation of different types of bonds, hybridisation and vander waals forces.

CO2 -- To learn about various fuels, fertilisers, silicones and have an idea about hardness of water and its purification methods.

CO3 – To have basic understanding of classification of organic compounds, hybridisation, polar effects, tautomerism, optical activity and electrophilic substitution.

CO4 – To inculcate knowledge on concepts of thermodynamics.

CO5 – To enable the students to learn about the kinetics of the reaction and photochemistry.

## **Allied Chemistry (For Physics) Semester IV**

### **Course Outcomes:**

On completion of this course, students will be able

CO1 – To study the bonding in coordination compounds and applications of coordination compounds.

CO2 – To learn about the carbohydrate, amino acids and proteins.

CO3 – To acquaint knowledge on chemotherapy.

CO4 – To familiarise about electrolytes, galvanic cell and corrosion.

CO5 – To develop a knowledge about volumetric analysis and various chromatographic techniques.

## **Allied Chemistry (For Physics) Practical**

### **Course Outcomes:**

On completion of this course, students will be able to-

CO1 learn about types of neutralization, redox and complexometric titrations.

CO2 learn the identification for various organic compounds like carbohydrate, carboxylic acid, aldehyde, phenol, amine, ketone and amide.



## **Allied Chemistry (For B.Sc. Biotechnology) – Semester II**

### **Course Outcomes:**

On completion of this course, students will be able

CO1 – To learn about the periodic classification of elements and formation of different types of bonds.

CO2 – To study the concepts of acids, bases pH and buffers.

CO3 –To enable the students to learn about the kinetics of the reaction and basic concepts of thermodynamics.

CO4 -- To have a basic understanding of classification of organic compounds, hybridisation, polar effects, tautomerism, optical activity and electrophilic substitution.

CO5 – To learn about hardness of water, purification methods, TDS, TSS, BOD, COD and familiarise on fuels and fertilisers.

## **Allied Chemistry (For B.Sc. Biotechnology – Semester II (Practical))**

### **Course Outcomes:**

On completion of this course, students will be able to-

CO1 learn about types of neutralization, redox and complexometric titrations.

CO2 learn the identification for various organic compounds like phenol, acid, amide & Carbohydrate.

## **DEPARTMENT OF BIOCHEMISTRY**

### **B. SC BIOCHEMISTRY**

#### **I-SEMESTER - Core Paper-I: Nutritional Biochemistry (UBYM11C)**

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

CO-1: Explore the role of food and nutrients in the maintenance of health and to understand about the calorific value of foods and nutrients, BMR and its determination.

CO-2: Know about the sources, daily requirements, biological functions and deficiency symptoms of various vitamins and minerals.

CO-3: Know about causes, biochemical manifestations and treatment of nutritional disorders such as Kwashiorkor and Marasmus (Under nutrition) and Obesity (over nutrition).

CO-4: Know about the physiological role and nutritional significance of carbohydrates, proteins and lipids.

CO-5: Understand the concepts of human rights and its applications.

#### **Non-Major Elective-I: Health and Nutrition (NMBY11C)**

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

CO1: Explain the significance of Health and Health related problems of different age groups.

CO2: Describe different classes of vitamins with their sources, functions and deficiency disorders.

CO3: Understand different supplementation programmes In India based on Nutrition and Health.

CO4: Know the nutritional significance of lipids in health management

CO5: Understand the nutritional values of minerals in leading healthy life

#### **II-SEMESTER - Core Paper-II : Cell biology (UBYM21C)**

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

CO-1: Explore the structural organization of prokaryotic and eukaryotic cell and to know about the classification of bacteria, virus and fungi.

CO-2: Know about the detailed information about the subcellular organelles such as nucleus, mitochondria, endoplasmic reticulum, golgi complex, lysosome etc.,

CO-3: Explore the organization of cells in to tissues and role of various molecules in cell-cell adhesion and cell-matrix adhesion.

CO-4: Know about the details of cell division such as mitosis and meiosis and its importance.

CO-5: Know the about the organization of prokaryotic and eukaryotic genome.

### **Non-Major Elective-II: Human Diseases and Preventive Aspects (NMBY21C)**

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

**CO1:** Explain infectious diseases, diseases in young children and prevention.

**CO2:** Describe causes, types, symptoms and treatment measures of cancer.

**CO3:** Explain causes, types and treatment for diabetes and Kidney stones.

**CO4:** Know the nutritional significance of lipids & it's diseases with treatment measures

**CO5:** Understand the causes, symptoms and management of liver diseases

### **I B.Sc BIOCHEMISTRY (Practical-I) (UBYL21C)**

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

CO-1: Know about the quantitative determination of vitamin-C, oxalic acid, iron, glycine by titrimetric method.

CO-2: understand the procedure of isolation and estimation of starch from potato, Casien from milk, Hemoglobin from blood and albumin from egg white.

CO-3: Calculate the BMI of a person to assess normal class, underweight and obesity.

CO-4: Identify the prokaryotic and eukaryotic cells by microscopic method.

CO-5: Know about the various stages of cell division.

### **III-SEMESTER - Core Paper-IV: Chemistry of Biomolecules – I (UBYM31C)**

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

**CO-1:** Understand the basic component or biomolecules of living organisms

**CO-2:** Have knowledge on the structure/conformational freedom of biomolecules, e.g. Carbohydrates, amino acids and proteins.

**CO-3:** Understand and demonstrate how the structure of biomolecules determines their chemical properties and reactivity.

**CO-4:** Learn the classifications of carbohydrates and proteins

**CO-5:** Recognize the importance of the three dimensional shape of a protein and its function and the role of non-covalent bonds in maintaining the shape of a protein.

#### **IV-SEMESTER - Core Paper-V: Chemistry of Biomolecules – II (UBYM41C)**

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

**CO-1:** Understand the basic component or biomolecules of living organisms

**CO-2:** Have knowledge of the structure/conformational freedom of biomolecules, e.g. lipids and nucleic acids.

**CO-3:** Understand and demonstrate how the structure of biomolecules determines their chemical properties and reactivity

**CO-4:** Compare and contrast saturated, mono-unsaturated, and poly-unsaturated fatty acids.

**CO-5:** Understand the types and structure of DNA and RNA.

#### **Core Paper-VI: Core Practical II (UBYL41C)**

On Completion of the course, students are able to understand

CO 1- Safety measures in laboratory, handling and care of instruments.

CO 2 - Determination of saponification, Iodine and acid value of oil using titrimetric methods.

CO 3 - Qualitative analysis of carbohydrates, amino acids and proteins.

CO 4- Quantitative estimation of biomolecules carbohydrates, proteins, amino acids.

CO 5- Quantitative estimation of Nucleic acids DNA and RNA.

#### **V-SEMESTER - Core Paper-VII: Enzymes (UBYM51C)**

CO 1- To gain knowledge about Enzymes, chemical nature and general properties of enzymes.

CO 2- To learn mechanism of enzymatic reactions and kinetics.

CO 3- To understand about isolation, homogenization and separation procedures of enzymes using various biochemical techniques.

CO 4- To recognize Enzyme, coenzymes and their role in biological processes in the body and industrial applications of Immobilized Enzymes.

CO 5- To understand on Enzyme Inhibition, types and mechanism of Inhibition.

#### **Core Paper-VIII: Metabolism (UBYM52C)**

**On Successful completion of course, students will be able to**

CO-1: Gain knowledge about anabolism and catabolism.

CO-2: Obtain knowledge on carbohydrate, lipid and Protein metabolism help to understand the conversion of simple nutrients after absorption into energy and cell macromolecules.

CO-3: Provide information on conversion of toxic ammonia into Urea through Urea cycle.

CO-4: Understand about Electron Transport Chain and Oxidative Phosphorylation

- . CO-5: Learn about Purine and Pyrimidine biosynthesis and catabolism.

### **Core Paper-IX: Analytical Biochemistry (UBYM53C)**

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

CO-1: Understand about pH, its importance in the body and its determination by glass electrode. To know about the working principle and applications of oxygen electrode.

CO-2: Explore about the principle, procedure and applications of different chromatographic techniques and electrophoretic techniques for the separation and identification of biomolecules.

CO-3: Know the Separation and purification of proteins and nucleic acids by Centrifugation, Chromatography and Electrophoresis techniques.

CO-4: Understand the principle, instrumentation and applications of colorimetry and UV spectroscopy techniques.

CO-5: Recognize the principle, instrumentation and applications of spectrofluorimetry and flame photometry techniques for the determination of vitamins, enzyme activity and minerals.

### **Core Elective Paper-I: Physiology (UBYA51C)**

CO-1: To understand different physiological systems and their functions

CO-2: To be able to analyse the status of different systems.

CO-3: To categorize different components according to their nature.

CO-4: To describe the mechanism and process of different physiological events.

CO-5: To draw and prepare charts about different human organ systems.

### **VI-SEMESTER - Core Paper-X: Clinical Biochemistry (UBYM61C)**

**On Successful completion of course, students will be able to**

CO-1: Understand the pathology, diagnosis and treatment of Diabetes Mellitus.

CO-2: Obtain information about Inborn Errors of Carbohydrate and amino acid metabolism.

CO-3: Learn the diagnostic procedures for the assessment of liver diseases through Liver function tests.

CO-4: Explain Renal function Tests that provide information regarding diagnostic procedures of kidney diseases.

CO-5: Gain knowledge about clinical symptoms, diagnosis and treatment of various hormonal disorders and diagnosis of various diseases through Clinical Enzymology.

### **Core Paper-XI: Molecular Biology (UBYM62C)**

After the completion of this course, the student will be able to

CO1: Understand the basic concepts of genetic information and the general principles of gene organization and expression

CO2: Understand the synthesis of DNA and Post replication processing.

CO3: Understand the synthesis of RNA and post transcriptional modifications

CO4: Understand the synthesis of protein and its post translational modifications

CO5: Describe the molecular mechanisms behind DNA damage and repair

### **Core Elective PaperII: Immunology (UBYA61C)**

CO-1: To understand different immunological components

CO-2: To be able to analyze the role of organs and cells for immunity.

CO-3: To categorize different components according to their nature.

CO-4: To describe the mechanism and process of immunological reactions.

CO-5: To draw and prepare charts about different defense mechanisms.

### **Core Paper-: Biotechnology (UBYA62C)**

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

**CO-1:** Understand the basic concepts of biotechnology and restriction enzymes.

**CO-2:** Understand principles of animal culture, media preparation, Invitro fertilization and embryo transfer technology.

**CO-3:** Get insight in applications or recombinant DNA technology in agriculture, production of therapeutic proteins.

**CO-4:** Explain the microbial degradation of pesticides, Bioremediation and Biofertilizers.

**CO-5:** Describe commercial production of fuels, microbial enzymes and vitamins.

### **Core Paper-XI: Core Practical-III (UBYL61C)**

CO-1. To understand the collection and preservation of biological specimens

CO-2. To determine the activity of Salivary amylase.

CO-3. Separation and identification of aminoacids and sugars by Radial Paper chromatography.

CO-4. Separation and identification of aminoacids and sugars by thin Layer chromatography.

CO-5. To analyse qualitatively the normal and abnormal constituents of Urine

CO-6. To estimate the amount of urea and creatinine in Urine.

### **Core Paper-XII: Core Practical - IV (UBYL62C)**

After the completion of this course, the student will be able to

CO1: Understand the Basic concepts and principles of Clinical Biochemistry, detail on the various biological specimens including the process of collection, preservation and storage.

CO2: Analyze blood for RBC, WBC, TC/DC, ESR and hemoglobin by performing hematological assays

CO3: Acquire knowledge in the quantitative estimation of biomolecules, and correlating the laboratory test results with common diseases or conditions.

CO4: Determine blood urea and creatinine which acts as renal indices

CO5: Explain the nature and function of various enzymes, normal levels and elevated levels in various diseases.

## **M.SC BIOCHEMISTRY**

### **I SEMESTER**

#### **Core Paper-I: Biomolecules (PBYM11C)**

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

**CO-1:** Demonstrate an understanding of chemistry, structure and functions of Biological molecules.

**CO-2:** Have knowledge of the structure, and functions of biomolecules, eg. Carbohydrates, Proteins, Lipids, and Nucleic acids.

**CO-3:** Understand the basic component of signalling molecules like prostaglandins, thromboxanes and Leukotrienes.

**CO-4:** Recognize vitamins enrichment and fortification.

**CO-5:** Understand about Phytochemicals structure and their functions.

#### **Core Paper-II: Biochemical Techniques (PBYM12C)**

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

**CO-1:** Recognize the basic principles and instrumentation of cell sorting, manometric and electrochemical techniques.

**CO-2:** To understand the principles and applications of chromatographic techniques used in biochemical studies.

**CO-3:** To obtain wide knowledge on latest electrophoretic techniques employed in research.

**CO-4:** Understand the principle, instrumentation and determination of biomolecules, activity of enzymes in biological samples, determination of minerals by various spectroscopic techniques like Visible and UV spectroscopy, spectrofluorimetry and flame photometry etc

**CO-5:** Express wide knowledge on microscopic techniques, detection and measurement of radioisotopes.

#### **Core Paper-III: Physiology & Cell biology (PBYM13C)**

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

**CO1:** Study about the tissues, cell junctions, CAMs and extra cellular matrix.

**CO2:** Explore about the structure of biological membrane and different transport mechanisms.



**CO3:** Explain the various components of digestive and circulatory systems with their functions.

**CO4:** Understand the structure and functions of respiratory system, acid-base balance and electrolyte balance in the human body.

**CO5:** Know the types of muscles and its contraction, structure and functions of neuron in nerve impulse transmission

## **II SEMESTER**

### **Core Paper-IV: Enzymes & Enzyme Technology (PBYM21C)**

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

CO-1: Know about the isolation and purification of enzymes from various sources and to understand the various enzyme assays for quantitative determination in biological sample.

CO-2: Explore the knowledge about isoenzymes and the separation of LDH with the help of electrophoresis. To study the allosteric regulation of enzymes.

CO-3: Know about the various factors affecting enzyme activity such as pH, temperature, substrate concentration, product concentration and to determine the active site of enzyme.

CO-4: Understand the role of various coenzymes and cofactors in enzyme activity. To study the mechanism of enzyme action.

CO-5: Know the immobilization of enzymes with applications. To know the industrial and therapeutic applications of enzymes

### **Core Paper-V: Intermediary Metabolism I (PBYM22C)**

On Successful completion of course, students will be able to

CO-1: Understand the pathways of synthesis and breakdown of biomolecules and about feeders pathway.

CO-2: Obtain knowledge on Carbohydrate metabolism which help to understand the conversion of simple nutrients after absorption into energy and synthesis of cell macromolecules.

CO-3: Acquire knowledge about Purine and Pyrimidine metabolism.

CO-4: Gain information on specialized products formed from aminoacids.

CO-5: Learn about the role of organisms in the oxidation and reduction of inorganic sulphur compounds and interconversion of sulphur compounds.

### **Core Paper-VI: Intermediary Metabolism II (PBYM23C)**

After the completion of this course, the student will be able to

- CO-1: The students will have knowledge of metabolic pathways leads to synthesis and catabolism of major bio-molecules. Get an idea about the structure, biosynthesis, oxidation and storage of fatty acids.
- CO-2: Describe what happens when lipids are metabolized, cholesterol, prostaglandins etc. are synthesized, emphasizing the genetic defects of lipid metabolism.
- CO-3: The students will have knowledge of metabolic pathways leads to biosynthesis of essential amino acids
- CO-4: Differentiate between ketogenic and glucogenic amino acids and common pathways of amino acid catabolism to release ammonia and carbon skeletons.
- CO-5: Understand the interconversion of major food stuffs.

### **Elective Paper –II: Energy And Drug Metabolism (PBYA21C)**

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

- CO-1: Understand the concepts on thermodynamics and bio energetics.
- CO-2: Elucidate the components and electron transport chain and mechanism of oxidative phosphorylation.
- CO-3: Gain knowledge about photosynthesis and their components.
- CO-4: Know the various energy sources for visceral organs.
- CO-5: Relate drug structure with metabolic processes and specific enzymes involved in metabolism.

### **Extra Disciplinary Paper-I: Essentials of Biochemistry (PBYE21C)**

On successful completion of the course students will be able to

- CO-1 Understand the nutritional needs and balanced diet for children, adults, old age people and pregnant lactating mothers.
- CO-2 Know the nutritional aspects of carbohydrates and its metabolic disorders
- CO-3 Gain information about the nutritional aspects of proteins its deficiency disorders
- CO-4 Know the significance of lipids in the diet and disorders due to lipid metabolism
- CO-5 Understand the role of vitamins in human health

### **Core Paper-VII: Practical-I(PBYL11C)**

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

CO-1: Know about the quantitative determination of vitamin-C, oxalic acid, iron, glycine by titrimetric method.

CO-2: understand the procedure of isolation and estimation of starch from potato, Casien from milk, Hemoglobin from blood and albumin from egg white.

CO-3: Calculate the BMI of a person to assess normal class, underweight and obesity.

CO-4: Identify the prokartic and eukaryotic cells by microscopic method.

CO-5: Know about the various stages of cell division.

### **Core Paper-VIII: PRACTICAL-II(PBYL21C)**

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

CO-1: Understand and perform the determination of activity of enzymes and carryout the kinetic assay of enzymes in biological samples.

CO2: Find out the blood group of the given blood sample.

CO-3: Understand and perform the microbial culture and staining techniques.

CO-4: Perform the separation of biomolecules by TLC and SDS-PAGE techniques.

CO-5: Analyse the antioxidant activity of the given biological samples.

## **III-SEMESTER**

### **Core Paper-IX: Biotechnology(PBYM31C)**

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

CO-1: know about the various cloning vectors employed in gene cloning technology and also to understand the methods of DNA sequencing and polymorphism.

CO-2: Explore about the applications of rDNA technology in producing therapeutically important proteins. To know about the separation and molecular weight determination of proteins using 2D-gel electrophoresis and mass spectroscopy.

CO-3: Get an idea about various bioinformatics tools and databases for structural and functional analysis of DNA and proteins.

CO-4: Understand the principle, procedure and applications of animal cell culture and plant tissue culture techniques. To know about the importance of patents and IPR.

CO-5: Explain the basic principles and methodology of producing transgenic animals and transgenic plants with their applications.

### **Core Paper-X: Clinical Biochemistry- I(PBYM32C)**

After the completion of this course, the student will be able to

CO-1: Understand the Basic concepts and principles of Clinical Biochemistry, detail on the various biological specimens including the process of collection, preservation and storage.

CO-2: Understand the aetiology, types, clinical manifestations and treatment of Diabetes mellitus and various disorders of carbohydrate metabolic pathways

CO-3: Enumerate of the different types of anemia based on aetiology and the blood clotting pathways and the blood clotting disorders.

CO-4: Elaborate on the role of Serum lipids including triglycerides, cholesterol and phospholipids in diseases. Detail the clinical role of serum cholesterol and state the Clinical features of atherosclerosis

CO-5: Appreciate the clinical application of enzymes in diagnosis, discussion on isoenzymes and understanding their role in diagnosis. Understanding the enzyme patterns in diseases of various organs such as liver and heart.

### **Core Paper-XI: Molecular Biology (PBYM33C)**

At the end of the course, students able to

CO-1: To understand process of central dogma of molecular biology.

CO-2: Exhibit a knowledge base in genetics and to analyze it.

CO-3: To draw and prepare charts about different molecular biology process.

CO-4: To describe the mechanism of molecular biology.

CO-5: Apply and develop the principles of molecular biology to the betterment of human life

### **Extra Disciplinary Paper-II: Life Style Diseases and Prevention(PBYE31C)**

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

CO1: Narrate the pathophysiology of Obesity, Diabetes and CHD.

CO2: Explore the causes and consequences of hypertension and renal stones and failure.

CO3: Explain the various components of digestive and circulatory systems with their functions.

CO4: Understand the structure and functions of respiratory system, acid-base balance and electrolyte balance in the human body.

**CO5:** Know the types of muscles and its contraction, structure and functions of neuron in nerve impulse transmission

#### **IV SEMESTER**

##### **Core Paper-XII: Hormones (PBYM41C)**

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

CO-1: Understand the classification, biosynthesis, regulation and mechanism of action of hormones.

CO-2: Understand the various endocrine glands, their secretion and functions of various hormones.

CO-3: Elucidate the biosynthesis, regulation and functions of hypothalamus and pituitary hormones.

CO-4: Explain the synthesis and functions of thyroid, parathyroid, calcitriol and Calcitonin hormones

CO-5: Understand the secretion and functions of gonadal and pancreatic hormones, their effects in target cells. To explore the secretion of adrenal hormones, their effects in target cells and its deficiency status

##### **Core Paper-XIII: Clinical Biochemistry – II(PBYM42C)**

On Successful completion of course, students will be able to

CO-1: Understand the biochemical basis of disease based on clinical investigations.

CO-2: Inborn errors of Carbohydrate. Protein, lipid metabolism with clinical symptoms, diagnosis and treatment,

CO-3: Provides information on Gastric and renal function tests and latest instrumentation for assessing gastric and renal function.

CO-4: Gain knowledge on functions of liver and assessing its function through various diagnostic tests.

CO-5: Obtain information regarding disorders of Thyroid, Pituitary and sex hormones

##### **Elective Paper IV: Signal Transduction (PBYA41C)**

On successful completion of the course students will be able to

CO-1 Understand the basic elements of intracellular and intercellular signal transduction pathways

CO-2 Obtain information regarding structure and regulation of protein kinases and protein phosphatases

CO-3 Gain knowledge on receptors that couple to G proteins its signal transduction in eukaryotic cells

CO-4 Acquire information about JAK-STAT and MAPK pathways

CO-5 know about nuclear receptors and cell surface receptors their signal transduction pathways

#### **Elective Paper V: Immunochemistry(PBYA42C)**

At the end of the course, students able to

CO-1: To understand actions of defense system.

