

K.L.E Society's  
Raja Lakhamagouda Science Institute, Belagavi  
Autonomous

**B.Sc., BCA, M.Sc. Physics, M.Sc. Chemistry, M.Sc. Mathematics**

Programme outcome

Undergraduate Programme

Bachelor of Science (B.Sc.)

- Acquired the knowledge with facts and figures related to various subjects in sciences such as Physics, Chemistry, Mathematics, Electronics, Statistics, Botany, Zoology, Biotechnology, computer application and other fields etc.
- Understood the basic concepts, fundamental principles, and the scientific theories related to various scientific phenomena and their relevancies in the day-to-day life
- Create, select and apply appropriate techniques, resources and modern technology in multidisciplinary environment
- B.Sc. student is able to concentrate on all basic and applied science subjects
- Graduate students will demonstrate a scientific knowledge of the core subjects
- The student will determine the appropriate level of technology for use in:
  - Experimental design and implementation
  - Analysis of experimental data
  - Student will be able to apply the underlying unifying structures of science
  - Students can investigate and apply scientific background to solve problems in a variety of contexts related to science, technology, business and industry, and illustrate these solutions using symbolic, numeric, or graphical methods
- Prepare students for prominent career in research, teaching profession, Indian civil services, various govt. sectors, industry, banks, and offices.

**Department of Physics**  
**I and II Semester**

<b>Course</b>	<b>Outcome</b>
Frame of Reference	CO1: To understand Set of co ordinates that can be used to determine the positions velocities of objects in that frame.
SHM and Vibrations	CO 2: Understanding the concepts of SHM and its applications.
Jet planes and Rockets	CO 3: Enable the Theories of Fundamental concepts of Jet and Rockets.
Rigid Body Dynamics	CO 4 : Formulate the Equations for Moment of Inertia of different bodies about different axes
Fluid Dynamics	CO 5: Applications of the theoretical concepts of Properties of Matter.
Ultrasonics and Acoustics	CO 6: To study the methods of production and detection of Ultrasonic waves and its applications.
Kinetic theory of Gases and transport phenomena	CO 7: Knowledge Maxwell's law of distribution of velocities and transport Phenomena
Thermodynamics	CO 8: Listing the basic ideas on Heat CO 9 : To study the Engines using basic Laws of Thermodynamics.
Low Pressure and Temperature	CO 10: Study of the concepts of Low Pressure and Temperature
Radiation	CO 11 : Experimental determination of Specific heat and verification of Stefan's Law

**III and IV Semester**

<b>Course</b>	<b>Outcome</b>
B.Sc. III Semester <b>Optics</b>	<p>CO1: This course provides students with a working knowledge of optical physics, including interference, diffraction, polarization, laser physics and optical fibers. They will be able to appreciate the applications of these concepts in modern physics.</p> <p>CO2: The syllabi focus on image forming systems and aberrations.</p> <p>CO3: Students will be able to recognize phenomena involved in variety of technologies in our day-to-day life.</p>
B.Sc. IV Semester <b>Electricity and Magnetism</b>	<p>CO1: The students will acquire in-depth knowledge in electrostatics and magneto statics.</p> <p>CO2: They will be able to apply laws to construct and solve electrical circuits such as LCR and L&amp;C circuits.</p> <p>CO3: To study the growth and decay of charges to compute the time constants.</p> <p>CO4: To apply knowledge of electricity and magnetism to explain natural physical processes.</p> <p>CO5: To build up strong problem solving skills by effective formulation of a circuit problem into a mathematical problem using circuit laws and theorems.</p> <p>CO6: Students will be able to use electromagnetic theory and principles in range of applications.</p>

**V and VI Semester**

SEM	Course	Outcome
V SEM	Classical Mechanics, Relativity & Electronics	<p><b>CO1:</b> Understand the terminologies used in classical mechanics &amp; employ conceptual understanding to make predictions and then approach mathematically.</p> <p><b>CO2:</b> This course will introduce students to principles of special theory of relativity and analog electronics. Students will be able to acquire basic knowledge of electronic devices. This helps students to develop ability to analyze electronics circuits and their applications.</p>
	Quantum Mechanics, Spectroscopy & Mathematical Physics	<p>This course enables students to Understand</p> <p><b>CO1:</b> The Importance of quantum mechanics at microscopic level.</p> <p><b>CO2:</b> The concept of interaction of electromagnetic radiation with matter.</p> <p><b>CO3:</b> Fundamental concepts of complex analysis and integral transforms</p>
VI SEM	Statistical Mechanics, Solid State Physics & Nuclear Physics	<p><b>CO1:</b> students will be able to understand</p> <ul style="list-style-type: none"> <li>• How statistics of the microscopic world can be used to explain the thermal features of the macroscopic world.</li> <li>• Bose-Einstein and Fermi Dirac statistics and establish connection between statistics and thermodynamics.</li> </ul> <p><b>CO2:</b> Provides an introduction to solid state physics. This study attempts to explain various types of phenomena like crystal structure, Crystal diffraction, Specific heats of solids, Free electron Theory, Semiconductors &amp; Magnetic materials</p> <p><b>CO3:</b> Basic properties of nucleus and nuclear models to study the nuclear structure properties. Students will be exposed to fundamental concepts and working principles of various nuclear instruments like GM counter, Scintillation counter, Linear accelerator and Cyclotron.</p>
	Energy Sources , Electronics , Analog Communication and C-Programming	<p><b>CO1:</b> Explain the conventional and renewable energy and their primary applications. • Describe the challenges and problems associated with the use of various energy sources, including fossil fuels, with regard to future supply and the environment.</p> <p><b>CO2:</b> This enables students to understand</p> <ul style="list-style-type: none"> <li>• the logic symbols, Truth table, Boolean expressions</li> <li>• logical behavior of digital circuits</li> </ul> <p><b>CO3:</b> Students will be exposed to Radio-wave Propagation Modulation &amp; Demodulation for long distance communication</p> <p><b>CO4:</b> Enables students to understand concepts of C- language and write program for simple applications of life.</p>

## Department of Chemistry

<b>B.Sc. I Semester</b>	
<b>Course</b>	<b>Course outcome</b>
<b>Inorganic chemistry</b>	
<b>Wave Mechanical concept of atom</b>	<ul style="list-style-type: none"> <li>• Understand the structure and composition of an atom</li> <li>• Understand the wave and practical dual nature of light</li> <li>• Able to understand the concept of Quantum numbers</li> </ul>
<b>Periodic Classification of Elements</b>	<ul style="list-style-type: none"> <li>• Knowledge of organization of periodic table</li> <li>• Understand the Periodic law and Periodic properties</li> <li>• Able to Classify elements into s, p, d and f block</li> </ul>
<b>Principles of volumetric analysis</b>	<ul style="list-style-type: none"> <li>• Understand the basic concepts of chemical analysis</li> <li>• Knowledge of different types of volumetric titrations</li> <li>• Understand the concept of indicators and applications</li> </ul>
<b>Organic chemistry</b>	
<b>Classification and Nomenclature of organic compounds</b>	<ul style="list-style-type: none"> <li>• Able to classify organic compounds and name them</li> </ul>
<b>Structure and bonding of organic molecule</b>	<ul style="list-style-type: none"> <li>• Understand the concept of different types of bonding</li> <li>• Knowledge of hybridization</li> <li>• Knowledge of bond length, angle and energy</li> </ul>
<b>Organic Reactions and their mechanism</b>	<ul style="list-style-type: none"> <li>• Understand the concept different electronic effects in the organic molecules</li> <li>• Knowledge of reactive intermediates</li> <li>• Understand the types of organic reactions</li> <li>• Knowledge of organic named reactions</li> </ul>
<b>Stereochemistry of organic compounds</b>	<ul style="list-style-type: none"> <li>• Understand the stereochemistry of the organic compounds</li> <li>• Know the different types of isomerism exhibited by the molecules (Optical isomerism, Geometrical and Conformational isomerism)</li> </ul>
<b>Physical Chemistry</b>	
<b>Gaseous State</b>	<ul style="list-style-type: none"> <li>• Able to understand real gas concept and basic principles</li> <li>• Knowledge of critical phenomenon of gases and critical physical constants</li> <li>• Understand collision properties</li> </ul>
<b>Solubility Phenomena</b>	<ul style="list-style-type: none"> <li>• Knowledge of solubility and factors influencing (Solids, Gas, Liquid)</li> <li>• Able to know concept of binary mixtures (liquid – liquid) and partially miscible liquid system</li> </ul>

	<ul style="list-style-type: none"> <li>• Understand the concept of ideal and non ideal solutions</li> </ul>
<b>Salt-hydrolysis</b>	<ul style="list-style-type: none"> <li>• Knowledge of salt hydrolysis</li> <li>• Hydrolytic constant/degree of hydrolysis and expression for <math>P^H</math> for combination of weak – strong acid - base</li> </ul>
<b>Nernst distribution law</b>	<ul style="list-style-type: none"> <li>• Able to understand the concept of solid distribution in solvents</li> </ul>
<b>B.Sc. II Semester</b>	
<b>Inorganic chemistry</b>	
<b>Chemical Bonding</b>	<ul style="list-style-type: none"> <li>• Understand the different types of bonding concept (Ionic, Covalent, Coordinate, Metallic)</li> <li>• Understand different bonding theories</li> <li>• Able to understand molecular orbital diagrams to interpret bonding</li> </ul>
<b>p-Block elements</b>	<ul style="list-style-type: none"> <li>• Knowledge of properties and characteristics of p-block elements</li> <li>• Able to understand basic principles of semiconductors and their types</li> </ul>
<b>Electroplating and Galvanization</b>	<ul style="list-style-type: none"> <li>• Application of electroplating and galvanization techniques</li> </ul>
<b>Organic chemistry</b>	
<b>Alkenes, Dienes and Alkynes</b>	<ul style="list-style-type: none"> <li>• Understand the classification of organic molecules as alkenes, dienes and alkynes</li> <li>• Knowledge of preparation methods of organic compounds</li> </ul>
<b>Aromatic hydrocarbons</b>	<ul style="list-style-type: none"> <li>• Knowledge of aromaticity</li> <li>• Able to understand properties and reactions of aromatic hydrocarbons</li> </ul>
<b>Composition of Organic compounds</b>	<ul style="list-style-type: none"> <li>• Understand the composition of organic compounds</li> <li>• Knowledge of elemental analysis</li> </ul>
<b>Spectroscopy</b>	<ul style="list-style-type: none"> <li>• Able to gain the knowledge of spectroscopy in the structural elucidation of organic compounds</li> </ul>
<b>Physical chemistry</b>	
<b>Colligative Properties</b>	<ul style="list-style-type: none"> <li>• Understand the concept of colligative properties and their determination and applications</li> </ul>
<b>First Law of Thermodynamics</b>	<ul style="list-style-type: none"> <li>• Able to understand the concepts and laws of thermodynamics</li> <li>• Able to apply the thermodynamic concepts in day-to-day chemical concepts</li> </ul>