CO-2: Acquaint the knowledge of immune components.

CO-3: To draw and prepare charts about different immunological process.

CO-4: To describe the mechanism of immunological reactions.

CO-5: Apply and develop the principles for the protection of human life.

#### **Core Paper-XIV: Practical-III(PBYL41C)**

**On Successful completion of course, students will be able to**

CO-1: Demonstrate the principles of laboratory practices in clinical biochemistry.

CO-2: Design and develop antioxidant assay for biochemical project work.

CO-3: Able to visualize the blood cells under microscope.

CO-4: Interpret the results of liver function test and renal function test.

CO-5: Develop a strategy to record the biochemical parameters to diagnose and prevent physiological defective conditions.

**DEPARTMENT OF COMPUTER SCIENCE**  
**B.SC COPUTER SCIENCE**

<b>Core Paper Theory - 1</b>			
Title of the paper with subject code	<b>Programming in C</b>		
Category of the course	Year	Semester	Credits
Core	I	I	4

CO-1: Understand the fundamentals of Tokens, Data types, operators, library functions and Input / Output statements of C-language.

CO-2: Comprehend the branching constructs and looping constructs of C-language and write simple programs implementing each of the constructs.

CO-3: Analyze User-defined functions, recursion and storage classes such as auto, extern, static with an example program illustrating its use.

CO-4: Demonstrate the concept of Array and identify how to use Integer array, char array in a program. Compare and contrast User-defined data types such as Structures and Union.

CO-5: Review the concept of pointers and how to use pointers to various data types, pointers to arrays, pointers to functions, pointers to structures. Create a program to illustrate the usage of file pointer and file handling streams for input and output of data.

<b>Core Practical - 1</b>			
Title of the paper with subject code	<b>Programming in C Lab</b>		
Category of the course	Year	Semester	Credits
Core	I	I	3

CO-1: Understand the basic concept of C Programming, and its different modules that includes conditional and looping expressions, Arrays, Strings, Functions, Pointers, Structures and File programming

CO-2: Acquire knowledge about the basic concept of writing a program.

CO-3: Role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language.

CO-4: Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.

CO-5: Role of Functions involving the idea of modularity.

<b>Core Paper Theory - 2</b>			
Title of the paper with subject code	<b>Digital Electronics &amp; Microprocessors</b>		
Category of the course	Year	Semester	Credits
Core	I	II	4

CO-1: Demonstrate conversions between number systems and understanding the logic gates.

Apply Boolean algebra and theorem for simplification of Boolean functions and also apply Karnaugh map, tabulation method for reducing Boolean expressions

CO-2: Deduce the working principles of various flip flops such as RS, JK, D and T Flip-Flops, Registers and Counters. Design the circuits for Adders, Subtractors, Decoders, Encoders, Multiplexers, Demultiplexers.

CO-3: Apply Assembly language constructs such as branching, looping, subroutines, conditional calls and addressing modes of 8085 MPU

CO-4: Deduce assembly level programs to perform the conversions between number systems and BCD to write simple arithmetic programs in assembly level language of 8085 MPU.

CO-5: Illustrate the concept of Interrupts and how interrupts can be used to implement the I/O functions such as Memory-Mapped I/O and Direct Memory Access.

<b>Core Practical - 2</b>			
Title of the paper with subject code	<b>Digital Electronics &amp; Microprocessors Lab</b>		
Category of the course	Year	Semester	Credits
Core	I	II	3

CO1: Understand, analyze and apply the basics of Digital Electronics like logic gates, flip flops, counters, registers.

CO2: Understand, analyze and apply the basics of microprocessor instruction sets, assembly level programming basics.

CO3: Deduce Adder and subtractor circuits and realize the circuits using universal gates.

CO4: Deduce Arithmetic operations such as addition, subtraction, multiplication, division using assembly language instructions and mnemonic codes.

CO5: Create sorting programs in ascending and descending order, searching programs and minimum and maximum programs using assembly level instructions.



<b>Core Paper Theory - 3</b>			
Title of the paper with subject code	<b>Programming in C++ and Data Structures</b>		
Category of the course	Year	Semester	Credits
Core	II	III	4

CO-1: Conceive the principles of Object Oriented Programming paradigm, its advantages, disadvantages and applications. Understand how C++ programming language can be used to implement the OOP's concepts through Class, Object, inheritance, polymorphism.

CO-2: Recall the Programming constructs such as branching statements and looping statements of C++ language, Class, object, and file stream classes.

CO-3: Understanding the concepts of basic data structures such as stack, queue, Linked list, applications of stacks.

CO-4: Comprehend the understanding of Trees, Graphs, its traversals, AVL tree, B tree, Hash table and functions.

CO-5: Calculate the single source shortest path using Dijkstra's Algorithm by representing the problem as graph.

<b>Core Practical - 3</b>			
Title of the paper with subject code	<b>Programming in C++ and Data Structures Lab</b>		
Category of the course	Year	Semester	Credits
Core	II	III	3

CO1: Apply object-oriented programming features to program design and implementation

CO2: Understand object-oriented concepts and how they are supported by C++

CO3: Understand implementation issues related to object-oriented techniques.

CO4: Demonstrate the ability to analyze, use, and create functions, classes, to overload operators.

CO5: Demonstrate the ability to understand and use inheritance and Pointers when creating or using classes and create templates

CO6: Determine which algorithm or data structure to use in different scenarios and be familiar with writing recursive methods.

CO7: Demonstrate understanding of the abstract properties of various data structures such as stacks, queues, lists, trees and graphs and Use various data structures effectively in application programs.

<b>Core Paper Theory - 4</b>			
Title of the paper with subject code	<b>Programming In Java</b>		
Category of the course	Year	Semester	Credits
Core	II	IV	4

CO-1: Understand how Java implements the Object Oriented Programming concepts, why it is called platform independent language and what makes it a network based language.

CO-2: Analyze the syntax specifications of class, object, package, inheritance, interface and other constructs of branching and looping statements in Java language as well as how Applets can be used for creating web based programs.

CO-3: Demonstrate the concepts of Exception handling constructs along with multi threading features supported by java.

CO-4: Evaluate various I/O streams and file streams available in Java for handling different types of data.

CO-5: Synthesis a simple chat application program in java through socket programming that incorporates various GUI components with the help of AWT classes of java.

<b>Core Practical - 4</b>			
Title of the paper with subject code	<b>Java Programming Lab</b>		
Category of the course	Year	Semester	Credits
Core	II	IV	3

CO1: Understand programming language concepts, particularly Java and object-oriented concepts.

CO2: Write, debug, and document well-structured Java applications

CO3: Implement Java classes from specifications and effectively create and use objects from predefined class libraries

CO4: Understand the behavior of primitive data types, object references, and arrays

CO5: Apply decision and iteration control structures to implement algorithms

CO6: Write simple recursive algorithms

CO7: Implement interfaces, inheritance, and polymorphism as programming techniques and apply exceptions handling

<b>Core Paper Theory - 5</b>			
Title of the paper with subject code	<b>Relational Database Management Systems</b>		
Category of the course	Year	Semester	Credits
Core	III	V	4

CO-1: Understand the basics of Database management, architecture, Architecture, Data models and ER diagrams.

CO-2: Infer the concepts of Relational model and relational calculus. Apply the rules for converting ER model to a relational model and implement SQL queries on the relational model.

CO-3: Summarize the normal forms for the relational model based on functional dependencies, multi-values dependencies and join dependencies.

CO-4: Discuss ACID properties of transactions and system recovery. Illustrate the need for concurrency control mechanism in DBMS such as Locking based protocols and Time stamp based protocols.

CO-5: Evaluate the advanced concepts of storage disks such as RAID, B+ trees, indexing and hashing concepts.

<b>Core Paper Theory - 6</b>			
Title of the paper with subject code	<b>Object Oriented Analysis and Design</b>		
Category of the course	Year	Semester	Credits
Core	III	V	4

CO-1: Recall the object oriented concepts for analysis and design of systems and gather functional requirements.

CO-2: Analyze the real world problems using the use case diagrams.

CO-3: Apply knowledge of OOPs concepts in Object Oriented Design and analyze the case study for the UML notations.

CO-4: Draw activity and state chart diagram for real word applications for evaluating a class diagram and object diagram for user requirements

CO-5 Design case studies and model it in different views with respect user requirement such as use case, logical, component and deployment and etc, and preparation of document of the project for the unified Attendance application.

<b>Core Paper Theory - 7</b>			
Title of the paper with subject code	<b>Operating System</b>		
Category of the course	Year	Semester	Credits
Core	III	V	4

CO-1: Understand the fundamentals of Operating System structures, focusing on process scheduling, memory management, file systems and I/O systems. Summarize various process-scheduling algorithms for a processor

CO-2: Identify the problem of race condition in time sharing operating system and the need for process synchronization. Relate the effects of synchronization on creation of deadlock. Discuss the methods of deadlock avoidance, prevention and ignoring.

CO-3: Compare and contrast different memory management methods and discuss how virtual memory is implemented by memory management unit using page replacement algorithm.

CO-4: Summarize the file structures and directory structure concepts along with its protection, implementation and recovery of file system. Deduce how file systems is implemented in Unix OS and Window OS.

CO-5: Demonstrate how I/O subsystems work and discuss how Mass storage structure work such as disk scheduling and management along with RAID technologies.

<b>Core Paper Theory - 8</b>			
Title of the paper with subject code	<b>Software Engineering</b>		
Category of the course	Year	Semester	Credits
Elective	III	V	4

CO-1: Understand the Software Engineering concepts for creation of software project and product.

CO-2: Plan a Software Project involving project scheduling and tracking along with risk analysis of the project undertaken.

CO-3: Discuss the Software Configuration Management system for a software project. Analyze the sequence of steps in software project and do a analysis modeling.

CO-4: Review various Design concepts in Software engineering such as Architectural design and User Interface design.

CO-5: Demonstrate the Component level design and testing techniques and strategies for the software along with the metrics for the software design.

<b>Core Paper Theory - 9</b>			
Title of the paper with subject code	<b>Visual Programming</b>		
Category of the course	Year	Semester	Credits
Elective	III	V	4

CO-1: Comprehend the Event-driven Programming and GUI model of Visual programming. Understand the features of VB IDE along with properties window, tool box window, design window, coding window.

CO-2: Analyze the programming constructs of branching and looping in Visual Basic with its built-in functions and properties.

CO-3: Demonstrate the use of various Controls such as Label, Text box, command button, option button, list box, combo box, etc., along with its unique properties and methods.

CO-4: Deduce the usage of common Dialog boxes, its properties, methods and how MDI forms can be used for creating multiple forms.

CO-5: Review various types of events for different controls and design an application with controls and events for creating a College Student Database that stores personal information of students.

<b>Core Paper Theory - 10</b>			
Title of the paper with subject code	<b>Software Project Management</b>		
Category of the course	Year	Semester	Credits
Elective	III	V	4

CO-1: Define Estimation of project cost and prepare cost-benefit evaluation among projects

CO-2: Perform project scheduling, activity network analysis and risk management

CO-3: Apply schedule and cost control techniques for project monitoring including contract management.

CO-4: Deduce quality models in software projects for maintaining software quality and reliability.

CO-5: Design a suitable project organization structure, leadership, decision and motivation styles, proper safety and ethical practices and be responsible to the society.

<b>Core Practical - 5</b>			
Title of the paper with subject code	<b>RDBMS-Lab</b>		
Category of the course	Year	Semester	Credits
Core	III	V	3

CO1: Brief knowledge about SQL Fundamentals.

CO2: Able to handle with different Data Base languages.

CO4: Table View, Log & Triggers.

CO5: Introduction to different Database packages(Oracle/ MySql, etc) Commit & Rollback.

CO6: Handling online Transactions.

CO7: Database connectivity with front-end.

<b>Core Paper Theory - 11</b>			
Title of the paper with subject code	<b>Computer Networks</b>		
Category of the course	Year	Semester	Credits
Core	III	VI	4

CO-1: Recall the concepts of communication, types of networks, transmission mode, types of medium, protocols and addresses.

CO-2: Apply layered protocol approach to communication representing OSI Reference model explaining the functional characteristics of each layer.

CO-3: Analyzing the protocols respective to the physical, data link, network, transport, session, presentation and application layers.

CO-4: Evaluate error control using error detection and correction, flow control using sliding window mechanism, IP addressing and subnet masking.

CO-5: Create an appropriate networking architecture for an organizational structure along with relevant protocols to support the network.

<b>Core Paper Theory - 12</b>			
Title of the paper with subject code	<b>Web Technology</b>		
Category of the course	Year	Semester	Credits
Core	III	VI	5

CO-1: Understand the methods for creating web pages using various scripting languages such as Java script, C# and ASP.NET.

CO-2: Analyze Document Object Model, browser object, navigation object, build-in and user-defined objects of Java Sript.

CO-3: Analyze the features of C# and its fundamentals, indexes, collections, regular expressions, Exception handling and events of C# language.

CO-4: Deduce ASP.NET framework and analyze HTML, Web Server control objects for creating a dynamic web page.

CO-5: Generate ASP applications that use Request and Response objects with OLEDB connections using IIS and address security issues in ASP.NET.

<b>Core Paper Theory - 13</b>			
Title of the paper with subject code	<b>Systems Software</b>		
Category of the course	Year	Semester	Credits
Elective	III	VI	4

CO-1: Recall the basic functioning of compilers, assemblers, interpreters and steps involved in executing a High level program.

CO-2: Design, Analyze and Implement one pass, two pass or multi pass assembler

CO-3: Design, Analyze and Implement loader, linker and macros.

CO-4: Assess various system software tools for editing, debugging and creating an user interface.

CO-5: Critique the features of modern editing /debugging tools.

<b>Core Paper Theory - 14</b>			
Title of the paper with subject code	<b>Data Mining</b>		
Category of the course	Year	Semester	Credits
Elective	III	VI	4

CO-1: Understanding the data mining concepts and different types of data warehouse such as Relational, Transactional, Object oriented, spatio-temporal, multimedia databases.

CO-2: Comprehend the data preprocessing techniques such as data reduction, data integration, data transformation, data reduction and discretization.

CO-3: Analyze various data mining techniques such as association rule mining, Multilevel, Multidimensional, and Constraint Based Association Mining and implement Apriori algorithm.

CO-4: Compare and contrast the classification and prediction techniques such as Tree induction, Bayesian Classification and Back Propagation.

CO-5: Review various Clustering Methods such as Hierarchical Methods, Density Based Methods, Web Mining, Spatial Mining and Temporal Mining.

<b>Core Paper Theory - 15</b>			
Title of the paper with subject code	<b>E-Commerce</b>		
Category of the course	Year	Semester	Credits
Elective	III	VI	4

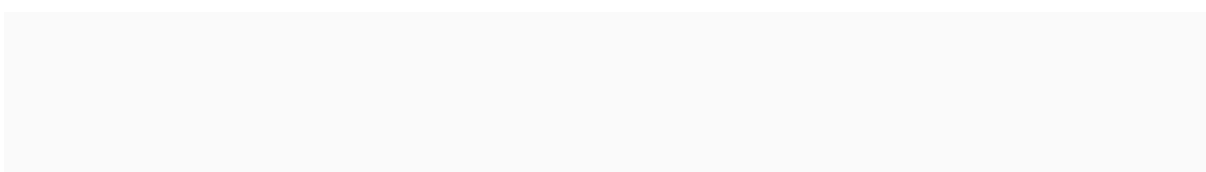
CO-1: Understand the foundations, Goals, technical components of E-commerce and advantages of using ecommerce over traditional commerce.

CO-2: Analyze the security issues and threats in e-commerce including Business to Consumer, Business-to-Business, Intra-organizational.

CO-3: Apply DES, Public Key Encryption and RSA algorithms for authorization and authentication.

CO-4: Access EDI models and payment of fund transfers using electronic cash.

CO-5: Create a web based marketing model for organic farm products using secure electronic transaction protocols.





<b>Core Paper Theory - 16</b>			
Title of the paper with subject code	<b>Digital Image Processing</b>		
Category of the course	Year	Semester	Credits
Elective	III	VI	4

CO-1: Understand the concepts of Image sensing steps and Image representation for analog and Digital Image.

CO-2: Apply Image processing techniques for noise removal and image enhancement from Digital Image.

CO-3: Analyze Image transformation techniques for analog and digital image.

CO-4: Evaluate Image compression models such as Huffman coding, JPEG, etc. for a given Digital Image.

CO-5: Design a Fourier Transform model to convert an analog image to a digital image.

<b>Core Paper Theory - 17</b>			
Title of the paper with subject code	<b>Software Testing</b>		
Category of the course	Year	Semester	Credits
Elective	III	VI	4

CO-1: Investigate the reason for bugs and analyze the principles in software testing to prevent and remove bugs

CO-2: identify the needs of software test automation, and define and develop a test tool to support test automation.

CO-3: Apply Flow/Graphs and Path Testing and Transaction Flow Testing Techniques as testing strategies

CO-4: Deduce Domain testing and syntax testing metrics and state graph methodologies.

CO-5: Device verification and validation tools for various levels of testing for software products such win runner tool.

<b>Core Paper Theory - 18</b>			
Title of the paper with subject code	<b>Computer Graphics and Multimedia</b>		
Category of the course	Year	Semester	Credits
Elective	III	VI	4

CO-1: Understand the principles of graphical components generated on computer displays.

CO-2: Infer output primitives and algorithms for line drawing, Circle generation and Ellipse drawing. Apply two dimensional transformations on objects and two dimensional viewing of line, curve, and polygon.

CO-3: Identity how Text, images and graphics can be used for multimedia systems and its applications in real world.

CO-4: Deduce how animation tools and techniques can be used for morphing in multimedia projects.

CO-5: Design a multimedia project using audio, video, textual and database driven project for creating the college website.

<b>Core Practical - 5</b>			
Title of the paper with subject code	<b>Web Technology Lab</b>		
Category of the course	Year	Semester	Credits
Core	III	VI	3

CO1: Understand, analyze and apply the role of languages like HTML, DHTML, CSS, XML, Javascript, VBScript, ASP.NET and protocols in the workings of the web and web applications

CO2: Analyze a web project and identify its elements and attributes in comparison to traditional projects.

CO3: Understand, analyze and create web pages using HTML, DHTML and Cascading Styles sheets.

CO4: Understand, analyze and build dynamic web pages using JavaScript and VBScript (client side programming).

CO5: Understand, analyze and build interactive web applications.

## M. SC COMPUTER SCIENCE

Title of the paper	<b>System Software</b>	
Category :	Year & Semester	Credits
	<b>First year &amp; Semester -I</b>	4

CO-1: Recall the basic functioning of compilers, assemblers, interpreters and steps involved in executing a High level program.

CO-2: Design, Analyze and Implement one pass, two pass or multi pass assembler

CO-3: Design, Analyze and Implement loader, linker and macros.

CO-4: Assess various system software tools for editing, debugging and creating an user interface.

CO-5: Critique the features of modern editing /debugging tools.

Title of the paper	<b>Advanced Java Programming</b>	
Category :	Year & Semester	Credits
	<b>First year &amp; Semester -I</b>	4

CO-1: Understand the basics of Servlet Life Cycle, Java Beans, EJB, RMI and JSP concepts.

CO-2: Apply classes and methods in servlets to learn the basics of polymorphism through use of super-classes and interfaces.

CO-3: Analyze how to handle exceptions and errors in Servlets and how to create Remote Method Invocation objects between source and destination.

CO-4: Comment on syntax and objects used in Java Server Pages on how to efficiently use front end design of a web page.

CO-5: Develop sophisticated, interactive user interfaces using the Java Swing class and appropriate layout managers.

Title of the paper	<b>Design and Analysis of Algorithms</b>	
Category :	Year & Semester	Credits
	<b>First year &amp; Semester -I</b>	4

CO-1: Understanding of steps in design of algorithms and analysis of time complexity and space complexity using asymptotic notation.

- CO-2: Describe and differentiate 5 broad types of design methods such as Divide and Conquer, Greedy, Backtracking, Branch and Bound, Dynamic Programming
- CO-3: Demonstrate knowledge about significance of each of the methods and differentiating various methods in solving specific problems.
- CO-4: Evaluating the performance of the methods in solving problems using time complexity analysis with asymptotic notation.
- CO-5: Design an algorithm for travelling salesman problem using 5 methods.

Title of the paper	<b>Theoretical Foundations of Computer Science</b>	
Category :	Year & Semester	Credits
	<b>First year &amp; Semester -I</b>	4

- CO-1: Describe foundations for computation and conversion steps for regular expression, finite automata and grammars.
- CO-2: Analyze the types of Grammars, concentrate on Regular languages and Context Free grammars and its properties.
- CO-3: Apply the pumping lemma for validating regular language and context free language and demonstrate algorithms for conversion between languages.
- CO-4: Evaluate linear automata and push-down automata for a given regular language and context free language.
- CO-5: Produce simple programs for a Turing Machine and List examples of undecidable problems

Title of the paper	<b>Advanced Java Programming Lab.</b>	
Category :	Year & Semester	Credits
	<b>First year &amp; Semester -I</b>	4

- CO-1: Understand the basic of beans programming and servlet programming using Advance Java concepts.
- CO-2: Analyze beans program for processing images and creating 3D plots for a given equation.
- CO-3: Analyze servlet programs for fetching IP address, port number, host name and understand how to use various controls in servlets.

CO-4: Deduce Bean program for creating pie chart, Date programs and implement RMI concepts in Java Servlets.

CO-5: Create a Chat application for multi users using java servlet program.

Title of the paper	<b>Algorithms Lab</b>	
Category :	Year & Semester	Credits
	<b>First year &amp; Semester -I</b>	4

CO-1: Understand how java language can be used for implement algorithm methods such as Divide and conquer, Greedy, Branch and bound, Dyanmic programming and Back tracking.

CO-2: Implement Merge and quick sort using Divide and conquer method through java programs.

CO-3: Implement Knapsack, tree vertex splitting and Job sequencing concepts using greedy method through java programs.

CO-4: Implement All pairs shortest path using Dynamic programming through java program.

CO-5: Create java programs for 8-queen's problem and Hamiltonian cycles using backtracking method through java program.

Title of the paper	<b>Computer Networks</b>	
Category :	Year & Semester	Credits
	<b>First year &amp; Semester -II</b>	4

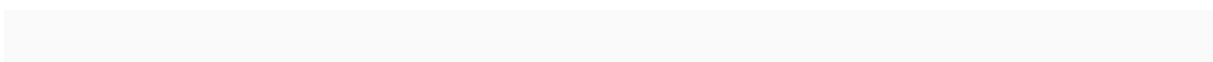
CO-1: Recall the concepts of communication, types of networks, transmission mode, types of medium, protocols and addresses.

CO-2: Apply layered protocol approach to communication representing OSI Reference model explaining the functional characteristics of each layer.

CO-3: Analyzing the protocols respective to the physical, data link, network, transport, session, presentation and application layers.

CO-4: Evaluate error control using error detection and correction, flow control using sliding window mechanism, IP addressing and subnet masking.

CO-5: Create an appropriate networking architecture for an organizational structure along with relevant protocols to support the network.



Title of the paper	<b>Digital Image Processing</b>	
Category :	Year & Semester	Credits
	<b>First year &amp; Semester -II</b>	4

CO-1: Understand the concepts of Image sensing steps and Image representation for analog and Digital Image.

CO-2: Apply Image processing techniques for noise removal and image enhancement from Digital Image.

CO-3: Analyze Image transformation techniques for analog and digital image.

CO-4: Evaluate Image compression models such as Huffman coding, JPEG, etc. for a given Digital Image.

CO-5: Design a Fourier Transform model to convert an analog image to a digital image.

Title of the paper	<b>Object Oriented Analysis and Design</b>	
Category :	Year & Semester	Credits
	<b>First year &amp; Semester -II</b>	4

CO-1: Recall the object oriented concepts for analysis and design of systems and gather functional requirements.

CO-2: Analyze the real world problems using the use case diagrams.

CO-3: Apply knowledge of OOPs concepts in Object Oriented Design and analyze the case study for the UML notations.

CO-4: Draw activity and state chart diagram for real word applications for evaluating a class diagram and object diagram for user requirements

CO-5 Design case studies and model it in different views with respect user requirement such as use case, logical, component and deployment and etc, and preparation of document of the project for the unified Attendance application.

Title of the paper	<b>Mobile Computing</b>	
Category : Elective	Year & Semester	Credits
	<b>First year &amp; Semester -II</b>	4

CO-1: Understand the basic functioning of mobile computing devices and wireless devices needed for wireless transmission.

CO-2: Comprehend the protocols used for mobile computing such as GSM and architecture for satellite systems.

CO-3: Discuss various types of wireless LANs, Hiper LANs, Bluetooth standards used and its security issues.

CO-4: Analyze Mobile network layer and Packet Delivery strategies in mobile network. Apply Tunneling and Reverse Tunneling methods in Adhoc Networks.

CO-5: Review Mobile transport layer, Congestion Control in transport layer and its protocols such as TCP. Discuss the performance of TCP over wireless transmission.

Title of the paper	<b>Computer Simulation and Modeling</b>	
Category :	Year & Semester	Credits
Elective	<b>First year &amp; Semester -II</b>	4

CO-1: Comprehend the basics of computer simulation using various distributions using different statistical models and analysis of Random generated data.

CO-2: Classify various statistical models for simulation of manufacturing using discrete distribution and continuous distribution such as Poisson process.

CO-3: Execute various types of statistical distributions and techniques for random number generation.

CO-4: Check on various tests involved for input data analysis so as to verify, validate and calibrate the estimated model in accordance with the input data

CO-5: Review various methods for output data analysis done for different types of simulations to measure the model performance and their estimation.

Title of the paper	<b>Computer Graphics</b>	
Category :	Year & Semester	Credits
Elective	<b>First year &amp; Semester -II</b>	4

CO-1: Understand the principles of graphical components generated on computer displays.

CO-2: Infer output primitives and algorithms for line drawing, Circle generation and Ellipse drawing.

CO-3: Apply two dimensional transformations on objects and two dimensional viewing of line, curve, and polygon.

CO-4: Evaluate various color models and animations such as graphics programming packages such as OPENGL

CO-5: Build a camera using a program to create shaded objects and to render textures and drawing shadows on an image.

Title of the paper	<b>RDBMS Lab</b>	
Category :	Year & Semester	Credits
	<b>First year &amp; Semester -II</b>	4

CO1: Brief knowledge about SQL Fundamentals.

CO2: Able to handle with different Data Base languages.

CO4: Table View, Log & Triggers.

CO5: Introduction to different Database packages (Oracle/ MySql, etc) Commit & Rollback.

CO6: Handling online Transactions.

CO7: Database connectivity with front-end.

Title of the paper	<b>Image Processing using Java Lab</b>	
Category :	Year & Semester	Credits
	<b>First year &amp; Semester -II</b>	4

CO-1: Understand Basic image manipulation such as reading, writing, quantization, sub sampling through java program.

CO-2: Comprehend Basic Intensity transformation and basic of Histogram Processing through java programs.

CO-3: Analyze Filtering concepts in spatial domain-2D FFT and smoothing filters using java programs.

CO-4: Apply Image coding using transformations with SPIHT algorithm through java program.

CO-5: Design a java program for Color image Enhancement with spatial sharpening techniques.

Title of the paper	<b>Principles of Compiler Design</b>	
Category :	Year & Semester	Credits
	<b>Second year &amp; Semester -III</b>	4



- CO-1: Comprehend the five phases of the compiler design and describe the nitty-gritty of functions of each of the phases.
- CO-2: Application of Regular Expression and Finite Automata for Lexical analysis of the language to describe the tokens and to recognize the tokens respectively by the compilers.
- CO-3: Analysis of parsing procedures by compare and contrast of various bottom-up and top-down parsing methods.
- CO-4: Evaluate the intermediate codes of the compiler and inspect optimization techniques for the intermediate code.
- CO-5: Synthesize a machine code of a trivial compiler for the design of Identifier token by constructing Regular Expression, Automata, Grammars, building a parser and an optimized intermediate code for the identifier

Title of the paper	<b>Data Warehousing and Data Mining</b>	
Category :	Year & Semester	Credits
	<b>Second year &amp; Semester -III</b>	4

- CO-1: Understanding the data mining concepts and different types of data warehouse such as Relational, Transactional, Object oriented, spatio-temporal, multimedia databases.
- CO-2: Comprehend the data preprocessing techniques such as data reduction, data integration, data transformation, data reduction and discretization.
- CO-3: Analyze various data mining techniques such as association rule mining, Multilevel, Multidimensional, and Constraint Based Association Mining and implement Apriori algorithm.
- CO-4: Compare and contrast the classification and prediction techniques such as Tree induction, Bayesian Classification and Back Propagation.
- CO-5: Review various Clustering Methods such as Hierarchical Methods, Density Based Methods, Web Mining, Spatial Mining and Temporal Mining.

Title of the paper	<b>Network Security</b>	
Category : <b>Elective - II</b>	Year & Semester	Credits
	<b>Second year &amp; Semester -III</b>	4

- CO-1: Understand the symmetric ciphers and classical encryption techniques.

CO-2: Comprehend the concepts of Block ciphers and the Data Encryption Standards such as Public key Encryption and Hash Functions, Public-Key Cryptography and RSA

CO-3: Analyze Network Security Practices through Authentication applications and Electronic Mail Security

CO-4: Apply Network Security using IP Security and Web Security.

CO-5: Review System Security by implementing firewalls for Intruder deduction and Malicious Software detection.

Title of the paper	<b>TCP/IP</b>	
Category : <b>Elective - II</b>	Year & Semester	Credits
	<b>Second year &amp; Semester -III</b>	4

CO-1: Recall the basic concepts of networking, communication, addressing and protocols.

CO-2: Understand various routing protocol such as CIDR, AARP, RARP, IP, ICMP, IPV6 and sub -netting concepts.

CO-3: Conceptualize the various fields of Transmission Control Protocol and analyze flow control and error control mechanism in TCP.

CO-4: Deduce the Internet Protocol fields, its versions and reliability level of IP in comparison to TCP.

CO-5: Process a detailed implementation of TCP along with flow control, error control and congestion avoidance mechanism.

Title of the paper	<b>Artificial Neural Networks</b>	
Category : <b>Elective - II</b>	Year & Semester	Credits
	<b>Second year &amp; Semester -III</b>	4

CO-1: Comprehend the relationship between biological neuron and artificial neuron and its working procedures.

CO-2: Apply Artificial Neural Network to implement Forward propagation and Back Propagation algorithms with various weight training methods.

CO-3: Analyze associative memory such as Hopfield Net and Bidirectional Associative memory using neural network approach.

CO-4: Evaluate various supervised and unsupervised learning methods using single level and multilevel neural networks.

CO-5: Review the various applications of neural network models by comparing and contrasting different types of neural network models

Title of the paper	<b>Cryptography</b>	
Category : Elective - III	Year & Semester	Credits
	<b>Second year &amp; Semester -III</b>	4

CO-1: Define Conventional Encryption model such as DES, RC 5 and AES.

CO-2: Explain Number Theory concepts such as Modular arithmetic, Euler's theorem, Chinese remainder theorem and RSA algorithm.

CO-3: Comprehend the principles of Public key Cryptography such as RSA algorithm and key management such as Diff – Hellman key exchange

CO-4: Review Authorization tools using Hash functions, Authentication requirements, functions, codes and Secure Hash algorithms

CO-5: Discuss Digital Signature and Authentication Protocols and Digital signature standards

Title of the paper	<b>Cloud Computing</b>	
Category : Elective - III	Year & Semester	Credits
	<b>Second year &amp; Semester -III</b>	4

CO-1: Understand the concepts of cloud computing, need for cloud computing, advantages and disadvantages.

CO-2: Discuss various forms of cloud services, platform as service, software as service, infrastructure as service and cloud service deployment.

CO-3: Discuss how cloud computing can be used for collaborating contact list, community, corporations, group projects and events.

CO-4: Review various cloud services available can be used for collaborating for online planning, schedule management, task management, project management, database and sharing files.

CO-5: Review web based collaborating tools, web conference tools and collaborating via blogs and wikis.

Title of the paper	<b>Distributed Database</b>	
Category : Elective - III	Year & Semester	Credits
	<b>Second year &amp; Semester -III</b>	4

- CO-1: Explain the techniques used for data fragmentation, replication, and allocation during the distributed database design process.
- CO-2: Analyze simple strategies for executing a distributed query to select the strategy that minimizes the amount of data transfer.
- CO-3: Apply the two-phase commit protocol to deal with committing a transaction that accesses databases stored on multiple nodes.
- CO-4: Validating distributed concurrency control based on the distinguished copy techniques and the voting methods.
- CO-5: Build Architecture for deploying Distributed Database model to replace a centralized University examination system.

## M. SC CST

Title of the paper	<b>Fundamentals of Digital Computers</b>	
Category : Core	Year & Semester	Credits
	<b>Firs year &amp; Semester -I</b>	4

**CO-1:** Demonstrate the principles of number systems, conversion between number systems and understanding the logic gates.

**CO-2:** Apply Boolean algebra and theorem for simplification of Boolean functions and also apply Karnaugh map, tabulation method for reducing Boolean expressions.

**CO-3:** Deduce the working principles of various flip flops such as RS, JK, D and T Flip-Flops, Registers and Counters.

**CO-4:** Design the circuits for Adders, Subtractors, Decoders, Encoders, Multiplexers, Demultiplexers.

**CO-5:** Designing circuits using ROM/PLA.

Title of the paper	<b>Internet and its Applications</b>	
Category : Core	Year & Semester	Credits
	<b>Second year &amp; Semester III</b>	4

**CO-1:** Understand the basic concepts of Internet, protocols, Emails, web based chats and browsing tools.

**CO-2:** Understand how to set up internet connections and intranet connections through Dial-up connections.

**CO-3:** Analyze various protocols related to Email services, Email applications, sending and receiving documents through Email accounts.

**CO-4:** Deduce different forms of web based chats through text and conferencing through audio / video modes along with identifying various chat vendors worldwide.

**CO-5:** Review multiple web browsers available in the market and discuss security, privacy issues in the browsers as well as wallet options in online product purchase.

Title of the paper	<b>Microprocessors</b>	
Category : Core	Year & Semester	Credits
	<b>Second year &amp; Semester III</b>	4

CO-1: Understand basics of number systems and concepts of microprocessors, microcontrollers and assembly languages. Comprehend the Architecture of 8085 microprocessor with its instruction sets and classifications.

CO-2: Apply Assembly language constructs such as branching, looping, subroutines, conditional calls and addressing modes of 8085 MPU.

CO-3: Analyze how different types of counters and time delays can be implemented using 8085 MPU.

CO-4: Deduce assembly level programs to perform the conversions between number systems and BCD to write simple arithmetic programs in assembly level language of 8085 MPU.

CO-5: Illustrate the concept of Interrupts and how interrupts can be used to implement the I/O functions such as Memory-Mapped I/O and Direct Memory Access.

Title of the paper	<b>Programming in C and C++</b>	
Category : Core	Year & Semester	Credits
	<b>Second year &amp; Semester III</b>	4

CO-1: Understand the language constructs and syntax of procedure oriented language - C and Object Oriented language - C++.

CO-2: Comprehend the data types, operators, branching constructs and looping constructs, arrays, pointers and storage classes in c and C++ programming languages.

CO-3: Analyze the object oriented programming paradigms such as Data Hiding, Encapsulation, Inheritance, Data Abstraction, and Polymorphism and also learn how to apply the OOP's concept using C++.

CO-4: Evaluate programs for implementing operator overloading and polymorphism in C++.

CO-5: Create programs to experiment file handling concepts of C and C++ using file streams operations.

<b>Core Practical - 2</b>			
Title of the paper with subject code	<b>C Programming and Microprocessors Lab</b>		
Category of the course	Year	Semester	Credits
Core	II	III	4

CO1: Understand the basic concept of C Programming, and its different modules that includes conditional and looping expressions, Arrays, Strings, Functions, Pointers, Structures and File programming

CO2: Acquire knowledge about the basic concept of writing a program.

CO3: Role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language.

CO4: Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.

CO 5: Role of Functions involving the idea of modularity.

Title of the paper	<b>Operating Systems</b>	
Category : Core	Year & Semester	Credits
	<b>Second year &amp; Semester IV</b>	4

CO-1: Understand the fundamentals of Operating System structures, focusing on process scheduling, memory management, file systems and I/O systems. Summarize various process-scheduling algorithms for a processor

CO-2: Identify the problem of race condition in time sharing operating system and the need for process synchronization. Relate the effects of synchronization on creation of deadlock. Discuss the methods of deadlock avoidance, prevention and ignoring.

CO-3: Compare and contrast different memory management methods and discuss how virtual memory is implemented by memory management unit using page replacement algorithm.

CO-4: Summarize the file structures and directory structure concepts along with its protection, implementation and recovery of file system. Deduce how file systems is implemented in Unix OS and Window OS.

CO-5: Demonstrate how I/O subsystems work and discuss how Mass storage structure work such as disk scheduling and management along with RAID technologies.

Title of the paper	<b>Data Structures</b>	
Category : Core	Year & Semester	Credits
	<b>Second year &amp; Semester IV</b>	4

CO-1: Comprehend the concepts of abstract data types, arrays, lists, Asymptotic analysis of time and space complexity for algorithms.

CO-2: Understanding the concepts of basic data structures such as stack, queue, Linked list, applications of stacks.

CO-3: Comprehend the concept of Trees, its types: Binary search trees, Threaded binary trees, its applications, Graphs, its traversals, its types: spanning tree and finding minimum cost spanning tree.

CO-4: Evaluate the working of various sorting methods, optimal sorting techniques and large object sorting in disks.

CO-5: Demonstrate the characteristics of AVL tree, B tree, Hash table and functions.

Title of the paper	<b>Object Oriented Analysis and Design</b>	
Category : Core	Year & Semester	Credits
	<b>Second year &amp; Semester IV</b>	4

CO-1: Recall the object oriented concepts for analysis and design of systems and gather functional requirements.

CO-2: Analyze the real world problems using the use case diagrams.

CO-3: Apply knowledge of OOPs concepts in Object Oriented Design and analyze the case study for the UML notations.

CO-4: Draw activity and state chart diagram for real word applications for evaluating a class diagram and object diagram for user requirements

CO-5 Design case studies and model it in different views with respect user requirement such as use case, logical, component and deployment and etc, and preparation of document of the project for the unified Attendance application.

Title of the paper	<b>Programming in Java</b>	
Category : Core	Year & Semester	Credits
	<b>Second year &amp; Semester IV</b>	4

CO-1: Understand how Java implements the Object Oriented Programming concepts, why it is called platform independent language and what makes it a network based language.

CO-2: Analyze the syntax specifications of class, object, package, inheritance, interface and other constructs of branching and looping statements in Java language as well as how Applets can be used for creating web based programs.

CO-3: Demonstrate the concepts of Exception handling constructs along with multi threading features supported by java.



CO-4: Evaluate various I/O streams and file streams available in Java for handling different types of data.

CO-5: Synthesis a simple chat application program in java through socket programming that incorporates various GUI components with the help of AWT classes of java.

Title of the paper	<b>Programming in Java Lab</b>	
Category : Core	Year & Semester	Credits
	<b>Second year &amp; Semester IV</b>	4

CO1: Understand programming language concepts, particularly Java and object-oriented concepts.

CO2: Write, debug, and document well-structured Java applications

CO3: Implement Java classes from specifications and effectively create and use objects from predefined class libraries

CO4: Understand the behavior of primitive data types, object references, and arrays

CO5: Apply decision and iteration control structures to implement algorithms

CO6: Implement interfaces, inheritance, and polymorphism as programming techniques and apply exceptions handling

Title of the paper	<b>Database Management Systems</b>	
Category : Core	Year & Semester	Credits
	<b>Third year &amp; Semester V</b>	4

CO-1: Understand the basics of Database management, architecture, Architecture, Data models and ER diagrams.

CO-2: Infer the concepts of Relational model and relational calculus. Apply the rules for converting ER model to a relational model and implement SQL queries on the relational model.

CO-3: Summarize the normal forms for the relational model based on functional dependencies, multi-values dependencies and join dependencies.

CO-4: Discuss ACID properties of transactions and system recovery. Illustrate the need for concurrency control mechanism in DBMS such as Locking based protocols and Time stamp based protocols.

CO-5: Evaluate the advanced concepts of storage disks such as RAID, B+ trees, indexing and hashing concepts.

Title of the paper	<b>Theory of Computation</b>	
Category : Core	Year & Semester	Credits
	<b>Third year &amp; Semester V</b>	4

CO-1: Describe foundations for computation and conversion steps for regular expression, finite automata and grammars.

CO-2: Analyze the types of Grammars, concentrate on Regular languages and Context Free grammars and its properties.

CO-3: Apply the pumping lemma for validating regular language and context free language and demonstrate algorithms for conversion between languages.

CO-4: Evaluate linear automata and push-down automata for a given regular language and context free language.

CO-5: Produce simple programs for a Turing Machine and List examples of undecidable problems

Title of the paper	<b>Visual Programming</b>	
Category : Core	Year & Semester	Credits
	<b>Third year &amp; Semester V</b>	4

CO-1: Comprehend the Event-driven Programming and GUI model of Visual programming. Understand the features of VB IDE along with properties window, tool box window, design window, coding window.

CO-2: Analyze the programming constructs of branching and looping in Visual Basic with its built-in functions and properties.

CO-3: Demonstrate the use of various Controls such as Label, Text box, command button, option button, list box, combo box, etc., along with its unique properties and methods.

CO-4: Deduce the usage of common Dialog boxes, its properties, methods and how MDI forms can be used for creating multiple forms.

CO-5: Review various types of events for different controls and design an application with controls and events for creating a College Student Database that stores personal information of students.

Title of the paper	<b>Computer Networks</b>	
Category : Core	Year & Semester	Credits
	<b>Third year &amp; Semester V</b>	4

CO-1: Recall the concepts of communication, types of networks, transmission mode, types of medium, protocols and addresses.

CO-2: Apply layered protocol approach to communication representing OSI Reference model explaining the functional characteristics of each layer.

CO-3: Analyzing the protocols respective to the physical, data link, network, transport, session, presentation and application layers.

CO-4: Evaluate error control using error detection and correction, flow control using sliding window mechanism, IP addressing and subnet masking.

CO-5: Create an appropriate networking architecture for an organizational structure along with relevant protocols to support the network.

Title of the paper	<b>RDBMS with visual programming Lab.</b>	
Category : Core	Year & Semester	Credits
	<b>Third year &amp; Semester V</b>	4

CO1: Brief knowledge about SQL Fundamentals.

CO2: Able to handle with different Data Base languages.

CO4: Table View, Log & Triggers.

CO5: Introduction to different Database packages (Oracle/ MySql, etc) Commit & Rollback.

CO6: Handling online Transactions.