<b>Acids-Bases</b>	<ul style="list-style-type: none"> <li>• Understand the applications of Acids and Bases</li> <li>• Knowledge of acid-base characteristics of biological fluids</li> </ul>
<b>Concept of Solubility Product Principle</b>	<ul style="list-style-type: none"> <li>• Able to understand the concept of solubility and its applications in purification of common salt</li> </ul>
<b>B.Sc. III Semester</b>	
<b>Inorganic Chemistry</b>	
<b>Fertilizers</b>	<ul style="list-style-type: none"> <li>• Understand the importance and harmful effects of the fertilizers on environment and agricultural products</li> </ul>
<b>Radioactivity (Properties of <math>\alpha</math>, <math>\beta</math>, <math>\gamma</math> rays)</b>	<ul style="list-style-type: none"> <li>• Knowledge of radioactive elements and their applications in chemistry</li> </ul>
<b>HSAB Principles</b>	<ul style="list-style-type: none"> <li>• Able to understand the concept of HSAB and apply the concept in its application in different areas of science</li> </ul>
<b>Organic Chemistry</b>	
<b>Aromatic Orientation</b>	<ul style="list-style-type: none"> <li>• Knowledge of orientation of substitution in aromatic compounds</li> </ul>
<b>Nucleophilic substitution reaction</b>	<ul style="list-style-type: none"> <li>• Knowledge of nucleophilic substitution reactions</li> <li>• Understand the difference between substitution &amp; elimination reactions</li> </ul>
<b>Alcohols</b>	<ul style="list-style-type: none"> <li>• Understand the nomenclature, preparation, reactions and applications of alcohols</li> </ul>
<b>Phenols</b>	<ul style="list-style-type: none"> <li>• Knowledge of nomenclature, preparation, reactions and applications of phenols</li> </ul>
<b>Organometallic compounds</b>	<ul style="list-style-type: none"> <li>• Able to know the synthetic applications of organometallics in organic synthesis</li> </ul>
<b>Infrared spectroscopy</b>	<ul style="list-style-type: none"> <li>• Understand the principles of in spectroscopy and its applications in interpretation of chemical compounds</li> </ul>
<b>Physical Chemistry</b>	
<b>Second law of thermodynamics</b>	<ul style="list-style-type: none"> <li>• Able to understand the concepts and laws of thermodynamics in general and second law of thermodynamics in specific</li> <li>• Understand the concept of heat engine, partial molal free</li> </ul>
<b>Liquid State</b>	<ul style="list-style-type: none"> <li>• Understand the concept of surface tension, viscosity and refractive index of liquids and their applications</li> </ul>
<b>Liquid crystals</b>	<ul style="list-style-type: none"> <li>• Knowledge of liquid crystals and their applications</li> </ul>