CO7: Database connectivity with front-end.

Title of the paper	<b>Software Engineering</b>	
Category : Core	Year & Semester	Credits
	<b>Third year &amp; Semester VI</b>	4

CO-1: Understand the Software Engineering concepts for creation of software project and product.

CO-2: Plan a Software Project involving project scheduling and tracking along with risk analysis of the project undertaken.

CO-3: Discuss the Software Configuration Management system for a software project. Analyze the sequence of steps in software project and do a analysis modeling.

CO-4: Review various Design concepts in Software engineering such as Architectural design and User Interface design.

CO-5: Demonstrate the Component level design and testing techniques and strategies for the software along with the metrics for the software design.

Title of the paper	<b>Principles of Compiler Design</b>	
Category : Core	Year & Semester	Credits
	<b>Third year &amp; Semester VI</b>	4

CO-1: Comprehend the five phases of the compiler design and describe the nitty-gritty of functions of each of the phases.

CO-2: Application of Regular Expression and Finite Automata for Lexical analysis of the language to describe the tokens and to recognize the tokens respectively by the compilers.

CO-3: Analysis of parsing procedures by compare and contrast of various bottom-up and top-down parsing methods.

CO-4: Evaluate the intermediate codes of the compiler and inspect optimization techniques for the intermediate code.

CO-5: Synthesize a machine code of a trivial compiler for the design of Identifier token by constructing Regular Expression, Automata, Grammars, building a parser and an optimized intermediate code for the identifier

Title of the paper	<b>Computer Organization And Architecture</b>	
Category : Core	Year & Semester	Credits
	<b>Third year &amp; Semester VI</b>	4

CO-1: Describe basic organization of computer and the architecture of 8086 microprocessor.

CO-2: Categorize the hierarchy of memory component and explain the working procedure of each of the memory types.

CO-3: Compare and contrast the different methods of computer I/O mechanisms.

CO-4: Evaluate computer arithmetic operations on integer number and floating point numbers.

CO-5: Conceptualize instruction level parallelism using instruction level pipelining mechanism.

Title of the paper	<b>Web Technologies</b>	
Category : Core	Year & Semester	Credits
	<b>Third year &amp; Semester VI</b>	4

CO-1: Understand the methods for creating web pages using various scripting languages such as Java script, C# and ASP.NET.

CO-2: Analyze Document Object Model, browser object, navigation object, build-in and user-defined objects of Java Sript.

CO-3: Analyze the features of C# and its fundamentals, indexes, collections, regular expressions, Exception handling and events of C# language.

CO-4: Deduce ASP.NET framework and analyze HTML, Web Server control objects for creating a dynamic web page.

CO-5: Generate ASP applications that use Request and Response objects with OLEDB connections using IIS and address security issues in ASP.NET.

Title of the paper	<b>Web Application Lab</b>	
Category : Core	Year & Semester	Credits
	<b>Third year &amp; Semester VI</b>	4

CO1: Understand, analyze and apply the role of languages like HTML, DHTML, CSS, XML, Javascript, VBScript, ASP.NET and protocols in the workings of the web and web applications

CO2: Analyze a web project and identify its elements and attributes in comparison to traditional projects.

CO3: Understand, analyze and create web pages using HTML, DHTML and Cascading Styles sheets.

CO4: Understand, analyze and build dynamic web pages using JavaScript and VBScript (client side programming).

CO5: Understand, analyze and build interactive web applications.

Title of the paper	<b>Advance Java Programming</b>	
Category : Core	Year & Semester	Credits
	<b>Fourth year &amp; Semester VII</b>	4

CO-1: Understand the basics of Servlet Life Cycle, Java Beans, EJB, RMI and JSP concepts.

CO-2: Apply classes and methods in servlets to learn the basics of polymorphism through use of super-classes and interfaces.

CO-3: Analyze how to handle exceptions and errors in Servlets and how to create Remote Method Invocation objects between source and destination.

CO-4: Comment on syntax and objects used in Java Server Pages on how to efficiently use front end design of a web page.

CO-5: Develop sophisticated, interactive user interfaces using the Java Swing class and appropriate layout managers.

Title of the paper	<b>Design and Analysis of Algorithms</b>	
Category : Core	Year & Semester	Credits
	<b>Fourth year &amp; Semester VII</b>	4

CO-1: Understanding of steps in design of algorithms and analysis of time complexity and space complexity using asymptotic notation.

CO-2: Describe and differentiate 5 broad types of design methods such as Divide and Conquer, Greedy, Backtracking, Branch and Bound, Dynamic Programming

CO-3: Demonstrate knowledge about significance of each of the methods and differentiating various methods in solving specific problems.

CO-4: Evaluating the performance of the methods in solving problems using time complexity analysis with asymptotic notation.

CO-5: Design an algorithm for travelling salesman problem using 5 methods.

Title of the paper	<b>Open Source Programming</b>	
Category : Core	Year & Semester	Credits
	<b>Fourth year &amp; Semester VII</b>	4

CO-1: Understand the history of open source programming and various open source languages such as python, PHP, MySQL.

CO-2: Comprehend the constructs and syntax of python language focusing on regular expressions, lists, dictionaries and exceptions.

CO-3: Demonstrate an understanding of Server side Scripting of PHP language along with its usage syntax, constructs, focusing on session objects and php cookies.

CO-4: Deduce database connectivity to MySQL, manipulating MySQL database using Python and PHP programs.

CO-5: Design an application for online examination portal using open source languages of Python, PHP as front-end and MySQL as back-end.

Title of the paper	<b>Advance Java Programming –Lab</b>	
Category :	Year & Semester	Credits
	<b>Fourth year &amp; Semester VII</b>	4

CO-1: Understand the basic of beans programming and servlet programming using Advance Java concepts.

CO-2: Analyze beans program for processing images and creating 3D plots for a given equation.

CO-3: Analyze servlet programs for fetching IP address, port number, host name and understand how to use various controls in servlets.

CO-4: Deduce Bean program for creating pie chart, Date programs and implement RMI concepts in Java Servlets.

CO-5: Create a Chat application for multi users using java servlet program.

Title of the paper	<b>Open Source Programming –Lab</b>	
Category : Core	Year & Semester	Credits
	<b>Fourth year &amp; Semester VII</b>	4

CO1: Understand the fundamental programming paradigms and constructs in PHP and python language.

CO2: Analyze string processing functions in PHP and python language such finding substring, length of a string, string concatenation.

CO3: Apply basic constructs of arrays, loops and branching statements in the PHP and python language.

CO4: Design a calculator program for validating various arithmetic operations in PHP language.

CO5: Design a python program for creating a web page for validating student mark statement with a Mysql database.

Title of the paper	<b>Computer Graphics</b>	
Category : Elective	Year & Semester	Credits
	<b>Fourth year &amp; Semester VII</b>	4

CO-1: Understand the principles of graphical components generated on computer displays.

CO-2: Infer output primitives and algorithms for line drawing, Circle generation and Ellipse drawing.

CO-3: Apply two dimensional transformations on objects and two dimensional viewing of line, curve, and polygon.

CO-4: Evaluate various color models and animations such as graphics programming packages such as OPENGL

CO-5: Build a camera using a program to create shaded objects and to render textures and drawing shadows on an image.

Title of the paper	<b>Artificial Intelligence And Expert Systems</b>	
Category : Elective	Year & Semester	Credits
	<b>Fourth year &amp; Semester VII</b>	4

CO-1: Demonstrate knowledge of the building blocks of AI as presented in terms of intelligent agents and Expert Systems.

CO-2: Analyze and formalize the problem as a state space, graph, design heuristics and select amongst different search or game based techniques to solve them.

CO-3: Develop intelligent algorithms for knowledge representation using AI programming languages. and also design intelligent systems for Game Playing

CO-4: Experiment logic grammars for creating semantic structures for Natural Language processing.

CO-5: Formulate the capability to represent various real life problem domains using logic based techniques and use this to perform inference or planning.



Title of the paper	<b>Systems Software</b>	
Category :	Year & Semester	Credits
Elective	<b>Fourth year &amp; Semester VII</b>	4

CO-1: Recall the basic functioning of compilers, assemblers, interpreters and steps involved in executing a High level program.

CO-2: Design, Analyze and Implement one pass, two pass or multi pass assembler

CO-3: Design, Analyze and Implement loader, linker and macros.

CO-4: Assess various system software tools for editing, debugging and creating an user interface.

CO-5: Critique the features of modern editing /debugging tools.

Title of the paper	<b>Unix And Shell Programming</b>	
Category :	Year & Semester	Credits
Core	<b>Fourth year &amp; Semester VIII</b>	4

CO-1: Understand all the UNIX utilities, the basic UNIX process structure and the UNIX file system

CO-2: Articulate simple UNIX filters, UNIX pipes and redirection, UNIX environment, traps, signals, and Regular Expressions.

CO-3: Deduce least one Shell scripting language and Classify system calls in UNIX

CO-4: Review the concepts of process, threads, and file structure,

CO-5: Compose a Shell scripting for creating an application with Inter process Communication using pipes, shared memory, semaphores and messages.

Title of the paper	<b>Distributed Databases</b>	
Category :	Year & Semester	Credits
Core	<b>Fourth year &amp; Semester VIII</b>	4

CO-1: Explain the techniques used for data fragmentation, replication, and allocation during the distributed database design process.

CO-2: Analyze simple strategies for executing a distributed query to select the strategy that minimizes the amount of data transfer.

CO-3: Apply the two-phase commit protocol to deal with committing a transaction that accesses databases stored on multiple nodes.

CO-4: Validating distributed concurrency control based on the distinguished copy techniques and the voting methods.

CO-5: Build Architecture for deploying Distributed Database model to replace a centralized University examination system.

Title of the paper	<b>E-Commerce</b>	
Category : Core	Year & Semester	Credits
	<b>Fourth year &amp; Semester VIII</b>	4

CO-1: Understand the foundations, Goals, technical components of E-commerce and advantages of using ecommerce over traditional commerce.

CO-2: Analyze the security issues and threats in e-commerce including Business to Consumer, Business-to-Business, Intra-organizational.

CO-3: Apply DES, Public Key Encryption and RSA algorithms for authorization and authentication.

CO-4: Access EDI models and payment of fund transfers using electronic cash.

CO-5: Create a web based marketing model for organic farm products using secure electronic transaction protocols.

Title of the paper	<b>Information Security</b>	
Category : Core	Year & Semester	Credits
	<b>Fourth year &amp; Semester VIII</b>	4

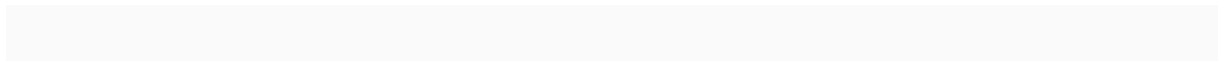
CO-1: Develop an understanding of computer security, operating system security, software security, network security and database security.

CO-2: Apply basic cryptography, how key encryption techniques are used to check for vulnerabilities in operating systems, software, network and database.

CO-3: Analyze various types of authentication models and protocols used in operating systems and security flaws that exist in software.

CO-4: Deduce various threats and vulnerabilities that exist in network structures and defense mechanism for protecting the network.

CO-5: Determine appropriate mechanisms for protecting information systems ranging from operating systems to database management systems and to applications.



Title of the paper	<b>Unix Lab</b>	
Category : Core	Year & Semester	Credits
	<b>Fourth year &amp; Semester VIII</b>	4

CO1: Comprehend the primitive UNIX commands used and also understand the fundamentals of unix operating system.

CO2: Analyze the Inter process communication (IPC) using message queues and pipes using c program.

CO3: Implement wait and signal using semaphores and detect deadlock using c program.

CO4: Device a program to illustrate the various process scheduling methods used in UNIX operating system.

CO5: Create a program for process synchronization and implement classical synchronization problems such as producer-consumer, Dining philosopher's problem and Reader-writer's problem.

Title of the paper	<b>Software Project Management</b>	
Category :	Year & Semester	Credits
Elective	<b>Fourth year &amp; Semester VIII</b>	4

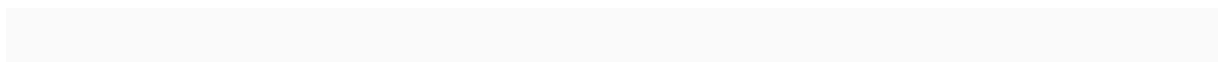
CO-1: Define Estimation of project cost and prepare cost-benefit evaluation among projects

CO-2: Perform project scheduling, activity network analysis and risk management

CO-3: Apply schedule and cost control techniques for project monitoring including contract management.

CO-4: Deduce quality models in software projects for maintaining software quality and reliability.

CO-5: Design a suitable project organization structure, leadership, decision and motivation styles, proper safety and ethical practices and be responsible to the society.



Title of the paper	<b>Fuzzy Logic</b>	
Category :	Year & Semester	Credits
Elective	<b>Fourth year &amp; Semester VIII</b>	4

CO-1: Exhibit knowledge in Classical and Fuzzy sets, Fuzzy logic and Fuzzy relations.

CO-2: Explain the fuzzy arithmetic operations and fuzzy relations involved in fuzzy sets.

CO-3: Implement Possibility theory on fuzzy logic and analyze fuzzy proposition and qualifiers.

CO-4: Deduce principles of uncertainty and non-specificity of fuzzy sets.

CO-5: Create applications of fuzzy logic in soft computing such as medicines.

Title of the paper	<b>Computer Simulation and System Modeling</b>	
Category :	Year & Semester	Credits
Elective	<b>Fourth year &amp; Semester VIII</b>	4

CO-1: Comprehend the basics of computer simulation using various distributions using different statistical models and analysis of Random generated data.

CO-2: Classify various statistical models for simulation of manufacturing using discrete distribution and continuous distribution such as Poisson process.

CO-3: Execute various types of statistical distributions and techniques for random number generation.

CO-4: Check on various tests involved for input data analysis so as to verify, validate and calibrate the estimated model in accordance with the input data

CO-5: Review various methods for output data analysis done for different types of simulations to measure the model performance and their estimation.

Title of the paper	<b>Network Programming</b>	
Category : Core	Year & Semester	Credits
	<b>Fifth year &amp; Semester IX</b>	4

CO-1: Understand the key protocols which support the Internet to be familiar with several common programming interfaces for network communication

CO-2: Demonstrate detailed knowledge of the TCP/UDP Sockets create applications using techniques such as multiplexing, forking, and multithreading.

CO-3: Analyze advanced programming techniques such as IPv6 Socket Programming, with major technologies and protocols used in network communication management.

CO-4: Deduce socket programming protocols such FTP, SMTP, POP, HTTP, SNMP, RTP – Internet Security and Firewall Design

CO-5: Design a system using knowledge of Unix/Linux operating systems to build robust client and server software for interprocess communication environment

Title of the paper	<b>Software Testing</b>	
Category : Core	Year & Semester	Credits
	<b>Fifth year &amp; Semester IX</b>	4

CO-1: Investigate the reason for bugs and analyze the principles in software testing to prevent and remove bugs

CO-2: identify the needs of software test automation, and define and develop a test tool to support test automation.

CO-3: Apply Flow/Graphs and Path Testing and Transaction Flow Testing Techniques as testing strategies

CO-4: Deduce Domain testing and syntax testing metrics and state graph methodologies.

CO-5: Device verification and validation tools for various levels of testing for software products such win runner tool.

Title of the paper	<b>Data Warehousing and Data Mining</b>	
Category : Core	Year & Semester	Credits
	<b>Fifth year &amp; Semester IX</b>	4

CO-1: Understanding the data mining concepts and different types of data warehouse such as Relational, Transactional, Object oriented, spatio-temporal, multimedia databases.

CO-2: Comprehend the data preprocessing techniques such as data reduction, data integration, data transformation, data reduction and discretization.

CO-3: Analyze various data mining techniques such as association rule mining, Multilevel, Multidimensional, and Constraint Based Association Mining and implement Apriori algorithm.

CO-4: Compare and contrast the classification and prediction techniques such as Tree induction, Bayesian Classification and Back Propagation.

CO-5: Review various Clustering Methods such as Hierarchical Methods, Density Based Methods, Web Mining, Spatial Mining and Temporal Mining.

Title of the paper	<b>Network Programming Lab</b>	
Category :	Year & Semester	Credits
	<b>Fifth year &amp; Semester IX</b>	4

CO1: Understand the various network based and web based scripting programs using Javascript, DHTML, ActiveX controls, etc.

CO2: Design programs for creating ActiveX controls.

CO3: Create programs for implementing OLE Server and Container.

CO4: Create programs for ISAPI extension and filter.

CO5: Design a Data-Driven DHTML Application and ActiveX Documents.

Title of the paper	<b>TCP/IP Networks</b>	
Category :	Year & Semester	Credits
Elective	<b>Fifth year &amp; Semester IX</b>	4

CO-1: Recall the basic concepts of networking, communication, addressing and protocols.

CO-2: Understand various routing protocol such as CIDR, AARP, RARP, IP, ICMP, IPV6 and sub-netting concepts.

CO-3: Conceptualize the various fields of Transmission Control Protocol and analyze flow control and error control mechanism in TCP.

CO-4: Deduce the Internet Protocol fields, its versions and reliability level of IP in comparison to TCP.

CO-5: Process a detailed implementation of TCP along with flow control, error control and congestion avoidance mechanism.

Title of the paper	<b>Artificial Neural Networks</b>	
Category :	Year & Semester	Credits
Elective	<b>Fifth year &amp; Semester IX</b>	4

CO-1: Comprehend the relationship between biological neuron and artificial neuron and its working procedures.

CO-2: Apply Artificial Neural Network to implement Forward propagation and Back Propagation algorithms with various weight training methods.

CO-3: Analyze associative memory such as Hopfield Net and Bidirectional Associative memory using neural network approach.

CO-4: Evaluate various supervised and unsupervised learning methods using single level and multilevel neural networks.

CO-5: Review the various applications of neural network models by comparing and contrasting different types of neural network models

Title of the paper	<b>Windows Programming</b>	
Category :	Year & Semester	Credits
Elective	<b>Fifth year &amp; Semester IX</b>	4

CO-1: Understand the fundamentals concepts of windows programming and windows development tools.

CO-2: Apply framework for project utility by writing windows programming applications.

CO-3: Analyze the MFC Library functions and its key features. Write simple Object programs for Fourier series application with Resources- Bar Chart with Resources.

CO-4: Evaluate Graph Applications, Word Processor Applications, Container Application, OLE Features and Specifications.

CO-5: Create Active X controls for word processor applications using OLE features.

Title of the paper	<b>Multimedia Systems</b>	
Category :	Year & Semester	Credits
Elective	<b>Fifth year &amp; Semester IX</b>	4

CO-1: Demonstrate the different types of media used in computers such as text, audio, video, animation.

CO-2: Analyze different audio formats available for multimedia MP3, MIDI and digital technology used for audio multimedia.

CO-3: Identity how Text, images and graphics can be used for multimedia systems and its applications in real world.

CO-4: Deduce how animation tools and techniques can be used for morphing in multimedia projects.

CO-5: Design a multimedia project using audio, video, textual and database driven project for creating the college website.

Title of the paper	<b>Distributed Computing</b>	
Category :	Year & Semester	Credits
Elective	<b>Fifth year &amp; Semester IX</b>	4

CO-1: Understand the hardware concepts such as Switched Multiprocessor and Multicomputer, software concepts such as - Network Operating Systems and NFS - Time Distributed Systems used in Distributed computing.

CO-2: Apply Client-Server model for implementing the communications in distributed systems.

CO-3: Identity how various synchronization methods are implemented for ensuring atomicity and how deadlocks are handled in distributed computing.

CO-4: Deduct how files and databases are used in distributed environment focusing on how distributed query is processed, updated and recovered.

CO-5: Plan a distributed concurrency control mechanism for a student's marksheet database distributed in the servers of various departments.

Title of the paper	<b>Image Processing</b>	
Category :	Year & Semester	Credits
Elective	<b>Fifth year &amp; Semester IX</b>	4



- CO-1: Understand the concepts of Image sensing steps and Image representation for analog and Digital Image.
- CO-2: Apply Image processing techniques for noise removal and image enhancement from Digital Image.
- CO-3: Analyze Image transformation techniques for analog and digital image.
- CO-4: Evaluate Image compression models such as Huffman coding, JPEG, etc. for a given Digital Image.
- CO-5: Design a Fourier Transform model to convert an analog image to a digital image.

**DEPARTMENT OF COMPUTER APPLICATIONS**

**BCA**

**First Semester**

<b>Core Paper Theory - 1</b>			
Title of the paper with subject code	<b>Fundamentals Of Digital Computers</b>		
Category of the course	Year	Semester	Credits
Core	I	I	4

CO1 : Explains the basic concepts of computer science

CO2: Solves the different conversion

CO3: Solves various boolean equations using axioms and laws

CO4: Analyse and illustrates various flip flops, registers and counter

CO5: Create various circuits

<b>Core Practical - 1</b>			
Title of the paper with subject code	<b>Pc – Software Lab</b>		
Category of the course	Year	Semester	Credits
Core	I	I	3

CO1: Recognize when to use each of the Microsoft Office programs to create professional business documents.

CO2: Use Microsoft Office programs to create personal and/or business documents following current professional and/or industry standards.

CO3: Create Mail merge

CO4: Illustrate various text alignment

CO5: Creating different charts for given data

CO6: Create Profession presentation

CO7: Define database

## **Second Semester :**

<b>Core Paper Theory - 2</b>			
Title of the paper with subject code	<b>Programming In C</b>		
Category of the course	Year	Semester	Credits
Core	I	II	4

CO1: Remember the basic constructs of C language

CO2: Understand and illustrate various decision making concepts

CO3: Know, Apply and construct functions for real world problems

CO4: create user defined data types

CO5: Create and Process files

<b>Core Practical - 2</b>			
Title of the paper with subject code	<b>C Programming Lab</b>		
Category of the course	Year	Semester	Credits
Core	I	II	3

CO1: Understand the basic concept of C Programming, and its different modules that includes conditional and looping expressions, Arrays, Strings, Functions, Pointers, Structures and File programming

CO2: Acquire knowledge about the basic concept of writing a program.

CO3: Role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language.

CO4: Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.

CO 5: Role of Functions involving the idea of modularity.

### Third Semester

<b>Core Paper Theory - 3</b>			
Title of the paper with subject code	<b>Programming In C++ and Data Structures</b>		
Category of the course	Year	Semester	Credits
Core	II	III	4

CO1: Recalls various Object Oriented concepts

CO2: State and construct different Inheritance

CO3: Construct classes for real world problem

CO4: Organize various data

CO5: Illustrate stack and queue

CO6: Demonstrate application of stack and Queue

CO7: Illustrate Tree and Graph

<b>Core Paper Theory - 4</b>			
Title of the paper with subject code	<b>Microprocessor &amp; its Applications</b>		
Category of the course	Year	Semester	Credits
Core	II	III	4

CO1: Understand microprocessor and operations

CO2: Illustrate data transfer and arithmetic instructions

CO3: Know and apply counters

CO4: Illustrate various conversions

CO5: Recall Interrupt, RAM and ROM

<b>Core Practical - 3</b>			
Title of the paper with subject code	<b>Programming In C++ With Data Structure Lab</b>		
Category of the course	Year	Semester	Credits
Core	II	III	3

CO1: Apply object-oriented programming features to program design and implementation

CO2: Understand object-oriented concepts and how they are supported by C++

CO3: Understand implementation issues related to object-oriented techniques.

CO4: Demonstrate the ability to analyze, use, and create functions, classes, to overload operators.

CO5: Demonstrate the ability to understand and use inheritance and Pointers when creating or using classes and create templates

CO6: Determine which algorithm or data structure to use in different scenarios and be familiar with writing recursive methods.

CO7: Demonstrate understanding of the abstract properties of various data structures such as stacks, queues, lists, trees and graphs and Use various data structures effectively in application programs.

### **Fourth Semester**

<b>Core Paper Theory - 5</b>			
Title of the paper with subject code	<b>Programming in Java</b>		
Category of the course	Year	Semester	Credits
Core	II	IV	4

CO1: Remember the basic construct of Java Language

CO2: State and construct different Inheritance and constructors

CO3: Illustrate different String Methods

CO4: Describe and construct Package, Interface and Thread

CO5: Illustrate Exception handling

CO6: Create and Process files

CO7: Demonstrate AWT controls

<b>Core Paper Theory - 6</b>			
Title of the paper with subject code	<b>Operating Systems</b>		
Category of the course	Year	Semester	Credits
Core	II	IV	4

CO1: Understand the basic functionality of the operating system

CO2: Summarize Memory Management

- CO3: Describe Scheduling
- CO4: Illustrate Device Management
- CO5: Understand File System
- CO6: Outline Security in Operating System

<b>Core Paper Theory - 7</b>			
Title of the paper with subject code	<b>Computer Graphics and Multimedia</b>		
Category of the course	Year	Semester	Credits
Core	II	IV	4

- CO1: Demonstrate line, circle and ellipse generating algorithm
- CO2: Show 2D and 3D Transformation
- CO3: Illustrate Color Models
- CO4: Understand Audio Processing in Computer
- CO5: Understand Video Processing in Computer

<b>Core Practical Paper – 4</b>			
Title of the paper with subject code	<b>Programming in Java Lab</b>		
Category of the course	Year	Semester	Credits
Core	III	IV	3

- CO1: Understand programming language concepts, particularly Java and object-oriented concepts.
- CO2: Write, debug, and document well-structured Java applications
- CO3: Implement Java classes from specifications and effectively create and use objects from predefined class libraries
- CO4: Understand the behavior of primitive data types, object references, and arrays
- CO5: Apply decision and iteration control structures to implement algorithms
- CO6: Write simple recursive algorithms

CO7: Implement interfaces, inheritance, and polymorphism as programming techniques and apply exceptions handling

### **Fifth Semester**

<b>Elective Paper Theory - 8</b>			
Title of the paper with subject code	<b>UNIX Programming</b>		
Category of the course	Year	Semester	Credits
Elective	III	V	4

CO1: Understand Shell and Shell Commands

CO2: Illustrate usages of Shell

CO3: State and Construct Shell Programming

CO4: Understand Unix Environment

CO5: State and Construct Unix Programming

<b>Elective Paper Theory - 9</b>			
Title of the paper with subject code	<b>Visual Programming</b>		
Category of the course	Year	Semester	Credits
Elective	III	V	4

CO1: Operate Visual Basic Controls

CO2: Illustrate Function and Procedure

CO3: Describe Control array and Combo Boxes

CO4: Use Menus and Dialog Boxes

CO5: define File Handling and File System

<b>Elective Paper Theory - 10</b>			
Title of the paper with subject code	<b>Software Project Management</b>		
Category of the course	Year	Semester	Credits
Elective	III	V	5

CO1: Understand functionality of Software Project Management

CO2: Demonstrate various cost analysis and benefits

CO3: Illustrate Project Sequencing and scheduling

CO4: Understand Risk Analysis and Monitoring

CO5: Summarize Organizational Management

<b>Core Paper Theory - 11</b>			
Title of the paper with subject code	<b>Relational Database Management Systems</b>		
Category of the course	Year	Semester	Credits
Core	III	V	4

CO1: Understand Need for Database Management System

CO2: Illustrate Normalization

CO3: Demonstrate codd's Rules

CO4: Use DDL, DML & TCL commands

CO5: Use PL/SQL commands

CO6: Utilize Front-end tool SQL \* plus

<b>Core Paper Theory - 12</b>			
Title of the paper with subject code	<b>Computer Networks</b>		
Category of the course	Year	Semester	Credits
Core	III	V	4

CO1: Understand OSI and TCP/IP Model

CO2: Explain multiplexing and switching

CO3: Illustrate Data link and Multiple access Protocols

CO4: State and explain routing algorithms

CO5: Illustrate Transport layer functionality



<b>Core Practical Paper – 5</b>			
Title of the paper with subject code	<b>RDBMS Lab</b>		
Category of the course	Year	Semester	Credits
Core	III	V	3

CO1: Brief knowledge about SQL Fundamentals.

CO2: Able to handle with different Data Base languages.

CO4: Table View, Log & Triggers.

CO5: Introduction to different Database packages (Oracle/ MySql, etc) Commit & Rollback. CO6: Handling online Transactions.

CO7: Database connectivity with front-end.

### **Sixth semester**

<b>Core Paper Theory - 13</b>			
Title of the paper with subject code	<b>Network Programming</b>		
Category of the course	Year	Semester	Credits
Core	III	VI	4

CO1: Explain ActiveX Scripts

CO2: Create ActiveX Documents

CO3: Illustrate URL Monikers

CO4: Create and Use IIS Applications

CO5: Using DLL

<b>Core Paper Theory - 14</b>			
Title of the paper with subject code	<b>Software Engineering</b>		
Category of the course	Year	Semester	Credits
Core	III	V	3

CO1: Explain preliminary concepts of Software Engineering

CO2: Demonstrate cost analysis

CO3: Illustrate the designing of software

CO4: Produce code for software and its rules

CO5: Outline the Quality Assurance techniques

<b>Core Paper Theory - 15</b>			
Title of the paper with subject code	<b>Web Technology</b>		
Category of the course	Year	Semester	Credits
Core	III	VI	4

CO1: Illustrate Application development using VBScript

CO2: Explain the basic construct of JavaScript

CO3: Construct programs using JavaScript Objects

CO4: Illustrate ASP.NET controls

CO5: Implement Client Server Communication

<b>Elective Paper Theory – 16</b>			
Title of the paper with subject code	<b>System Software</b>		
Category of the course	Year	Semester	Credits
Elective	III	VI	5

CO1: Explain Assembler features and functionality

CO2: Create and use Macro

CO3: Explain working principles of linker

CO4: Illustrate the loader

CO5: Comprehend various System Software tools

<b>Elective Paper Theory – 17</b>			
Title of the paper with subject code	<b>E-Commerce</b>		
Category of the course	Year	Semester	Credits
Elective	III	VI	5

- CO1: Define and describe Electronic Commerce
- CO2: Illustrate Secure Transaction
- CO3: Explain Payment and purchase order process
- CO4: Summarize the security issues in Electronic communication
- CO5: Distinguish various e-mail message handling technique

<b>Elective Paper Theory – 18</b>			
Title of the paper with subject code	<b>Data Mining</b>		
Category of the course	Year	Semester	Credits
Elective	III	VI	5

- CO1: Explain various database
- CO2: Recognize and Reproduce data preprocessing
- CO3: State and Explain Data Mining Technique
- CO4: Illustrate the classification and predictions
- CO5: Apply clustering technique

<b>Elective Paper Theory – 19</b>			
Title of the paper with subject code	<b>Digital Image Processing</b>		
Category of the course	Year	Semester	Credits
Elective	III	VI	5

- CO1: Define basic concepts of Image Processing
- CO2: Illustrate the image enhancement technique
- CO3: Apply Image enhancement technique

CO4: Define Image restoration

CO5: Apply Image compression technique

<b>Elective Paper Theory – 20</b>			
Title of the paper with subject code	<b>Object Oriented Analysis and Design</b>		
Category of the course	Year	Semester	Credits
Elective	III	VI	5

CO1: State the methodologies and Frameworks

CO2: Define different use case models

CO3: Create various design process

CO4: Illustrate User Interfaces

CO5: Comprehend Quality Assurance

<b>Core Paper Theory – 21</b>			
Title of the paper with subject code	<b>Software Testing</b>		
Category of the course	Year	Semester	Credits
Elective	III	VI	5

CO1: Define the bugs and its types

CO2: Illustrate Transaction flow testing and data flow testing strategies

CO3: Describe domain testing

CO4: Distinguish different testing

CO5: Apply the verification and validation technique

<b>Core Practical Paper – 6</b>			
Title of the paper with subject code	<b>Web Application Lab</b>		
Category of the course	Year	Semester	Credits
Core	III	VI	3

CO1: Understand, analyze and apply the role of languages like HTML, DHTML, CSS, XML, Javascript, VBScript, ASP.NET and protocols in the workings of the web and web applications

CO2: Analyze a web project and identify its elements and attributes in comparison to traditional projects.

CO3: Understand, analyze and create web pages using HTML, DHTML and Cascading Styles sheets.

CO4: Understand, analyze and build dynamic web pages using JavaScript and VBScript (client side programming).

CO5: Understand, analyze and build interactive web applications.

## **DEPARTMENT OF MICROBIOLOGY**

### **B. SC MICROBIOLOGY**

#### **General Microbiology and Microbial Physiology (UMYM11C)**

- CO-1. To study the origin of microbiology and scope. Microscopes - principles and application in microbiology field. Staining techniques – to stain the bacterial cell and differentiate form each other.
- CO-2. To isolate the aerobic and anaerobic microorganism using the culture methods. Sterilization process prevents the microbial contamination. Antimicrobial chemotherapy-study the antibiotic mechanism.
- CO-3. Identify bacteria by the physiological, morphological and biochemical methods.
- CO-4. Study the growth curve of bacteria in batch, continuous and synchronous culture. Basic nutritional requirements, the vegetative cell turns to spore by sporulation.
- CO-5. Bio- geo chemical cycle study is used to know the bacteria adaptation of nutrient form environment. Distribution of algae in the environment and their cycle.

#### **Practical – 1 General Microbiology and Microbial Physiology (UMYL11A)**

- CO-1. To practice sterilization methods. Learn to prepare media and their quality control.
- CO-2. To learn streak plate, pour plate and serial dilution.
- CO-3. Staining techniques and motility test.
- CO-4. Observation of different type of algae and isolation of fungi and LPCB. Antimicrobial activity.
- CO-5. To practice biochemical test for bacteria like IMViC, Carbohydrate fermentation test, catalyse and oxidase.

#### **Allied Biochemistry I (UBYA11C)**

- CO-1. Understand the basic component or biomolecules of living organisms. Have knowledge of the structure/conformational freedom of biomolecules of carbohydrates. Learn the classifications of carbohydrates
- CO-2. Understand and demonstrate how the structure of biomolecules determines their chemical properties and reactivity.

- CO-3. Learn the molecular structures of 20 amino acids, differentiating essential and non-essential amino acids, biologically important modified amino acids and their functions.
- CO-4. Recognize the structural levels of organization of proteins, 3D structure of proteins, its functions and denaturation.

#### **Non-major elective - Cellular Organization (NMMY11C)**

- CO-1. By the end of the course, the students are able to understand the structural organization, types and functions of cell membranes
- CO-2. Understand the structural organization and functions of various cell organelles.
- CO-3. Know about the organization of genes, genome and chromosomes. Also understand gene expression strategies.
- CO-4. Be familiar with the regulation, stages and control of cell cycle.
- CO-5. Be acquainted with the growth, physiological characteristics microbial cell and strategies of cell division.

#### **Immunology (UMYM21C)**

- CO-1. To know blood transfusion, blood groups.
- CO-2. To learn about cells and organs of immune system, types of immunity and complement pathways.
- CO-3. To learn about antigen, haptens, adjuvants, immunoglobulin structure and functions.
- CO-4. To learn about vaccines, immune response and cytokines.
- CO-5. To know about Autoimmunity, Transplantation immunology, antigen and antibody reaction and its applications.

#### **Practical – 2 Immunology (UMYL21C)**

- CO-1. To Know about the handling of the blood and blood agglutination and gel precipitation test.
- CO-2. To practice the CFT and ELISA
- CO-3. To practice the enumeration of blood cells and isolation of lymphocytes.
- CO-4. To learn antibody production, Arthurs reaction and anaphylactic reaction.
- CO-5. To understand the immediate and delayed hypersensitivity reaction.

### **Allied Biochemistry II (UBYA21C)**

- CO-1. Understand the basic component or biomolecules of living organisms. Have knowledge of the structure/conformational freedom of biomolecules. Understand and demonstrate how the structure of biomolecules determines their chemical properties and reactivity.
- CO-2. To understand the types and structure of DNA and RNA.
- CO-3. Learning kinetics of enzyme catalysed reactions and enzyme inhibitions and regulatory process, Enzyme activity, Enzyme Units, Specific activity.
- CO-4. To know the sources, biological functions and deficiencies of vitamins.

### **Allied Practical – 2 Allied Biochemistry I & II (UBYY21C)**

- CO-1. Estimation of ascorbic acid and calcium in milk.
- CO-2. They acquire knowledge in the Identification of carbohydrate and amino acids with suitable tests
- CO-3. Colorimetric estimation of protein and phosphorous.
- CO-4. Preparation of starch from potatoes and casein from milk.

### **Non-major elective - Diversity of Life Forms (NMMY21C)**

- CO-1. By the end of the course, the student are able to know the fundamentals of taxonomy and systemic classification organisms
- CO-2. Be familiar with the structural organization of organisms
- CO-3. Know about the important criteria used for classification of plants, animals and microorganisms
- CO-4. Know about the natural habitat, geographic origins and migrations of species in Indian subcontinent.
- CO-5. Understand the functioning of host parasite relationships.

### **Molecular Biology (UMYM31C)**

- CO-1. Understand the chemical components of DNA and various forms of DNA. Know about the organization of prokaryotic and eukaryotic genome.
- CO-2. Understand the DNA replication, repair and recombination in prokaryotes with that of eukaryotes.



- CO-3. To know about RNA synthesis and processing and function of different types of RNA.
- CO-4. To know about protein synthesis and inhibition factors of protein synthesis.
- CO-5. To Understand prokaryotic and eukaryotic gene expression and control of gene expression.

### **Practical – 3 - Molecular Biology (UMYL31C)**

- CO-1. Learn to estimate DNA and RNA.
- CO-2. Learn to isolate Plasmid, Genomic and Chromosomal DNA.
- CO-3. Learn to isolate RNA and antibiotic resistant mutants.
- CO-4. Acquire Knowledge in Preparation of competent cells.
- CO-5. Acquire Knowledge in Transformation of *E. coli*.

### **Bioinstrumentation II (UMYA31B)**

- CO-1. By the end of the course, the student should be able to learn about the principle, application and uses of various laboratory equipments
- CO-2. Learn the principles, types and application of different chromatography techniques
- CO-3. Understand the mechanisms, types and application of electrophoresis techniques
- CO-4. Know about the mechanisms, uses and different types of spectrophotometer
- CO-5. Understand the principle and application of radioisotopes in the field biology.

### **Allied Practical – 3 Bioinstrumentation (UBYY31C)**

- CO-1. By the end of the course, the student should be able to learn about the principle pH titration and draw the pKa values of acids.
- CO-2. Learn about the separation of biomolecules using chromatography techniques.
- CO-3. Understand the mechanisms and uses of electrophoresis techniques.
- CO-4. Know about the principle and application of UV spectrophotometer.

- CO-5. Know about the quantitative estimation various chemicals using gas chromatography.
- CO-6. Understand the principle and uses of PCR, sequencer, flow cytometry and fermenter.

#### **Soil and Agricultural Microbiology (UMYM41A)**

- CO-1. Upon successful completion of this course, the student should be able to understand types, structure, formation and microbial flora of soil.
- CO-2. Understand the role soil microflora in biogeochemical cycle in the environments.
- CO-3. Know about the mechanism and responsibility of microbial interaction with microbes, plant, animal and insects.
- CO-4. Be familiar with the role of microorganism in nitrogen fixation and know about the types and mode of action of biopesticides.
- CO-5. Know about defense mechanism, etiology, epidemiology and management various plant diseases caused by microorganisms.

#### **Practical – 4 - Soil And Agricultural Microbiology (UMYL42A)**

- CO-1. By the end of the course, the student should be able to learn different methods for the isolation and identification soil microorganisms.
- CO-2. Understand the mechanisms and application of enzymes produced by soil microorganisms.
- CO-3. Know about the role and methods used for the isolation and identification of *Rhizobium* and *Azotobacter*.
- CO-4. Know about the application and methods used for isolation and identification of nitrogen fixing algae.
- CO-5. Understand the causes, symptoms, control and treatment of various plant diseases caused by microorganisms.

#### **Biostatistics (UMSA43A)**

- CO-1. To study the types of biological data, Populations, samples from populations, random sampling, parameters and statistics.
- CO-2. Students will be able differentiate between the mean, the median, and the mode of data; determine the value of the mean, the median, and the mode of ungrouped data and grouped data.

- CO-3. Students will define event, outcome, trial, simple event, sample space and calculate the probability that an event will occur and able to Calculate the probability of events for more complex outcomes. Solve applications involving probabilities.
- CO-4. Students will able to distinguish between nonparametric and parametric tests and Calculate the degrees of freedom for the chi-square test for independence and locate critical values in the chi-square table.
- CO-5. Familiar in recognize regression analysis applications for purposes of description and prediction. Calculate and interpret confidence intervals for the regression analysis.

#### **Allied 4 Practical 4: Biostatistics (UMSY43A)**

- CO-1. To learn the proper measure of tendency to use for each level of measurement and to calculate the mode, median and mean.
- CO-2. Learn to Compute and interpret a correlation and coefficients in a linear regression analysis
- CO-3. Understand what the parameter means in Binomial and Poisson and learn to know how to compute the probability using the PMF for both Binomial and Poisson distribution
- CO-4. Students will be able to identify to identify an appropriate significance test from a list of common and know how to look up details and apply the significance test.
- CO-5. Understand the basics of experimental design, including the definition of the experimental unit, response, variable, factor(s), and level(s) of a basic experiment, and the role of randomization and replication to permit causal inference.

#### **Medical Bacteriology (UMYM51C)**

- CO-1. On successful completion of the course, the students will obtain knowledge on handling of clinical specimens of bacterial samples. They acquire aseptic method of collection, transport and isolation of medically important bacteria
- CO-2. Students learn as diagnostic part of any specimen to identifying the Drug – antibiotic sensitive bacteria.
- CO-3. Learn the morphology, cultural characters, biochemical analysis, clinical finding and lab diagnosis of Tuberculosis bacteria, Diphtheria bacteria and gram positive bacteria.

CO-4. Know about the medically important bacteria like cholera causing vibrio, colon inflaming Enterobacteriaceae microorganisms, typhoid bacteria, burn infection bacteria.

CO-5. Learn the morphology, cultural characters, biochemical analysis, clinical finding and lab diagnosis, treatment of Tetanus bacteria, sexually transmitted microorganisms and miscellaneous microorganisms.

### **Medical Mycology And Parasitology (UMYM52A)**

CO-1. Upon effective completion of this course, the students learn about able the systematic of classification& essentials of taxonomy.

CO-2. To broad educate and understand the dermatophytic fungi, opportunistic fungi and subcutaneous fungi for its morphology, characteristic features and lab diagnosis, treatment.

CO-3. On successful completion of the course, the students will obtain knowledge on handling of clinical specimens of fungal samples. They acquire aseptic method of collection, transport, isolation and testing of medically important bacteria.

CO-4. On effective completion of this course, the students learn about classification &importance of intestinal parasite like amoeba, giardia and blood parasite that causing malaria, leishmaniasis and kala-azar.

CO-5. Broad education is necessary to understand morphology, cultural characters, biochemical analysis, clinical finding, lab diagnosis and treatment of intestinally important parasites & blood parasites. Also the students learn the skill to isolate, identify the medically important parasites.