<b>B.SC. IV SEMESTER</b>	
<b>Inorganic Chemistry</b> <b>Chemistry of <i>d</i> and <i>f</i> block elements</b>	<ul style="list-style-type: none"> <li>• Understand the characteristics, properties and reactions of <i>d</i> and <i>f</i> block elements</li> </ul>
<b>General Chemistry</b>	<ul style="list-style-type: none"> <li>• Knowledge of chemistry (role of Ag-Br) in photography</li> <li>• Understand the preparation and reactions of interhalogen compounds</li> </ul>
<b>Organic Reagents in Inorganic analysis</b>	<ul style="list-style-type: none"> <li>• Able to understand the use of organic reagents in inorganic analysis</li> </ul>
<b>Environmental chemistry</b>	<ul style="list-style-type: none"> <li>• Understand the impact of environmental pollution and the application of chemistry to control the pollution</li> </ul>
<b>Organic Chemistry</b> <b>Aldehydes and Ketones</b>	<ul style="list-style-type: none"> <li>• Understand the nomenclature, preparation, reactions of aldehydes and ketones</li> </ul>
<b>Carboxylic Acids</b>	<ul style="list-style-type: none"> <li>• Understand the nomenclature, preparation, reactions of carboxylic acids</li> </ul>
<b>Aromatic Amines</b>	<ul style="list-style-type: none"> <li>• Understand the nomenclature, preparation, reactions of aromatic amines</li> </ul>
<b>Ethers &amp; Epoxides</b>	<ul style="list-style-type: none"> <li>• Understand the nomenclature, preparation, reactions of ethers and epoxides</li> </ul>
<b>Pesticides and Insecticides</b>	<ul style="list-style-type: none"> <li>• Understand the impact of pesticides and insecticides on environmental and the adverse effects</li> </ul>
<b>Physical Chemistry</b> <b>Electrochemistry</b>	<ul style="list-style-type: none"> <li>• Knowledge of electrochemical concepts and applications in conductivity measurements and transport number</li> </ul>
<b>Chemical kinetics</b>	<ul style="list-style-type: none"> <li>• Understand the concept of chemical kinetics</li> <li>• Knowledge of its implication in rate laws of a reaction</li> </ul>
<b>Nanochemistry</b>	<ul style="list-style-type: none"> <li>• Understand the concept of nano-chemistry</li> <li>• Knowledge of preparation of nanocrystals and their characterization</li> </ul>
<b>B.Sc. V Semester (Paper - I)</b>	
<b>Inorganic Chemistry</b> <b>Coordination Compounds</b>	<ul style="list-style-type: none"> <li>• Understand the differences between salts, double salts and complex salts</li> <li>• Knowledge of coordination compounds and their properties and applications</li> </ul>
<b>Theory of Gravimetric Analysis</b>	<ul style="list-style-type: none"> <li>• Understand principles and applications of gravimetric analysis in industrial and chemical process</li> </ul>
<b>Nuclear Chemistry</b>	<ul style="list-style-type: none"> <li>• Understand the importance and constructive use of nuclear reactions</li> </ul>
<b>Organic Chemistry</b>	<ul style="list-style-type: none"> <li>• Knowledge of heterocyclic compounds and their properties and applications in medicinal chemistry</li> </ul>

<b>Heterocyclic Compounds</b>	
<b>Organic Synthesis using active methylene compounds</b>	<ul style="list-style-type: none"> <li>• Understand the importance of active methylene compounds in organic chemistry</li> </ul>
<b>Pericyclic Reactions</b>	<ul style="list-style-type: none"> <li>• Knowledge of pericyclic reactions and their applications in organic synthesis</li> </ul>
<b>Alkaloids</b>	<ul style="list-style-type: none"> <li>• Understand the properties and importance of alkaloids</li> </ul>
<b>Physical Chemistry Phase equilibria</b>	<ul style="list-style-type: none"> <li>• Able to understand importance and implications of phase equilibria</li> </ul>
<b>Interfacial Surface Chemistry</b>	<ul style="list-style-type: none"> <li>• Understand the phenomenon of surface chemistry and applications</li> </ul>
<b>Enzyme catalysis</b>	<ul style="list-style-type: none"> <li>• Knowledge of enzyme catalysis and applications</li> </ul>
<b>Kinetics of chain reactions</b>	<ul style="list-style-type: none"> <li>• Understand the kinetics of chain reactions and able to apply the knowledge in science</li> </ul>
<b>B.Sc. V Semester (Paper - II)</b>	
<b>Inorganic Chemistry Industrial chemistry</b>	<ul style="list-style-type: none"> <li>• Understand the properties and applications of Alloys, abrasives, ceramics, fuels and explosives</li> </ul>
<b>Small Scale Industrial products</b>	<ul style="list-style-type: none"> <li>• Knowledge of small scale industrial process and able to plan for establishing small scale units</li> </ul>
<b>Organic Chemistry Reagents and Reactions</b>	<ul style="list-style-type: none"> <li>• Understand the usefulness of reagents in chemical sciences</li> </ul>
<b>Industrial organic chemistry</b>	<ul style="list-style-type: none"> <li>• Understand the properties and applications of dyes</li> <li>• Knowledge of drugs and their medicinal implications</li> </ul>
<b>Polymers</b>	<ul style="list-style-type: none"> <li>• Able to understand the properties and applications of polymers and student should able to think of polymerization industrial process</li> </ul>
<b>Physical Chemistry Electro Motive Force</b>	<ul style="list-style-type: none"> <li>• Understand the concept chemical potentials and able to apply the knowledge to work with emf cell and their applications</li> </ul>
<b>Physical properties and molecular structure</b>	<ul style="list-style-type: none"> <li>• Understand the physical properties of molecules in arriving at molecular structure</li> </ul>
<b>B.Sc. VI Semester PAPER – I</b>	
<b>Inorganic Chemistry Coordination compounds and Metal ligand Equilibria</b>	<ul style="list-style-type: none"> <li>• Students are able to understand the advances in bonding characteristics in coordination compounds</li> <li>• Understand the stability of metal complexes and factors affecting</li> </ul>
<b>Electronic spectra of transition metal complexes</b>	<ul style="list-style-type: none"> <li>• Knowledge of electronic spectral techniques in understanding the geometry of complexes</li> <li>• Students gain interest in research</li> </ul>