### **Medical Virology (UMYM53A)**

CO-1. To study the general properties and methods of cultivation. Replication of virus and Detection techniques.

CO-2. To analyze the pathogenecity and clinical feature for the pathogenic virus like Rabies, arthropod viruses.

CO-3. To understand the pathogenesis and clinical features of virus like HIV and oncogenic viruses.

CO-4. Bacteriophages- properties, life cycle and importance in microbiology.

CO-5. Viral disease- prevention, diagnosis and treatment.

### **Practical – 5 - Bacteriology, Mycology, Parasitology & Virology (UMYL51A)**

- CO-1. Students acquire ability to understand and develop skills, techniques for collection, transport and isolate the medically important bacteria from various clinical specimens.
- CO-2. Learn to develop the skill of isolate and biochemical analysis of bacterial pathogens and to study the pattern of drug sensitivity.
- CO-3. To Understand the principle and methods of isolating bacteriophages from environmental sources.
- CO-4. Learn about both conventional and advanced techniques for isolation and identification of medically important fungi
- CO-5. To be familiar with various morphological features to identify the intestinal and blood protozoans that causing vulnerable human infections.

#### **Elective I Microbial Genetics and Genetic Engineering (UMYA51C)**

- CO-1. Gains basic knowledge on the concept of gene, plasmid, bacteriophage and transposons.
- CO-2. Learn about the methods of gene transfer, mutation and its detection.
- CO-3. Gives wide knowledge on various vectors for gene cloning.
- CO-4. Obtain ideas on the various enzymes used in genetic engineering.
- CO-5. Provides over view on the methods of gene cloning and gene transfer.

#### **Elective II Industrial and Pharmaceutical microbiology (UMYA52C)**

- CO-1. Understands the common terms used in industries, Media formulations and important microbes of industries.
- CO-2. Learn about types of fermentations and fermentor.
- CO-3. Provides knowledge on the production of commercial microbial products.
- CO-4. Gains idea on separation, extraction and purification and packaging of products.
- CO-5. Enable the students to have sound knowledge on the ecology of Pharmaceutical industries, Good manufacturing practices, and sterile pharmaceutical preparations. The IPR also provides the procedures for patenting the technology.

#### **Environmental Microbiology (UMYM61A)**

- CO-1. To know about organisation of biosphere and components of ecosystem.

- CO-2. To learn about microbes in extreme environments.
- CO-3. To learn in detail about microbes in aquatic environment, water pollution, water borne disease, Microbiological analysis of water, Home treatment system.
- CO-4. To know about Composition of air, air borne microorganism, air borne diseases, quality assessment methods and air sanitation.
- CO-5. To learn about solid and liquid waste management, degradation of xenobiotic compounds, lignin and bioterrorism.

### **Food & Dairy Microbiology (UMYM62A)**

- CO-1. To study the role of microorganism in food. Importance of microorganism in food.
- CO-2. Preservation by physical methods- low and high temperature, drying. Preservation by chemical method- addition of food additives.
- CO-3. To study the contamination of different types of food such as milk, cereals, vegetables and fruits.
- CO-4. Pathogenesis and clinical feature of food borne pathogens. Food analyse and by laboratory testing and food sanitation.
- CO-5. Fermentation food –cheese bread, and beverages.

### **Practical – 6 - Environmental, Food & Dairy Microbiology (UMYL61A)**

- O-1. To learn about Detection of number of Bacteria in milk by various method.
- CO-2. Gains knowledge to determine the quality of milk.
- CO-3. Learn to isolate the yeast and molds from spoiled nuts, fruits, and vegetables and also to examine specific food for bacterial contamination.
- CO-4. Knowledge gain to determine of BOD and COD of wastewater and Water analysis by MPN and Membrane filter method.
- CO-5. Learn to Quantify the microorganisms in air settle plate and air sampler methods. Detection of aflatoxin B<sub>1</sub> from moldy grains using thin layer chromatography.

### **Elective III Biotechnology (UMYA62A)**

- CO-1. To acquire knowledge on history of biotechnology and known the Microbial production of industrial enzymes and its application. To understand the kinetics of soluble and immobilized enzymes.
- CO-2. Understand the principles and application of genetic recombinant technology and strain improvement (mutational, rDNA technologies). Know about production of SCP, Biofertilizer (BGA, VAM) Biopesticides (*Bacillus thuringiensis*). ethanol; antigens, interferons, vaccines, insulin and gene-therapy methods.
- CO-3. To acquire knowledge in plant tissue culture techniques and methods of gene transfer into plant cells. Understand the production of secondary metabolites using suspension/immobilized cell culture.
- CO-4. To know the methods of plant micro propagation, crop improvement and development of transgenic plants.
- CO-5. Be familiar with animal cell metabolism, cell cycle and regulation. Know the animal cell culture techniques and transgenic animals.

## **M.SC MICROBIOLOGY**

### **General Microbiology and Laboratory Animal Science (PMYM11C)**

- CO-1. To studies the principle of microscopes. Principle and operations of ultracentrifuges, refrigerated, lyophilizes. Staining methods and sterilization methods. To study the antimicrobial agents mechanism.
- CO-2. Bacteria- structure, properties and biosynthesis of cell compounds. Bacterial growth curve in bacterial and synchronous culture. To study aerobic and anaerobic culture.
- CO-3. To study the distribution of algae and their life cycle based on the classification.
- CO-4. Laboratory animal – maintenance, breeding. Nutritional requirements of laboratory animals. Handling of laboratory animals.
- CO-5. Laboratory animals used for pathogenicity, hypersensitivity testing. Proper maintenance and disposal of animal wastes.

### **Immunology and Immunotechnology (PMYM12C)**

- CO-1. To know about immunity and immune response.
- CO-2. To learn about antigens, immunoglobulins and its purification techniques.
- CO-3. To learn about antigen and antibody reaction and its applications.
- CO-4. To know about Complement system, Autoimmunity, Transplantation and tumour immunology.
- CO-5. To learn about vaccines and immunization schedule.

### **Microbial Taxonomy (PMYM13C)**

- CO-1. Upon successful completion of this course, the student should be able to know the fundamental of taxonomy and systematic of classification.
- CO-2. Be familiar with bacterial classification using Bergey manual. Also know different types of bacteria
- CO-3. Learn about physiological and microscopical characteristics of different fungi
- CO-4. Be familiar with the different classification of protozoa
- CO-5. Know about different types and classification of algae and viruses

### **General Microbiology, Physiology and Immunology and Immunotechnology (PMYL11C)**

- CO-1. Upon successful completion of this course, the students are able to know the application of different microscope and microscopic techniques to study the organism externally and internally



- CO-2. Understand about various techniques and its mechanisms used for the control of microorganisms
- CO-3. Be familiar with different staining procedures used to study the morphological characteristics of bacteria
- CO-4. Know about the preparation and uses of various culture media
- CO-5. Learn the techniques used for the enumeration of microbes in various samples and isolation of pure cultures
- CO-6. Recognize the method of bacterial antigen preparation and raising polyclonal antisera in experimental animals
- CO-7. Learn the types, mechanism and application of different immunological techniques
- CO-8. Be acquainted with the techniques applied for the preparation and purification of immunoglobulins

#### **Metabolic Pathways (PMYA11C)**

- CO-1. Enzyme –mechanism, inhibition of enzyme action metabolic channelling in living organism.
- CO-2. To study the generation of electron and ATP for use as energy source.
- CO-3. Cellular respiration in carbohydrates and aerobic and anaerobic for energy yield.
- CO-4. Lipid metabolism- biosynthesis of fatty acid and steroids and triglycerals.
- CO-5. Biosynthesis of nucleic acid materials and amino acids.

#### **Microbial Diversity (PMYA12C)**

- CO-1. By the end of the course, the students are able to know the classification and distribution of prokaryotic and eukaryotic organisms.
- CO-2. Understand the physiological adaptation, types, role and application of thermophilic and methanogenic microbes.
- CO-3. Understand the physiological adaptation, classification and application of alkalophilic, acidophilic, barophilic and halophilic microorganisms.
- CO-4. Be familiar with the objectives of space microbiology and recognize the life of organisms in atmosphere.
- CO-5. Realize the life on Mars environment and know to monitoring significant microbial flora on mars.

### **Virology (PMYM21C)**

- CO-1. Virus- general properties, virioids, prions, satellite RNA. To study general diagnosis methods.
- CO-2. Bacteriophage- structure, properties and life cycle.
- CO-3. To study the plant viruses properties structural organization and life cycle and other type of viruses like cyanophage.
- CO-4. To understand the pathogenesis and clinical feature of viruses (HIV, Pox, Herpes, RNA viruses)
- CO-5. Viral disease- prevention, diagnosis and treatment.

### **Systematic Medical Bacteriology (PMYM22C)**

- CO-1. To know about normal microflora and virulence factors of Pathogens.
- CO-2. To study the rules for clinical sample collection.
- CO-3. To learn about the gram-positive organisms.
- CO-4. To know about gram- negative and fastidious organisms.
- CO-5. To get the conceptual knowledge about zoonotic disease, nosocomial infection and hospital waste management.

### **Mycology and Parasitology (PMYM23C)**

- CO-1. Upon effective completion of course the students able know the history, taxonomy and classification of fungi.
- CO-2. Students learn characteristics of superficial mycoses and systematic fungal infections.
- CO-3. Be familiar with techniques of handling the fungal clinical specimens and its toxins.
- CO-4. Know about, classification, host parasite relation. Also the importance of intestinal parasite like amoeba, giardia and blood parasite that causing malaria, leishmaniasis, kala-azar and toxoplasmosis.
- CO-5. On effective completion students are familiar with morphology, cultural characters, biochemical analysis, clinical finding and lab diagnosis of Helminth parasites, trematode parasite, nematode parasites and infection in AIDS patients.

### **Systematic Bacteriology, Mycology, Parasitology and Virology (PMYL21C)**

- CO-1. By the end of the course, the student should be able to know different methodologies in collection and transport of clinical specimens.

- CO-2. Learn different cultivation methods and biochemical tests used for the identification of pathogenic bacteria.
- CO-3. Learn various antibiotic susceptibility test.
- CO-4. Be trained on the microscopical examination, cultivation and identification of fungal pathogens.
- CO-5. Become skilled at the examination of parasites in clinical specimens.
- CO-6. Learn the methods used for isolation and characterization of bacteriophages.

### **Bioinformatics and Biostatistics (PMYA21C)**

- CO-1. To get wide knowledge about human genome project, Databases and Sequence analysis tools
- CO-2. To learn about PCR, Next generation sequencing and concepts of QSAR
- CO-3. To explain statistical methods, graphical representations, probability theory and distributions.
- CO-4. To get expertise in correlation, regression, chi-test, F- test and T-test.
- CO-5. To explain and use the sampling methods and ANOVA

### **Industrial and Pharmaceutical Microbiology (PMYA22C)**

- CO-1. Gives an idea on isolation, preservation of industrially important microbes, Raw materials and sterilization of media. Learn about types of fermentation.
- CO-2. Acquire knowledge on fermentor and production of therapeutic and diagnostic products.
- CO-3. Understand the biology of industrially important microbes. Learn the modern fermentation techniques for production of biofuels, biochips and seaweed cultivation
- CO-4. Provides knowledge on the production of commercial Primary metabolites
- CO-5. Enable to know the secondary metabolite production. Gives ideas about secret process and procedures for patent.

### **Microbial Genetics (PMYM31C)**

- CO-1. Upon successful completion students acquire knowledge on Experimental evidence of DNA as genetic material and its types.
- CO-2. Know about the organization and expression of genes in bacteria.
- CO-3. To learn on the types, properties, model plasmids which widely used in gene cloning.

CO-4. Students learn on the types, causative agents and testing techniques of mutation and cancer causing agents.

CO-5. Ability to acquire knowledge on gene regulation, molecular recombination and transacting factors on genetics of model organisms.

### **Genetic Engineering (PMYM32C)**

CO-1. Provides knowledge on the various enzymes used in genetic engineering

CO-2. Deals with the vectors used in genetic engineering

CO-3. Enable to gain sound knowledge on the gene cloning using various microbes and gene transfer methods

CO-4. Acquire knowledge on analysis of recombinant DNA using PCR and blotting techniques

CO-5. Learn the current techniques of gene cloning, sequencing methods and application of genetic engineering in various fields.

### **Molecular Biology (PMYM33C)**

CO-1. To gain complete knowledge on biomolecules, Nucleic acids and Molecular approaches to diagnosis and strain identification.

CO-2. Study the DNA replication, repair and recombination, enzymes involved in replication and to understand DNA damage and repair mechanisms.

CO-3. To know about RNA synthesis and processing and RNA transport.

CO-4. To know about protein synthesis, inhibition factors and post translation modification of protein.

CO-5. To understand gene expression at transcription and translation level. Role of chromatin in regulating gene expression and gene silencing.

### **Soil and Agricultural Microbiology (PMYA31A)**

CO-1. To understand about soil microorganisms, interactions between microbes, microbes and plants, mycorrhizae.

CO-2. To describe about nitrogen fixation, bio fertilizers and biopesticides.

CO-3. To learn about plant pathogens, mechanism of infections and plant defence mechanism.

CO-4. To discuss about the symptoms, etiology and management of various plant diseases.

CO-5. To get knowledge about plant disease management, sanitation methods and also about disease forecasting.

### **Microbial Genetics, Molecular Biology and Genetic Engineering (PMYL41A)**

- CO-1. Learn the techniques for isolation of plasmid and genomic DNA, estimation of DNA by chemical and U-V method.
- CO-2. Learn the techniques for isolation of RNA from yeast, estimation of RNA by chemical and U-V method and isolation of antibiotic resistant auxotrophic mutants.
- CO-3. Get hands on training on protein estimation, determination molecular weight of protein, 2D-Gel electrophoresis. Isoelectric focusing. Separation of amino acids by TLC and paper chromatography.
- CO-4. Gains experimental knowledge on separation of proteins using chromatography. Immobilization of enzymes and whole cells. Western blotting. Protoplast and spheroplast isolation. Induction of beta-galactosidase activity in E. coli using IPTG.
- CO-5. Acquire knowledge on the lab skills for competent cell preparation, transformation, PCR, Native PAGE and Restriction analysis.

### **Environmental Biotechnology (PMYE31A)**

- CO-1. By the end of the course, the student are able to know about the occurrence, causes and effects of biofilm and understand the principle and application of biofilm reactor.
- CO-2. Learn the principles, designing, types and applications of various bioreactors.
- CO-3. Understand the mechanisms, types and physiology of microbes in denitrification and methanogenesis. Also learn methods and technologies adopted for portable water and sewage water treatment.
- CO-4. Know about the effect of hazardous chemicals and its degradation effectiveness by naturally occurring microorganisms.
- CO-5. Realize the value of microorganisms in bioremediation of polluted environments.

### **Food, Dairy and Environmental Microbiology (PMYM41A)**

- CO-1. To study about the factors influencing microbial growth, food spoilage causing microorganisms and food preservation techniques.
- CO-2. To learn dairy microorganism, dairy products and fermented food, milk borne diseases and food sanitation.
- CO-3. To have a deep knowledge on air microorganisms, air borne diseases and air sanitation methods.

- CO-4. To discuss about the methods involved in solid and liquid waste management.
- CO-5. To get knowledge about xenobiotic degradation, biomagnification and bioleaching.

#### **Research Methodology and Bioinstrumentation (PMYA41C)**

- CO-1. By the end of the course, the students are able to understand the objective of research and study various methodologies on research process.
- CO-2. Learn about the importance, components and framing research report.
- CO-3. Know about various molecular biological methods applied in the study of gene mutation and gene expression and analysis of bimolecular compounds.
- CO-4. Understand the components, mechanism and application of histochemical and immunotechniques.
- CO-5. Know the components, principle and application of microscopic and radiolabeling techniques.

#### **Soil, Agricultural, Food and Environmental Microbiology (PMYL42A)**

- CO-1. By the end of the course, the student should be able to know different methods for isolation and enumeration of biologically significant soil and water microorganisms.
- CO-2. Learn about mushroom cultivation, understand the causes, symptoms and management of plant diseases.
- CO-3. Learn various antibiotic susceptibility test
- CO-4. Become skilled on the quality assurance of milk and microbiological assessment of food substances.
- CO-5. Understand the mechanism and application of enzymes produced by soil microorganisms.
- CO-6. Learn the methods applied in physicochemical and microbiological analysis of potable water.

## **DEPARTMENT OF BIOTECHNOLOGY**

### **B.SC BIOTECHNOLOGY**

#### **Cell Biology (UBTM11D)**

- CO-1. A student will be able Students will understand the basic structural organization of prokaryotic and eukaryotic cells
- CO-2. Will have complete knowledge about Specific organelles and its function.
- CO-3. Student can learn the mechanism of DNA replication
- CO-4. Students can learn the mechanism of transcription.
- CO-5. Students can learn the mechanism of translation.

#### **Practical- 1 Cell Biology and Microbiology (UBTL11C)**

- CO-1. This course enables the students to differentiate the various prokaryotes and eukaryotic division of cells.
- CO-2. They will be able to stain and observe cell types using different microscopic techniques.

#### **Allied microbiology (UMYA11D)**

- CO-1. A student will be able Students will understand the History and scope of microbiology
- CO-2. Will have complete knowledge about microbial classification
- CO-3. Student can learn the role of microbes in environment
- CO-4. Students can gain knowledge on basics in Medical microbiology.
- CO-5. Students can learn use of microbes in industry.

#### **Plant Physiology (NMBT11D)**

- CO-1. A student will acquire the knowledge about photosynthesis and its molecular level pathway.
- CO-2. Will have basic knowledge about the biological pathways.
- CO-3. Student will get appropriate knowledge about nitrogen fixation.
- CO-4. Student will learn the basics about biosynthesis of its metabolites and its actions.
- CO-5. This unit clearly give the knowledge about the stresses that will affect the plants.

### **Non-major elective: Animal Physiology**

- CO-1. Students can learn a topic on blood and circulation.
- CO-2. This course enables students to know about cardiovascular System.
- CO-3. Will able to gain complete knowledge on respiratory system
- CO-4. Students can understand nervous system.
- CO-5. This course gives an idea about excretory system.

### **Developmental Biology and Genetics (UBTM21D)**

- CO-1. It provides an introduction about the fundamental molecular mechanisms of organism development
- CO-2. Will have complete knowledge about embryogenesis
- CO-3. Student can learn the mechanism of Drosophila development
- CO-4. Students can learn the Mendelian laws.
- CO-5. Students can learn the mechanism of genetic recombination

### **Practical- 2 Molecular developmental biology and Genetics (UBTL22D)**

- CO-1. This course enables the students to study the development of organisms.
- CO-2. They will be able to perform qualitative and quantitative experiments

### **Allied chemistry (UCYA22D)**

- CO-1. A student will be able Students will understand the basic Structure of atoms and chemical bonding
- CO-2. Will have complete knowledge Acids-Bases and Solutions
- CO-3. Student can learn Chemical kinetics and thermodynamics
- CO-4. Students can learn Fundamentals of organic chemistry
- CO-5. Students can learn Industrial chemistry.

### **Basics of Ecology(NMBT21C)**

- CO-1. Students can learn a topic on biotic and abiotic environmental factors and their interactions, symbiosis and concept of habitat and niche.



- CO-2. This course enables students to know about characteristics of population and its growth curve, population regulation, life history strategies and finally concept of metapopulation.
- CO-3. Will able to gain complete knowledge on community attribute and structure, species diversity and its measurement, ecotones and edges.
- CO-4. Students can understand mechanism of ecological succession and concept of climax.
- CO-5. This course give an idea about terrestrial and aquatic ecosystem.

### **Non-major elective: EVOLUTION**

- CO-1. Students can learn a topic on emergence of evolutionary thoughts.
- CO-2. This course enables students to know about origin of molecules.
- CO-3. Will able to gain complete knowledge on origin of cells and unicellular evolution
- CO-4. Students can understand evolutionary history.
- CO-5. This course give an idea about human evolution.

### **Immunology (UBTM31D)**

- CO-1. A student will gain overall knowledge about immune system and its components
- CO-2. Will have complete knowledge about primary and secondary lymphoid organs
- CO-3. Students study about the details theory portion on antibody
- CO-4. Students can complement with the cytokines and its activation
- CO-5. Students will know about the detail on hypersensitivity types and reactions

### **Immunology and Biochemistry Practical**

- CO-1. A student will perform a practical section on various immunodiagnostic techniques along with identification in human blood
- CO-2. Will come to know practical work on the volumetric, qualitative and quantitative analysis

### **Allied Biochemistry (UBYA31D)**

- CO-1. A student will be able Students will understand the basic Structure of atoms
- CO-2. Will have complete knowledge about Classification of prophyryns
- CO-3. Student can learn metabolism of Bichemicals
- CO-4. Students can learn about enzymes
- CO-5. Students can learn about metabolic disorders

### **Animal and Medical Biotechnology**

- CO-1. A student will have knowledge on animal cell culture, primary and secondary cell culture as well as its maintenance and applications of cell culture.
- CO-2. This course enables students to know techniques like artificial insemination, in vitro fertilization, embryo culturing and its maintenance.
- CO-3. Student can learn about diagnosis of pathogenic microbes using modern techniques and its preventive measures. They will have complete knowledge on monoclonal antibody production and vaccination.
- CO-4. Students can understand gene therapy methods and gene editing technology.
- CO-5. Will able to gain theoretical knowledge on nucleic acid analysis methods like PCR, blotting techniques, DNA finger printing, AFLP, RFLP. This course also enables students to apply nanotechnology methods to animal biotechnology.

### **Core Practical 4 - Animal and Medical Biotechnology**

- CO-1. A student will perform a practical basic techniques related to animal cell culture
- CO-2. Will come to know practical work on DNA isolation and identification

### **Allied Theory 3- Biophysics and Biostatistics**

- CO-1. A student will be able Students will understand Scope and methods of biophysics
- CO-2. Will have complete knowledge Biological macromolecules
- CO-3. Student can learn scope of biostatistics
- CO-4. Students can learn about Measures of central tendency
- CO-5. Students can learn about Probability distributions

### **Plant biotechnology**

- CO-1. A student will gain knowledge in detail about the plant genome organization
- CO-2. Will come to study about the plant growth regulators
- CO-3. Students study about the details theory portion on plant tissue culture
- CO-4. Students will know about the regulation of gene expression
- CO-5. Students will study about the details on transgenic plants

### **Environmental Biotechnology**

- CO-1. A student will acquire the knowledge about our ecosystem and the energy flow.
- CO-2. Will have basic knowledge about type of pollution and its effects.

- CO-3. Student will get appropriate knowledge about to control pollution and remediation process.
- CO-4. Student will learn the basics about biofertilizers, biopesticides and crop production.
- CO-5. This unit clearly give the knowledge about the genetically modified organisms.

### **Bioinformatics**

- CO-1. The Student are able to get biological database and gene prediction rules and software
- CO-2. Will have complete knowledge about sequence alignments and Drug design.
- CO-3. Student can understanding the Proteomics and Oncogenes.
- CO-4. Students can appreciate the sequence alignment tools and phylogenetic relationship.
- CO-5. Students are apply the bioinformatics approaches to Drug Designing.

### **Plant Biotechnology & Environmental Biotechnology practical course outcome**

- Co-1 This course enables them to culture plant cells
- Co-2 They can able to analyze B.O.D and C.O.D

### **Methods in Biology**

- CO-1. A student will acquire the knowledge about the separation of bio micro and macro molecules.
- CO-2. Will have basic knowledge about histochemical and immunotechniques.
- CO-3. Student will get appropriate knowledge about to instruments and techniques used for the analysis of biomolecules.
- CO-4. Student will learn the basics about microscopic techniques.
- CO-5. This unit clearly give the knowledge about the research and thesis writing.

### **Genetic Engineering – (PBTM23D)**

- CO-1. Students can learn a topic on introduction of genetic engineering, cloning vector and its type.
- CO-2. This course enables students to know about technology such as recombinant DNA technology, gene cloning, DNA sequencing.
- CO-3. Will able to gain complete knowledge on nucleic acid analysis technique such as PCR, Antisense technology, Whole genome sequencing, Chromosome walking, jumping. Human genetic disease, Ligase chain reaction, Site directed mutagenesis, Principles of Electrophoresis and blotting techniques.
- CO-4. Students can understand prokaryotic and eukaryotic expression system and its application.

CO-5. This course give an idea about gene transfer methods and gene cloning and its manipulations.

### **Industrial Biotechnology**

CO-1. The Student are able to get media for industrial fermentation process.

CO-2. Will have complete knowledge about Bioreactors and Fermentation types.

CO-3. Student can understanding the Industrial Production*like.*, Alcohol.

CO-4. Also comprehension about product recovery process.

CO-5. Students are learn the product extraction and formulation techniques.

### **Core Practical 7- Genetic Engineering & Industrial Biotechnology**

**CO -1** - To introduce the student to basics of genetic engineering techniques such as genomic and plasmid DNA isolation, extraction and estimation of DNA, RNA and proteins, Agarose gel electrophoresis.

**CO -2** Students gain practical knowledge on Isolation and screening of organisms and production process

### **Microbial biotechnology**

CO-1. A student will gain knowledge in detail about the history and scope of microbial biotechnology

CO-2. Will come to study about the microbial enzymes and applications

CO-3. Students study about the detail procedure about production of beverages

CO-4. Students will know about the biofertilizer and biopesticides

CO-5. Students will study about the details on bioremediation

### **Environmental Biotechnology - Elective**

CO-1. A student will acquire the knowledge about the reactors and it types.

CO-2. Will have basic knowledge about reactors design and effluent treatment.

CO-3. Student will get appropriate knowledge about drinking water treatment.

CO-4. Student will learn the basics about hazardous chemicals and its environmental impacts.

CO-5. This unit clearly give the knowledge about the sewage and waste water treatment.

## **M. SC BIOTECHNOLOGY**

### **Biochemistry (PBTM11D)**

- CO-1. A student will gain knowledge about the molecule and its bond.
- CO-2. Will have basic knowledge about structure and function of biomolecules.
- CO-3. Student will get appropriate knowledge about biological pathways and metabolisms.
- CO-4. Student will learn about enzymes and its metabolisms.
- CO-5. This unit clearly give the knowledge about the proteins and nucleic acids.

### **Cell and Developmental biology (PBTM12D)**

- CO-1. A student will study in detail about the cell membrane structure and function
- CO-2. Will come to know about the cell signaling and pathways
- CO-3. Students study about the details theory portion on cancer
- CO-4. Students will study in detail about the basics concept in development of plant and animals
- CO-5. Students will know about the detail theory portion on morphogenesis and organogenesis in animals and plants

### **Molecular genetics (PBTM13D)**

- CO-1. A student will gain knowledge in detail about the mendelian principles and laws
- CO-2. Will come to study about the gene mapping methods
- CO-3. Students study about the detail procedure about microbial genetics
- CO-4. Students will know about the quantitative genetics
- CO-5. Students will study about the details on gene regulation

### **Biochemistry, Cell and Developmental Biology and Molecular Genetics (PBTL11D)**

#### **Practical**

- CO-1. A student will study about in practical on estimation, separation and chromatographic techniques
- CO-2. Will come to know practically about the cell counting, suspension and viability
- CO-3. Students study in detail about the isolation of DNA, RNA from various sources

#### **Environmental Biotechnology**

- CO-1. A student Acquire knowledge about impact of microbial metabolism on environment.
- CO-2. Will have knowledge about Different types of pollution and pollution control methods and strategies.
- CO-3. Student will get appropriate knowledge about bioremediations.
- CO-4. Student will learn about types of effluents and different types of treatment methods.

CO-5. This unit clearly gives the knowledge about Involvement of Biotechnology on waste treatment.

#### **Biostatistics (PMSA12D)**

CO-1. A student Acquire knowledge about collection of data

CO-2. Able to learn hypothesis testing

CO-3. Student will get appropriate knowledge Correlation

CO-4. Student will learn about t test

CO-5. This unit clearly gives the knowledge about ANOVA.

#### **Ecology and Evolution(PBTA11D)**

CO-1. Students can learn a topic on biotic and abiotic environmental factors and their interactions, symbiosis and concept of habitat and niche, characteristics of population and its growth curve, population regulation, life history strategies and finally concept of metapopulation

CO-2. This course enables students to know about characteristics of population and its growth curve, population regulation, life history strategies and finally concept of metapopulation, community attribute and structure, species diversity and its measurement, ecotones and edges.

CO-3. Students can learn a topic on emergence of evolutionary thoughts and origin of molecules.

CO-4. Students can understand evolutionary history.

CO-5. This course give an idea about human evolution

#### **Microbiology and Bioprocess technology (PBTM21D)**

CO-1. A student will gain knowledge in detail about the classification of microorganisms

CO-2. Will come to study about the microbial pathogenicity of microbes

CO-3. Students study about the detail procedure about role of microbes in food

CO-4. Students will know about the principles and advantages of bioprocess technology

CO-5. Students will study about the details on fermentation

#### **Immunology (PBTM22D)**

CO-1. The students would be able to develop immune system and Lymphatic Systems.

CO-2. Will have complete knowledge about Humoral Immune Response, CMI and MAbs.

CO-3. The students are able to understand the Antigen and antibody reactions.

CO-4. Also comprehension about Antigen processing and presentation, Host Parasite Relationship and Infectious disease.

CO-5. Students are learn the Immuno-techniques like ELISA, Western Blotting and RIA

### **Genetic Engineering (PBTM23D)**

- CO-1. A student will study about isolation and purification of DNA and RNA
- CO-2. Will come to know about the recombinant protein using bacterial, animal and plant vectors
- CO-3. Students study in detail about the sequencing methods
- CO-4. Students will know about the labeling methods and probes
- CO-5. Students will study on the molecular cloning and recombinant technology

### **Microbiology and Bioprocess technology, Immunology and Genetic Engineering Practical**

- CO-1. A student will study about isolation of microbes and production, estimation of enzyme products
- CO-2. Will come to know practically about the immunodiagnostic techniques
- CO-3. Students study in detail about the preparation, staining, transformation, amplification and determination of DNA.

### **Intellectual Property Rights & Biosafety (PBTA21D)**

- CO-1. The students would be able to get Intellectual Property Types of IP.
- CO-2. Will be able to acquire knowledge about Patent databases and Patent search.
- CO-3. The students are able to understand the Filing of a patent application.
- CO-4. Also comprehension about Patent application- forms and guidelines, fee structure and PCT.
- CO-5. Students are learn the Biosafety, GMos and Risk assessment.

### **Methods In Biology**

- CO-1. Student Acquire knowledge of methods of estimating population density and remote sensing methods.
- CO-2. Students will well versed in important molecular biology techniques.
- CO-3. Student will gain knowledge about laboratory instruments.
- CO-4. Student will get basic concepts and immense knowledge about medical instruments.
- CO-5. This unit clearly gives the knowledge about microscopic techniques.

### **Plant Physiology (PBTE21D)**

- CO-1. Student Acquire knowledge of photosynthesis and CO<sub>2</sub> fixation.
- CO-2. Students will study about respiration and photorespiration.
- CO-3. Student will gain knowledge about Plant hormones.

CO-4. Student will get basic concepts and immense knowledge on transport mechanism of plant.

CO-5. This unit clearly gives the knowledge about plant secondary metabolites and stress physiology.

#### **Plant and Animal Biotechnology (PBTM31D)**

CO-1. This course enables the student to understand various types of culture techniques in plant tissue culture

CO-2. Will have complete knowledge about transgenic plants and its creation

CO-3. This course enables the student to understand various types of culture techniques in Animal tissue culture

CO-4. Students can learn cell lines, detection of cell viability and cytotoxicity

CO-5. Will have complete knowledge about transgenic animals and its creation.

#### **Bioinformatics (PBTM32D)**

CO-1. A student will be able to use biological database and extract biological data

CO-2. Will have complete knowledge about sequence alignments and tools used.

CO-3. Student can access specialized secondary databases and can infer on phylogenetics.

CO-4. Students can appreciate structural biology and biological pathway prediction.

CO-5. This course enables students to apply bioinformatics in important clinical areas like Drug Designing and Discovery.

#### **Molecular Biology(PBTM33D)**

CO-1. The students would learn central dogma.

CO-2. Will be able to acquire knowledge about DNA replication and Recombination.

CO-3. The students are able to understand the RNA synthesis and Transport.

CO-4. Also comprehension about Protein synthesis and processing

CO-5. Students understand the gene expression studies.

#### **Plant & Animal Biotechnology, Bioinformatics, Molecular Biology**

CO-1. A student will study about culturing of plant and animal cells

CO-2. Will come to know practically about various tools in Bioinformatics

CO-3. Students study in detail about isolation and analysis of DNA.

#### **Nano-Biotechnology (PBTM31D)**

CO-1. Students would be learn basics and scale of nanotechnology.

CO-2. Will be able to acquire classes of nanomaterials and nanocomposites.



CO-3. The students are able to understand the synthesis of nanomaterials.

CO-4. Also comprehension about Nanoparticle characterization

CO-5. Students understand the application of nanomaterials.

### **Virology**

CO-1. A student will gain knowledge in detail about the structure of animal viruses and plant viruses

CO-2. Will come to study about the genome organization of animal viruses

CO-3. Students study in detail about the detail genome organization of plant viruses

CO-4. Students will know about the methods to diagnose animal virus infection

CO-5. Students will study about the methods to diagnose plant virus infection

### **Animal Physiology – (PBTE31D)**

CO-1. Students can learn a topic on blood and circulation.

CO-2. This course enables students to know about cardiovascular System.

CO-3. Will able to gain complete knowledge on respiratory system

CO-4. Students can understand nervous system.

CO-5. This course give an idea about excretory system.

### **Principles of Gene Manipulation Technology**

CO-1. Students can learn about tools in gene manipulation.

CO-2. This course enables students to know about genetic engineering techniques.

CO-3. Will able to gain complete knowledge gene transfer technique

CO-4. Students can understand transgenic animals.

CO-5. This course give an idea about GMOs and ethics.

### **Stem Cell Biology**

CO-1. Students can learn a topic on introduction of stem cell and its classification, Embryonic, hematopoietic and neural stem cells and its sources.

CO-2. This course enables students to know about embryonic Stem Cells, organogenesis and Stem cells cryopreservation.

CO-3. Will able to gain complete knowledge on characteristics of stem cell, cell cycle and its pathways.

CO-4. Students can understand chromatin modification and transcriptional regulation, chromatin modifying factors and human embryonic stem cell ethical issues.

- CO-5. This course give an idea about therapeutic applications of embryonic stem cells, bone marrow stem cells, adipose derived stem cells and hematopoietic stem cells in Heart regeneration and neural defects.

### **Research Methodology**

- CO-1. A student Acquire knowledge about research, types and importance of research.
- CO-2. Students will learn about research proposal.
- CO-3. Student will gain knowledge about data and information collection.
- CO-4. Student will get basic concepts and immense knowledge about statistical techniques.
- CO-5. This unit clearly gives the knowledge about usage of computer on research.

### **Marine Biotechnology**

- CO-1. The students would learnthe principles of oceanography and Marine Ecology.
- CO-2. Will be able to acquire knowledge about Planktonic Microorganisms Diversity.
- CO-3. The students are able to understand the Microalgae-genome and Sponges.
- CO-4. Also comprehension about Bioprospecting of marine environment.
- CO-5. Students understand the source of valuable natural products.

## **DEPARTMENT OF COMMERCE**

### **B. COM**

#### **FINANCIAL ACCOUNTING-I UCMM11A**

- CO-1 preparing financial statements in accordance with appropriate standards.
- CO-2 Prepare ledger accounts using double entry bookkeeping and record journal entries accordingly
- CO-3 interpreting the business implications of financial statement information
- CO-4 Prepare Bank reconciliation statement from incomplete statement
- CO-5 Explain the purpose of double entry system to understanding the accounting system properly and rectification errors.

#### **BUSINESS COMMUNICATION – UCMM12E**

- CO1.Students learns the importance of business communication and the methods of communication. Also, introduction to business letter is done.
- CO 2. To learn the types of business letter in various context like interview, enquiry, sales letters.
- CO3. Different letter forms like bank correspondence, insurance correspondence which are of practical importance are learnt.
- CO 4. Students learn how to write a report and its components like agenda, minutes of meeting, office order, circular etc.
- CO5. Students demonstrate strong knowledge on latest trends in communication like E-mail,video conferencing and internet.

#### **BUSINESS ECONOMICS –UCMA11E/UCMA11A**

- CO –1 Students learn the fundamentals of business economics and meaning of technical terms associated with economics.
- CO –2 To know the two key determinants – demand and supply of micro economics.
- CO –3 To know the meaning of consumer behavior theory and interpretation of different economists about the theory.
- CO –4 To understand about theory of production and law of variable proportion.
- CO –5 To analyze about market structure and role of time elements in price determination.

### **BASIS OF RETAIL MARKETING- NMCM11A (Non – Major)**

- CO –1 To expose the students to various trend in retail business.
- CO –2 To provide the basic understanding of broad set of specialized activities and techniques in managing retail business.
- CO –3 To motivate the students to take up retailing business as a carrier.

#### SEM -2

### **ADVANCED FINANCIAL ACCOUNTING – UCMM21A**

- CO-1 To familiarize the concept of Branch account and its system
- CO- 2 To understand the Scope of departmental accounting
- CO–3 To introduce the system of Hire Purchasing
- CO –4 Enable the students to understand partnership account from admission to dissolution.

### **PRINCIPLES OF MANAGEMENT – UCMM22A**

- CO –1 To develop knowledge about evolution of management thoughts
- CO –2 To better understanding of planning and decision making
- CO -3 To give an idea about organization structure and different types of organisation
- CO –4 To make them familiarize with recruitment process and stages in selection
- CO –5 To provide idea about motivation, importance of communication and Principles of coordination.

### **INDIAN ECONOMY- UCMA21A**

- CO –1 To know the causes and effects of under developed, developing and developed economies.
- CO –2 Students understand the cause and effect of over population and problems associated with it.
- CO – 3 To know the dependence and interdependence between agriculture and growth in economy.
- CO – 4 To know the development of different types of industries – small, medium and large scale industries.
- CO –V To know the various means of transport and also understands the impact of poverty in our country and steps taken to eradicate the same.

### **BASIS OF INSURANCE – NMCM21A(Non-Major)**

- CO –1 To acquaint the students with the origin and scope of insurance along with types of insurance.
- CO –2 To impart the fundamentals of life insurance and the regulating bodies associated with insurance.

### SEM -3

#### **ORPORATE ACCOUNTING – UCMM31A**

- CO-1 Enabling the students to understand the features of Shares and Debentures
- CO-2 Develop an understanding about redemption of Shares and Debenture and its types.
- CO-3 To give an exposure to the company final accounts
- CO-4 To provide knowledge on Goodwill
- CO-5 Students can get an idea about internal reconstruction.

#### **BUSINESS LAW – UCMM32A**

- CO-1 Make the students understand about business and corporate law
- CO-2 Develop knowledge on contract and various types of types of contracts
- CO-3 To help the students to understand the concept of sale of goods
- CO-4 Make the students understand about companies and its types
- CO-5 To equip the students with proper knowledge about Foreign exchange.

#### **BANKING THEORY LAW & PRACTICE-UCMM33A**

- CO –1 To help to gather knowledge on banking and financial system in India
- CO – 2 To provide knowledge about commercial banks and its products
- CO –3 To aim to familiarize banking system in India
- CO -4 To enable them to understand better customer relationship
- CO -5 To create awareness about modern banking services like e-banking, m-banking and internet banking.

#### **MARKETING- UCMM34A**

- CO –1 To develop an idea about marketing and its functions
- CO – 2 To enhance the students on consumer behaviour
- CO – 3 To familiarize students about product and its classifications
- CO –4 To make them understand pricing policies

CO –5 To introduce the concept of sales forecast.

**BUSINESS STATISTICS-(ALLIED) USMA34A /UCMA31A**

CO-1 To familiarizes the concept of statistics

CO-2 To provide practical exposure on calculation of measures of average

CO-3 To provide practical exposure on calculation of measures of correlation and regression.

CO-4 To introduce the students about the concept of provability

CO-5 To provide practical exposure on calculation of trend analysis.

**ADVANCED CORPORATING ACCOUNTING – UCMM41A**

CO –1 Enable the students to understand about amalgamation , absorption and external reconstruction

CO –2 To make them aware about accounts of banking companies

CO –3 To Keep them aware about accounts of insurance companies

CO –4 Enable the students to gain an idea of liquidation of companies

CO –5 To introduce and develop knowledge of holding companies accounts

**COMPANY LAW – UCMM42A**

CO –1 To understand the provisions of companies act and its implications.

CO –2 Aims at enhancing student knowledge about the secretarial practices followed incorporates and industries.

**FINAICIAL SERVICES- UCMM43A**

CO-1. To give an idea about fundamentals of financial services and players in financial sectors

CO-2 To create an awareness about merchant banking, issue management, capital markets and role of SEBI

CO-3 To provide knowledge about leasing and hire purchase concepts

CO -4 To make them understand about different types of insurance and IRDA Act.

**BUSINESS TAXATION – UCMM44A**

CO 1 : To enable to students to gain knowledge of Tax System in India.

CO 2 : To gain and insight on the recording and analyzing the transactions for compliances under GST.

CO 3: It makes the students about Taxation and Assessment proceedings.

CO 4 : Student gain the knowledge of GST Audit.

CO 5 : This enable the students to understand the Custom duty and its proceedings.

### **SEM -5**

#### **ELEMENTS OF OPERATION RESEARCH- (ALLIED) UMSA45A/UCMA41A**

- CO –1 To introduce the meaning and scope of operation research
- CO –2 To give practical exposure to Linear programming problems
- CO –3 To give practical exposure to transportation and assignment problems
- CO –4 To helps to facilitates the learning of network analysis
- CO –5 To give practical exposure to sequencing and game theory.

#### **ELEMENTS OF COST ACCOUNTING- UCMM51A**

- CO -1 Aimed to familiarize the concept of cost accounting
- CO –2 Helps to gather knowledge on preparation of cost sheet in its practical point of view
- CO –3 To facilitate the idea and meaning of material control with pricing methods
- CO –4 Develop the knowledge about remuneration and incentives
- CO –5 To introduce the concept of overhead cost.

#### **PRACTICAL AUDITING – UCMM52A**

- CO –1 To appreciate the importance and scope of auditing in business.
- CO –2 To understand the steps involved in the audit of accounts
- CO –3 To impart knowledge about provision of the companies act relating to the appointment, right, Duties and liabilities of an auditor.
- CO -4 Students can gain the knowledge on recent updates in auditing.(EDP audit etc.,)
- CO -5 To enable the students to gain knowledge of various techniques of auditing

#### **ENTERPRENEURIAL DEVELOPMENT-UCMM53A**

- CO –1 To aiming to develop students about Entrepreneurship development
- CO –2 To create an awareness on various Entrepreneurship Development Programme
- CO – 3 To enable them to understand project formulation
- CO –4 To familiarize the students with EDP schemes
- CO –5 To give an introduction about MSME, EDI and other training institutes in Entrepreneurship.