<b>Organic Carbohydrates</b>	<b>Chemist</b>	<ul style="list-style-type: none"> <li>• Understand the sources, properties, reactions and applications of different types of carbohydrates</li> </ul>
<b>Amino acids, Peptides &amp; Proteins</b>		<ul style="list-style-type: none"> <li>• Knowledge of amino acids, peptides and proteins in day to day life</li> <li>• Properties and applications in biochemical processes</li> </ul>
<b>Vitamins and Hormones</b>		<ul style="list-style-type: none"> <li>• Understand the important functions of vitamins and hormones</li> <li>• Student should able to understand need for regulating healthy biochemical processes</li> </ul>
<b>Terpenoids</b>		<ul style="list-style-type: none"> <li>• Knowledge of usefulness of terpenoids</li> </ul>
<b>Physical Chemistry Electromagnetic Radiation Rotational Spectrum</b>		<ul style="list-style-type: none"> <li>• Understand the broad spectrum of electromagnetic radiation</li> <li>• Knowledge of rotational energy changes with the interaction of radiation</li> <li>• Students were able to interpret the rotational spectrum</li> </ul>
<b>Vibrational Spectrum</b>		<ul style="list-style-type: none"> <li>• Knowledge of vibrational energy changes with the interaction of radiation</li> <li>• Students were able to interpret the vibrational spectrum</li> </ul>
<b>Electronic Spectrum</b>		<ul style="list-style-type: none"> <li>• Knowledge of electronic energy changes with the interaction of radiation</li> <li>• Students were able to interpret the electronic spectrum</li> </ul>
<b>B.Sc. VI Semester PAPER – II</b>		
<b>Inorganic Chemistry Analytical chemistry</b>		<ul style="list-style-type: none"> <li>• Understand the chromatographic and electrogravimetric techniques</li> <li>• Knowledge of errors in chemical analysis and their minimization</li> </ul>
<b>Corrosion</b>		<ul style="list-style-type: none"> <li>• Understand the cause for corrosion and its prevention</li> </ul>
<b>Soil Analysis</b>		<ul style="list-style-type: none"> <li>• Knowledge of soil chemistry</li> <li>• Students are able to understand the importance protecting soil fertility</li> </ul>
<b>Organic Chemistry Soaps &amp; Detergents</b>		<ul style="list-style-type: none"> <li>• Students understand the preparation skills of Soaps and detergents</li> </ul>
<b>NMR Spectroscopy</b>		<ul style="list-style-type: none"> <li>• Knowledge of microwave energy interaction with nuclei</li> <li>• Students were able to interpret the NMR spectrum in solving organic structures</li> </ul>
<b>Mass Spectroscopy</b>		<ul style="list-style-type: none"> <li>• Students are able to use the mass spectral techniques in structural elucidation</li> </ul>
<b>Named reactions</b>		<ul style="list-style-type: none"> <li>• Students able to understand the named reactions and</li> </ul>

	their mechanisms
<b>Physical Chemistry Photochemistry</b>	<ul style="list-style-type: none"><li>• Knowledge of photochemical reactions and their applications</li></ul>
<b>Chemical Equilibrium</b>	<ul style="list-style-type: none"><li>• Understand the concept of equilibrium concept with its implication on various reactions</li></ul>
<b>Quantum chemistry</b>	<ul style="list-style-type: none"><li>• Knowledge of quantum chemistry and its implication in all the areas of chemical sciences</li></ul>

## Department of Mathematics

<b>B.Sc I Semester</b>	
<b>Paper-I : Analysis-I and Matrices</b>	
<b>Real numbers</b>	Understand the notions of inequalities and absolute values
<b>Limits and Continuity</b>	Calculate the limit and examine the continuity of a function at a point.
<b>Differentiability</b>	Understand the consequences of various mean value theorems for differentiable functions.
<b>Indeterminate Forms</b>	Able to use L-Hospital rule
<b>Matrices</b>	Determine the matrix equation $Ax = B$ using row operations and matrix operations.
<b>Paper-II : Set Theory, Algebra &amp; Calculus-I</b>	
<b>Set theory and Functions</b>	Understand the concept of arbitrary union and intersection
<b>Theory of Equations</b>	Understand the importance of synthetic division method
<b>Higher Order derivative</b>	Able to understand the Leibnitz's rule for $n^{\text{th}}$ derivative of products
<b>Reduction Formulae</b>	Determine Integration by reduction formula.
<b>Polar Coordinates</b>	Able to understand pedal equation for polar and Cartesian curves
<b>B.Sc II Semester</b>	
<b>Paper I: Complex Numbers and Calculus II</b>	
<b>Complex numbers</b>	Able to understand algebra of complex number
<b>Singular points, curvature, envelopes and asymptotes</b>	Knowledge of evolutes and involutes
<b>Tracing of curves</b>	Able to produce a rough idea of overall shape of a plane curve
<b>Application of definite integrals</b>	Applying definite integral in calculating areas between two curves, volumes, length of curves
<b>Function of two variables</b>	Able to determine the equation of the plane tangent to the surface.