#### **FINANCIAL MANAGEMENT – UCMM54A**

- CO –1 To provide introduction to Financial Management
- CO –2 To create an awareness about capital structure and theories of capital structure
- CO –3 To make them understand the cost of capital in wide aspects
- CO –4 To provide knowledge about dividend policies and various dividend models.
- CO –5 To enable them to understand working capital management.

**INCOME TAX LAW AND PRACTICE – I(ELECTIVE)UCMA51A**

- CO – 1 To introduce the basic concept of Income Tax.
- CO – 2 In order to familiarize the different know-how and heads of income with its components.
- CO – 3 It helps to build an idea about income from house property as a concept.
- CO – 4 It give more idea about the income from business or profession .
- CO – 5 Make the students familiarizes with the concept of depreciation and its provisions.

**SEM -6**

**ADVANCED COST ACCOUNTING – UCMM61A**

- CO1. To make the students understand the knowledge of output costing.
- CO2. Students can know the contract costing.
- CO3. They enable to prepare process of Costing and Techniques in Cost Accounting.
- CO 4. Students understand the operating costing methods.
- CO 5. It's make the students to understand the Marginal Costing and its types.

**MANAGEMENT ACCOUNTING – UCMM62A**

- CO –1 To enlighten the students thought and knowledge on management Accounting
- CO –2 Helps to give proper idea on financial statement analysis in practical point of view
- CO –3 To introduce the concept of fund flow and cash flow statement
- CO –4 To provide knowledge about budget control keeping in mind the scope of the concept
- CO –5 To develop the know-how and concept of marginal costing with practical problems

**BUSINESS ENVIRNOMENT – UCMM63A**

- CO- 1 Students can understand the concept of Business Environment.
- CO-2 Its creates knowledge of Political Environment among the students.
- CO- 3 Enable the students to know about the Socio-Cultural Environment and its impact on Business.
- CO - 4 Students can get the knowledge of Economic & Technological environment.
- CO -5 It enrich the students in Global Environment like WTO, TRIM etc.,

**INCOME TAX LAW AND PRACTICE – II(ELECTIVE) UCMA61A**

- CO –1 To develop an idea about capital gain among students
- CO –2 To enlighten the concept of income from other source
- CO –3 Enabling the students to have a fair idea on set-off and carry forward of losses
- CO –4 To determine the concept of assessment of individual
- CO –5 To equip the students with thoughts and points on assessment of firms.



**HUMAN RESORURCE MANAGEMENT(ELECTIVE) UCMA62A**

- CO 1 To aiming to enable the students in Human Resources Management
- CO –2 To introduce the students about placement and training
- CO –3 To facilitate the knowledge about performance appraisal and different methods
- CO –4 To provide an idea about different compensation policies

**DEPARTMENT OF COMMERCE**  
**M.COM., (general)**  
**PROGRAM SPECIFIC OUTCOMES**

SEM 1

**Advanced Corporate Accounting & Accounting Standards-PCMM11A**

CO1.To familiarize students with accounting with the accounting treatment adopted for raising funds

and redeeming them.

CO 2.To help the students understand the techniques of restructuring and liquidating the corporate

entities.

CO3. To provide the student with knowledge of recent developments in corporate accounting.

CO 4.To understand the procedure for valuing goodwill and shares of a company.

CO5.To comprehensive understanding of the advanced issues in accounting for assets, liabilities and

owner's equity.

**Advanced financial Management-PCMM12E**

CO1. To understand various forms of market imperfections and their implications for financial managers

CO2. To define the financial dimension to the development and achievement of corporate objectives, strategic plans and policies.

CO3. To explain the changing financial needs through the life-cycle development of an organization.

CO4. To examine the developments in financial instruments available to firms for financing or investment purposes and assess their role in various corporate financial policies.

CO5. To determine the strategic policies, tactical plans and activities of business acquisitions, and demonstrate knowledge of the financial valuation methods involved.

**Organizational Behavior-PCMM13E/PCMM13A**

CO1. Students will gain knowledge to analyze and compare different models used to explain individual behavior related to motivation and rewards

CO2. It identifies the processes used in developing communication and resolving conflicts.

CO3. Student understands the concepts of group dynamics, organizational change,

CO 4. Analyse the behavior of individuals and groups in organizations in terms of the key factors that influence organizational behavior.

CO5. Assess the potential effects of organizational- level factors (such as structure Culture and change) on organizational behavior.

### **Managerial Economics-PCMM14A/PCMM14E**

CO1. To understand the basic concepts of managerial economics. And the economic goals of the firms and optimal decision making.

CO2. To impart the basic concepts of Demand, Supply and Equilibrium and their determinants and to analyze the effect of these factors on market dynamics.

CO3. To understand cost function and the difference between short-run and long-run cost function and to establish the linkage between production function and cost function.

CO 4. To examine about the market structure and its strategy.

CO 5. To identify the pricing methods, planning and forecasting.

### **ACCOUNTING OF SPECIALIZED INSTITUTIONS – PCMA11A(Elective)**

**CO 1 :** To enable the students to understand accounting practices in Acquisition and Amalgamation and its procedures.

CO2 : Its provide knowledge about the provisions as per Banking Regulation Act.

CO 3 : To Provide knowledge about legal provision Act 1956.

CO 4: Students can understand the concept of Accounting system. ( Single & Double Accounts).

CO 5 : It creates the knowledge of Specialized Institutions and Government Grants for Accounting standard 12 & 13.

### **SEM -2**

#### **Advanced cost and management accounting-PCMM21A**

CO1. To understand of the role and function of cost and management accounting in achieving the objectives of an organization

CO 2. To demonstrate costing methods and techniques appropriate to a variety of different businesses

CO 3. To understand the costing system, management control and cost control techniques.

CO 4. To examine the costing method and operating costing (JIT costing)

CO 5. To impart knowledge on standard costing and variance analysis.

### **Quantitative Techniques for Business Decisions- PCMM22A**

CO1. To know about linear programming.

CO2. To know the various techniques of operations research

CO3. To analyze transportation problem, North West corner rule and MODI method.

CO4. To identify the assignment problem and network analysis like CPM, PERT. Free float and Independent float.

CO 5. To understand game theory and its methods.

### **Corporate Laws -**

CO1. To understand the concept of SEBI regulation.

CO 2. To examine about Competition Act, 2002 and Foreign Exchange Management Act (FEMA) 1999.

CO3. To know about the Property rights, Patents Act 1970, Copy rights and Information technology

Act 2000.

CO 4. To understand about Environmental Protection Act 1986 and its prevention and control of environmental pollution 5. To impart knowledge on Consumer Protection Act 1986 and MRTP Act.

CO 5. Apply principles of corporate law in a rigorous and principled manner. Undertake legal research at an intermediate level using both primary and secondary sources.

### **Income Tax Law and Practice (Elective)-PCMA21A**

CO1. To understand the basic concept of assessment year, Revenue Income and expenditure.

CO2. To know about the heads of Income and depreciation.

CO 3. To analyze the income under the heads of capital gains

CO 4. To computation of total income

CO5. To identify the assessment procedure of income tax and to compute the net wealth.

### **Total Quality Management(Extra disciplinary)-PCME21A**

CO1: Identify Quality and Cost considerations

CO2: Evaluate Statistically Quality Control

CO3: Understand Sampling Inspection

CO4: Identify Quality management System and total quality control

CO5: Understand ISO 9000 and environmental management system

## SEM -3

### **Research Methodology – PCMM31A**

CO1. To understand the concept of research methodology, to know about research design and sampling

CO 2. To analyze methods of data and impart knowledge on reliability and about various tests

CO3. Develop data collection instrument according to the underlying theoretical framework ,learn  
about research report and drafting.

CO 4. Develop data collection instrument according to the underlying theoretical framework.

CO 5. Explain how to conduct data collection (quantitative and qualitative) .

### **Knowledge Management-PCMM32A**

CO1: Understand Knowledge economy and Knowledge management strategy

CO2: Identify Knowledge Attributes

CO3: Understand Infrastructure of Knowledge Management and Applications

CO4: Develop Knowledge Culture

CO5: Comprehend Knowledge Management tools, techniques and knowledge audit.

### **Fundamentals of Information Technology- PCSM34A**

CO1. Recognize when to use each of the Microsoft Office programs to create professional and academic documents.

CO2. Use Microsoft Office programs to create personal, academic and business documents following current professional and/or industry standards

CO 3. To be familiar with contemporary issues in networking technologies.

CO4. To understand the organization of computer networks, factors influencing computer network development and the reasons for having variety of different types of networks.

CO 5. To understand the concepts of main protocols such as HTTP, FTP, SMTP, TCP, UDP, IP

### **INDIRECT TAX – (Elective) PCMA31A**

CO 1 : To enable to students to gain knowledge of Tax System in India.

CO 2 : To gain and insight on the recording and analyzing the transactions for compliances under  
GST.

CO 3: It makes the students about Taxation and Assessment proceedings.

CO 4 : Student gain the knowledge of GST Audit.

CO 5 : This enable the students to understand the Custom duty and its proceedings.

**CRM & Relationship marketing – (Elective) PCMA32A**

CO 1 . To enable the students to understand the need for CRM.

CO2 . Students will have complete knowledge of statistical analysis of customer surveys.

CO3 . To impart knowledge on customer relationship marketing.

CO4 . Students will have complete knowledge on customer partnership like internal , external and

suppliers.

CO5 . To impart knowledge on technology in CRM and changing corporate culture.

**Business Ethics, Corporate Governance and Social Responsibility(Extra Disciplinary) –  
PCME31A**

CO1. Understand Concept of ethics and ethical management

CO2 . Describe the Environmental Responsibility

CO3 . Describe Corporate Social Responsibility

CO4. Generate Corporate Governance

CO5. Describe Codes of Governance.

SEM -4

**Management Information Systems-PCMM41A**

CO1. Understand Concept and components of MIS

CO2:.Understand Data Base Management systems

CO3. Discuss Information system

CO4. Indicate Transaction processing and support system

CO5. Describe Functional Information systems

**Investment analysis and portfolio Theory(PCMM42A)**

CO1. To impart knowledge on Securities, Market Securities, Economic forecasting and Stock investment decisions.

CO2. To develop skills in the preparation of bond, options and futures, warrants and convertible securities.

CO3. To examine the technical analysis, forecasting and individual stock performance.

CO 4. To identify the portfolio analysis, portfolio selection, Risk investors preferences and selecting best portfolio

CO5. To determine the capital market theory, Asset pricing Model and to evaluate management performance.

### **Merchant Banking and Financial Services-PCMM43A**

CO.1 Understand Merchant Banking and its functions

CO2. Understand the Public issue management

CO3. Demonstrate Post –Issue activities and portfolio management services

CO4. Describe Underwriting and global debt instruments

CO5. Understand the Depository receipts and stock exchanges

### **Strategic Human Resource Management**

CO1. Basic understanding of Strategic Human Resource Management

CO2. Understanding of HR Functions from Strategic perspective

CO3. Learning strategy implementation concerning HR

CO4. Broader understanding of SHRM and its links with corporate strategy

CO5. Learning new developments in the field of SHRM

### **Project & Viva Voce – PCMP41A**

CO1. Students will acquire the ability to make links across different areas of knowledge and to generate, develop and evaluate ideas and information so as to apply these skills to the project task.

CO2. Students will acquire the skills to communicate effectively and to present ideas clearly and coherently to specific audience in both the written and oral forms.

CO 3. Students will analyse data and synthesize research findings.

CO4. Students can demonstrate a capacity to communicate research results clearly, comprehensively and persuasively.

**DEPARTMENT OF BUSINESS ADMINISTRATION**

**B. B. A**

**FINANCIAL ACCOUNTING**

CO 1	Understand and apply accounting concepts, principles and conventions for their routine Monetary transaction
CO 2	Prepare ledger accounts using double entry bookkeeping and record journal entries accordingly
CO 3	Create and Prepare financial statements in accordance with Generally Accepted Accounting Principles
CO 4	Apply basic Accounting Standards
CO 5	Analyze, interpret and communicate the information contained in basic financial statements and explain the limitations of such statements.

**PRINCIPLES OF MANAGEMENT**

CO 1	Understand the overview of management, theory of management and practical applications of the same
CO 2	Integrate management principles into management practices
CO 3	Develop analytical and problem-solving skills, based on understanding of management concepts and theories.
CO 4	Applying planning and managerial decision-making skills
CO 5	Comprehend & correlate all the management functions which are happening around with fundamental concepts and principles of management

**MANAGERIAL ECONOMICS**

CO 1	Students will be able to remember the concepts of micro economics and also able to understand the various micro economic principles to make effective economic decisions
CO 2	students would be able to understand the law of demand & supply & their elasticities
CO 3	Evaluate & analyze the concepts and apply them in various situations in industry
CO 4	Students would be able to apply various techniques to forecast demand for better utilization of resources.
CO 5	understand the basics of market structures and their environment



## **BUSINESS COMMUNICATION SKILLS**

CO 1	Enumerate basic concepts and mechanics of Oral and Written Communication.
CO 2	Develop business report writing skills.
CO 3	Develop presentation skills and communicate confidently.
CO 4	Gaining an understanding of emerging electronic modes of communication

## **LEGAL ASPECTS OF BUSINESS**

CO 1	Acquire a sound understanding of the legal aspects of the laws affecting businesses
CO 2	know the factors to be included in contract to perform and understand the methods of discharge of contracts and how to find the solution after breaking the contracts
CO 3	Explain the importance Creation of Agency, roles and responsibilities of Agent and rights of Principal and Agent, in case of discharge of Agency
CO 4	Describe current law, rules, and regulations related to settling business disputes
CO 5	Describe types of companies and Explain various clauses of companies' act 1956.
CO 6	Distinguish duties and liabilities of promoters and compare and contrast duties of Directors and independent Directors

## **ORGANISATIONAL BEHAVIOR**

CO 1	Define, explain and illustrate a range of theories of organizational behaviour, organization culture, change and Development.
CO 2	Understanding of dynamics of OB, the concept of personality and perception, values and attitude
CO 3	Enumerate the importance of leadership, attitude and values in organization
CO 4	Analyze different personality theories and understand leadership theories
CO 5	Understand Individual behavior and dynamics of groups and effective team building
CO 6	Develop his personality, decision making abilities and interpersonal communication skills.
CO 7	Generalize organizational culture and development.
CO 8	Analyse the behaviour of individuals and groups in organisations in terms of organizational behaviour theories, models and concepts

## **BUSINESS STATISTICS**

CO 1	Define statistics, become aware of wide range of applications in statistics
CO 2	Classify and tabulate data by using statistical methods
CO 3	Prepare diagrammatic and graphical representations of statistical data.
CO 4	Apply various measures of central tendency –mean, median, mode, GM and H.M

CO 5	Understanding the concepts of various measures of dispersion and its applications in business decisions
CO 6	Ability to understand the concept of Correlation, Regression, Time Series Analysis and Index Numbers

### **COMPUTER APPLICATIONS IN BUSINESS**

CO 1	Gain familiarity with the concepts and terminology used in the development, implementation and operation of business computer applications
CO 2	Understand to use word, excel, power point and database.
CO 3	Achieve hands-on experience with productivity/application software to enhance business activities
CO 4	Explore various methods where Information Technology can be used to support existing businesses and strategies
Co5	To inculcate knowledge on RDBMS concepts and Program.

### **COST ACCOUNTING**

CO 1	Describe the meaning and concepts of Cost accounting
CO 2	Explain the concepts of Cost analysis and control
CO 3	Able to prepare cost sheet.
CO 4	Critically evaluate various cost and interpret in relation to business
CO 5	Analyze the results after applying various costing methods and techniques

### **INTERNATIONAL TRADE**

CO 1	Understand the meaning of International trade and distinguish it from domestic trade.
CO 2	Understand the importance of EXIM Policy and how to apply them in due course of business.
CO 3	Understand the legal framework of foreign trade in India.
CO 4	Understand and analyze the impact of Foreign currency in international trade.
CO 5	Analyze and Evaluate the business environment

### **MARKETING MANAGEMENT**

CO 1	Understand the concepts of Marketing, Marketing Mix, Marketing Segmentation, Buyer Behaviour, Sales management and focuses on the applications.
CO 2	Analyze the buyer behavior of domestic and industrial consumers and market segmentation.
CO 3	Critically evaluate the needs of the customer from the products/services - Marketing mix - product, price, place and Promotion
CO 4	Develop strong marketing plans and strategies and persuasively communicate your offerings, recommendations and rationale.

## **FINANCIAL MANAGEMENT**

CO 1	Understand the concept of capital
CO 2	List the primary sources of capital and incorporate their cost when making investment decisions.
CO 3	Understand the concept of Debt and Equity and the theories related to capital structure.
CO 4	Estimate the cash flow from the project and evaluate the investment decision.
CO 5	Understand the dividend policies and how it increases the wealth of the company.
CO 6	Can take decisions related to working capital requirements.

## **HUMAN RESOURCE MANAGEMENT**

CO 1	Understand HRM Functions and Practices
CO 2	Apply HRM concepts and skills across various types of organizations
CO 3	Understand and apply the recruitment and selection process
CO 4	Evaluate the performance of the employee and identify the training needs
CO 5	Develop training and development programme
CO 6	Understand the recent trends in HR

## **MANAGEMENT INFORMATION SYSTEM**

CO 1	Can define what is Management Information System and explain its role in decision making
CO 2	Explain different type of networks
CO 3	Understand the concept of DSS & BPO
CO 4	Understand the various Hardwares and softwares used in Management Information system
CO 5	Understand the importance of SDLC and ERP

## **OPERATIONS RESEARCH**

CO 1	Learn the concept of OR and its application in various management aspects
CO 2	Develop the OR model from real life situations
CO 3	Define and formulate linear programming problems
CO 4	Apply Transportation and Assignment model to Optimize the resource utilization
CO 5	Use critical path analysis and programming evaluation production and review techniques for timely project scheduling and completion
CO 6	Model competitive real world phenomena using concepts from game theory
CO 7	Understand steps in decision making process and take decisions using EMV and Decision Trees.

## **PRODUCTION AND MATERIALS MANAGEMENT**

CO 1	understand of importance of Production management
CO 2	Identify and evaluate the key factors in Plant Capacity, Location and Layout decisions
CO 3	understand various methods of materials management
CO 4	Apply techniques for effective utilization of operational resources and managing the processes to produce good quality products and services at competitive prices.
CO 5	Categorize and prioritize the maintenance programmes

## **CUSTOMER RELATIONSHIP MANAGEMENT**

CO 1	Understand the concept of Customer relationship management
CO 2	Apply CRM strategies on Customer Retention process
CO 3	Understand the evolution CRM and impact of technology on CRM
CO 4	Learn the steps in the selection of CRM Packages
CO 5	Explore the recent trends in CRM

## **MANAGEMENT ACCOUNTING**

CO 1	Apply accounting framework to prepare financial statements
CO 2	Imbibe critical thinking skills to analyze financial statements
CO 3	Evaluate the financial position of the business by using ratio analysis
CO 4	Value the concepts of marginal costing and its application in managerial decision making
CO 5	Evaluate the cost related aspects of business

## **PRINCIPLES OF INSURANCE**

CO 1	Understand various types of risks.
CO 2	Assess the process of identifying and measuring the risk.
CO 3	Acquaint with the functioning of life Insurance in risk management.
CO 4	Understand general insurance contract
CO 5	Learn how to manage Risk

## **RESEARCH METHODOLOGY AND BUSINESS**

CO 1	Learn and Understand the research Process and its approaches
CO 2	Apply a range of quantitative and / or qualitative research techniques to business and management problems / issues
CO 3	understanding of research design and scaling methods
CO 4	Demonstrate knowledge and understanding of data analysis and interpretation in relation to the research process
CO 5	Conceptualise the research process
CO 6	Enabling to draft a research report

## SERVICES MARKETING

CO 1	Understand the concepts and growth of service marketing
CO 2	Appreciate the difference between marketing physical products and intangible services
CO 3	Recognise the challenges faced in services delivery as outlined in the services gap model.
CO 4	Learn about the various types of services

## ADVERTISING AND SALESMANSHIP

CO 1	Understand the process involved in Advertising and Market segmentation
CO 2	Learn about the media selection and budget planning.
CO 3	Planning the sales promotion activities
CO 4	Implementation of Sales and Advertising Strategies
CO 5	Control Measures

## CONSUMER BEHAVIOUR

CO 1	Understand the Application of consumer behaviour in marketing
CO 2	Explain Individual and group determinants of consumer behaviour
CO 3	Understand the Environmental influences on consumer behavior
CO 4	Learn Consumer decision making process

## ENTREPRENEURIAL DEVELOPMENT

CO 1	Understand concepts, process and types of entrepreneurship, Project management and EDP
CO 2	Able to define who is an Entrepreneur and what his or her characteristic features are, what skills made them successful and what qualities are required to become an Entrepreneur
CO 3	Demonstrate the ability to provide a self-analysis in the context of an entrepreneurial career
CO 4	Able to develop skills in the area of conducting feasibility studies, analysis of opportunities and strategies and promotion of entrepreneurship
CO 5	Exposed to entrepreneurial cultural and industrial growth so as to prepare them to set up and manage their own small units
CO6	Get aware of various financial institutions/agencies supporting the entrepreneurs

## FINANACIAL SERVICES

CO 1	Learn about the capital markets and Stock Exchanges
CO 2	Understands the role of financial institution and its functions
CO 3	Understands the activities of Merchant banking institutions
CO 4	Understands the role of Hire purchase and leasing
CO 5	Understands the role of Mutual fund industry and its functions