<b>Paper II: Algebra &amp; Geometry</b>	
<b>Mathematical logic</b>	Able to define different quantifiers
<b>Group theory</b>	Understand the importance of algebraic properties with regard to working within various number systems.
<b>Sphere</b>	Understand the equation of sphere and its basic properties.
<b>Cone</b>	Understand the equation of cone and its basic properties.
<b>Cylinder</b>	Understand the equation of cylinder and its basic properties..
<b>B.Sc III Semester</b>	
<b>Paper-I : Analysis II</b>	
<b>Sequence and series</b>	Determine if an infinite sequence is monotonic.
	Determine the sequence of partial sums of an infinite series.
	Determine if an infinite series converges absolutely or conditionally.
<b>Calculus of more than one variables</b>	Apply Taylor's theorem and maclaurin's series to different varieties of problems
	Able to find maxima and minima of given curves
<b>Paper-II: Group theory and Number Theory</b>	
<b>Group Theory</b>	Understand the importance of algebraic properties with regard to working within various number systems
	Understand the concept of homomorphism and isomorphism
<b>Number Theory</b>	Understand the methods and techniques used in number theory.
	Understand the solution of linear congruence
	Knowledge of Fermat's Little theorem and Wilson's theorem
<b>B.Sc IV Semester</b>	
<b>Paper-I : Differential Equations-I</b>	
<b>Homogeneous and linear differential equations and its application</b>	Evaluate first order differential equations including separable, homogeneous equation, Bernoulli's equation
	Knowledge of exact differential equation
	Knowledge of higher order exact differential equation
	Understand the particular integrals
<b>Clairaut's Equation</b>	Understand the equation solvable for p,x and y.
<b>Paper-II: Vector Calculus and Laplace Transform</b>	
<b>Vector Calculus</b>	Understand the dot, cross and Triple product of vector space.
	Understand the concept of Green's theorem and Stoke's theorem.
<b>Laplace Transforms</b>	Apply laplace transform to find solution of initial value

	problems for linear ordinary differential equations.
	Understand the Laplace transform in engineering and physics.
	Knowledge of Heavyside function and Derac Delta function.
<b>B.Sc V Semester</b>	
<b>Paper I: Real Analysis</b>	
<b>The Riemann Integration(I)</b>	Understand finding the area under the curve.
<b>The Riemann Integration(II)</b>	Understand the mean value theorem and their applications
<b>Improper Integrals</b>	Able to verify the convergence and divergence of Improper Integrals.
<b>Beta and Gamma functions</b>	Knowledge of Beta Gamma functions and their relations.
<b>Multiple Integration &amp; Differentiation under integral sign</b>	Recognize When a function of two variables is integrable over a rectangular region.
<b>Paper II : Numerical Analysis</b>	
<b>Solution of non-linear and linear equations</b>	Able to solve Linear and Nonlinear equations using different methods.
<b>Finite Differences</b>	Able to use finite difference in continuous process in a finite number of sufficiently small time intervals.
<b>Interpolation</b>	Estimating the function at intermediate point
<b>Quadrature Formula</b>	Understand the method of solving problems using Simpson's and Trapezoidal rules.
<b>Solution of Initial Value Problems</b>	Able to find solution of initial value problem for Ordinary differential equation using various methods.
<b>Paper III : Dynamics and Calculus of variations</b>	
<b>Kinematics</b>	To solve quantitative kinematics problems, including objects falling under the influence of gravity.
<b>Central Orbits</b>	Gains knowledge about motion of a particle under a central force.
<b>Motion of a projectile</b>	Able to derive the path of projectile as a parabola.
<b>Elastic Impact</b>	Able to understand impact of elastic bodies.
<b>Calculus of variations</b>	Apply the knowledge of calculus of variation to solve a wide range of real world problems of science and engineering.
<b>B.Sc. VI Semester</b>	
<b>Paper-I : Differential Equations</b>	
<b>Series solution of differential Equation</b>	The Power series method is used to seek a power series solution to certain differential equations.
<b>Simultaneous Differential Equation</b>	Able to solve the simultaneous differential equation with two or three variables.
<b>Total Differential Equation</b>	Understand the condition of integrability and its solution.
<b>Linear Partial Differential Equation</b>	Able to find the solution of linear partial differential equation of second order with constant coefficient.

<b>Non-linear partial Differential Equation</b>	Able to solve non linear partial differential equation using Charpit's method
<b>Paper-II: Complex Analysis and Algebra</b>	
<b>Analytic Function</b>	Able to construct analytic function using Milne-Thomson's method.
<b>Complex Integration</b>	Understand the concept of complex integration using various theorems.
<b>Calculus of Residues</b>	Understand the concept of Zero's singularities, poles and Cauchy's residue theorem.
<b>Ring Theory</b>	Recognize the properties of Ring
<b>Linear Algebra</b>	Recognize the concepts of the terms linear independence, basis, and dimension, and apply these concepts to various vector spaces and subspaces.
<b>Paper-III : Topology, Fourier Series and Graph Theory</b>	
<b>Topological space</b>	Recognize the concepts of the terms closure, limit points, derived sets, interior, exterior and boundary points of a set.
<b>Subspaces and Separation Axioms</b>	Gains knowledge of separation axioms.
<b>Fourier series and Transforms</b>	Understand the concept of Fourier series, half range cosine and sign series.
<b>Graph Theory I</b>	Gains knowledge about basic concepts of Graphs and its properties.
<b>Graph Theory II</b>	Gains knowledge about Eulerian and Hamiltonian graphs.

## Department of Botany

<b>B.Sc. I Semester</b>		
<b>Plant Microtechniques, Angiosperm Histology, Anatomy and Embryology</b>		
<b>S.No.</b>	<b>Course</b>	<b>Course outcome</b>
1	Plant Microtechniques	<ul style="list-style-type: none"> <li>• Students study about various types of Microscopes</li> <li>• Making of temporary microscopic slides</li> <li>• Different cutting techniques and permanent microscopic slides using paraffin method.</li> <li>• Apply various techniques to study plant tissues</li> </ul>
2	Angiosperm Histology and Anatomy	<ul style="list-style-type: none"> <li>• Develop an understanding of concepts and fundamentals of plant histology and anatomy</li> <li>• Examine the internal anatomy of plant systems and organs</li> <li>• Develop critical understanding on the evolution of concept of organization of shoot and root apex.</li> <li>• Analyze the composition of different parts of plants and their relationships</li> <li>• Differentiate between normal and anomalous secondary growth</li> <li>• Evaluate the adaptive and protective systems of plants</li> </ul>
3	Embryology	<ul style="list-style-type: none"> <li>• Understanding the process of development of Embryo in plants</li> <li>• Understand the pollen morphology and the applications of palynology</li> </ul>

<b>B.Sc.II Semester</b>		
<b>Plant Physiology and Pharmacognosy</b>		
<b>S.No.</b>	<b>Course</b>	<b>Course outcome</b>
1	Plant water Relations	<ul style="list-style-type: none"> <li>• Understand the physiology and functioning of the plants</li> <li>• Understand Water relation of plants with respect to various physiological processes</li> </ul>
2	Enzymes	<ul style="list-style-type: none"> <li>• Understand the nature, their role and mode of action and factors influencing them</li> </ul>
3	Bioenergetics	<ul style="list-style-type: none"> <li>• Understand the concept of <u>energy</u> flow through living systems,</li> <li>• different <u>cellular</u> processes such as <u>cellular respiration</u> and the many other <u>metabolic</u> and <u>enzymatic</u> processes that lead to production and utilization of energy</li> </ul>

		<ul style="list-style-type: none"> <li>Differentiate anabolic and catabolic pathways of metabolism</li> </ul>
4	Physiology of plant growth	<ul style="list-style-type: none"> <li>Helps student to study the Growth processes in plants,</li> <li>Concepts of Seed germination and dormancy</li> <li>Know about Photoperiodism and Vernalization</li> </ul>
5	Pharmacognosy	<ul style="list-style-type: none"> <li>Helps student to study of crude drugs obtained from natural sources- plants,</li> <li>the scientific study of the structural, physical, chemical, biological characters of crude drugs and related substances of plant</li> </ul>

<b>B.Sc. III Semester</b>		
<b>Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms</b>		
<b>S.No.</b>	<b>Course</b>	<b>Course outcome</b>
1	Algae	<ul style="list-style-type: none"> <li>Students can develop critical understanding on morphology, anatomy and reproduction</li> <li>Economic importance of Algae</li> </ul>
2	Fungi	<ul style="list-style-type: none"> <li>Students can develop critical understanding on morphology, anatomy and reproduction</li> <li>Economic importance of Fungi</li> </ul>
3	Plant pathology	<ul style="list-style-type: none"> <li>The student can know and understand living entities that cause diseases in plants,</li> <li>the interactions between the disease causing agents and host plant in relation to overall environment;</li> <li>The method of preventing or management the diseases and reducing the losses/damages caused by diseases.</li> </ul>
4	Bryophytes	<ul style="list-style-type: none"> <li>Students can develop critical understanding on morphology, anatomy and reproduction of Bryophytes</li> <li>Economic importance of Bryophytes</li> </ul>
5	Pteridophytes	<ul style="list-style-type: none"> <li>Students can develop critical understanding on morphology, anatomy and reproduction</li> <li>Economic importance of Pteridophytes</li> </ul>
6	Gymnosperms	<ul style="list-style-type: none"> <li>Students can develop critical understanding on morphology, anatomy and reproduction</li> <li>their ecological and economical importance</li> </ul>
7	Paleobotany	<ul style="list-style-type: none"> <li>Students can understand the origin and subsequent evolution of major groups of plants and their interrelationships</li> <li>Studies on Palaeobotany make the students to understand the chronological events of that have taken place in the history of Earth.</li> <li>Understand different methods of fossilization.</li> </ul>

<b>B.Sc.IV Semester</b>		
<b>Systematics Botany of Angiosperms and Utilization of plants</b>		
<b>S.No.</b>	<b>Course</b>	<b>Course outcome</b>
1	Morphology	<ul style="list-style-type: none"> <li>To understand the morphological and floral characters in identifying the taxonomic position of the plant</li> <li>Understand the taxonomic terminology and use of same in identification of plants</li> <li>Evaluate the Important herbaria and botanical gardens</li> <li>Understand and Interpret the rules of ICN in botanical nomenclature</li> </ul>
2	Plant Systematics	<ul style="list-style-type: none"> <li>Generalize the characters of the families according to Bentham &amp; Hooker's system of Classification</li> <li>Assess terms and concepts related to Phylogenetic Systematics</li> </ul>
3	Diversity of flowering plants	<ul style="list-style-type: none"> <li>Helps to identification and classification of plants scientifically into some categories like family, genus, species etc.</li> <li>Nomenclature of the plants</li> </ul>
4	Plant resources and Utilization	<ul style="list-style-type: none"> <li>Helps the student to study Origin,distribution, cultivation and uses of some important food plants,oil yielding plants,Spices,beverages and Fibres</li> </ul>
5	Ethno Botany	<ul style="list-style-type: none"> <li>Gaining the knowledge of plant products and their importance in human care</li> </ul>

<b>B.Sc.V Semester Paper –I</b>		
<b>Plant Breeding and Horticulture</b>		
<b>S.No.</b>	<b>Course</b>	<b>Course outcome</b>
1	Plant Breeding	<ul style="list-style-type: none"> <li>Develop conceptual understanding of plant</li> <li>Introduction, Plant genetic resources, gene bank and gene pool.</li> <li>Familiarize with genetic basis of heterosis,</li> <li>Classify Sexual and Asexual modes of reproduction a</li> <li>Reflect upon the role of various non- conventional methods used in crop improvement, Understand the concept of IPR</li> </ul>
2	Horticulture	<ul style="list-style-type: none"> <li>Analyze various nursery management practices</li> <li>Students develop entrepreneurships in Nurseries and farm houses</li> <li>Understand the concept of different types of horticultural crops, their conservation and management</li> </ul>

		<ul style="list-style-type: none"> <li>• Examine the various branches of horticulture, fruit and vegetable crops, floriculture</li> <li>• Critically evaluate different cultivation practices and disease management,</li> </ul>
3	Harvest Technology	<ul style="list-style-type: none"> <li>• Understand the concept of different types of horticultural practices for value addition</li> <li>• Develop their competency on pre and post-harvest technology in horticultural crops</li> <li>• Evaluate the importance of floriculture and contribution spices and condiments on Economy</li> <li>• Understand the post-harvest preservation requirements i.e. refrigeration, canning, dehydration and chemical preservation.</li> <li>• Students can critically evaluate different cultivation practices and disease management</li> <li>• Students learn landscaping practices and garden design</li> </ul>
4	Weed and Pest management	<ul style="list-style-type: none"> <li>• To study types of weeds</li> <li>• Analyze the different methods of weed control and harvest treatments</li> <li>• Examine the economic implications of cultivation of tropical and sub-tropical vegetable crops</li> </ul>
5	Hydroponics	<ul style="list-style-type: none"> <li>• Understands the concept of Soil less culture</li> <li>• Learn to grow vegetables, fruit, herbs and flowers in hydroponics</li> </ul>

<b>B.Sc.V Semester Paper –II</b>		
<b>Ecology, Environmental pollution and Phytogeography</b>		
<b>S.No.</b>	<b>Course</b>	<b>Course outcome</b>
1	Plant Ecology	<ul style="list-style-type: none"> <li>• Understand the basic concepts of plant ecology,</li> <li>• characteristics of different plant communities,</li> <li>• The structure and functions of eco-system</li> <li>• Understand core concepts of biotic and abiotic</li> <li>• Understand the soil profile and its physical and chemical components</li> <li>• Assess the adaptation of plants in relation to light water,</li> <li>• Evaluate energy sources of ecological system</li> </ul>
2	Conservation of Natural resources	<ul style="list-style-type: none"> <li>• Understanding of the concept and scope of plant biodiversity identify the causes and implications of loss of biodiversity,</li> <li>• Apply skills to manage plant biodiversity,</li> <li>• Utilize various strategies for the conservation of biodiversity awareness to conserve endangered species and to care for biological hot spots</li> </ul>

3	Environmental pollution	<ul style="list-style-type: none"> <li>• Study of different sources of environmental problems ,</li> <li>• understanding on the concept and issues of global environmental change,</li> <li>• Understand the basics of pollution and effects of different toxins in human body.</li> <li>• ,Effluent treatment and its ways to dispose the same</li> </ul>
4	Phytogeography	<ul style="list-style-type: none"> <li>• To Analysis the phytogeographical regions and forest types of India</li> </ul>

### B.Sc.VI Semester Paper –I

#### Microbiology, Cell Biology and Genetics

S.No.	Course	Course outcome
1	Microbiology	<ul style="list-style-type: none"> <li>• Understand diverse group of minute, simple life-forms</li> <li>• the structure, function and classification of these microorganisms</li> <li>• Impact aspects on everyday life</li> </ul>
2	Cell Biology	<ul style="list-style-type: none"> <li>• Students will understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially</li> <li>• understand how these cellular components are used to generate and utilize energy in cells</li> </ul>
3	Genetics	<ul style="list-style-type: none"> <li>• Understand the fundamental concept of heredity and variation</li> <li>• Comprehend the effect of chromosomal abnormalities in numerical as well as structural changes leading to genetic disorders.</li> <li>• Able to analyze the effect of mutations on gene function</li> </ul>

### B.Sc.VI Semester Paper –II

#### Molecular biology, Biotechnology and Plant Tissue Culture

Molecular biology	<ul style="list-style-type: none"> <li>• Learn the scope and importance of molecular biology.</li> <li>• Student is able to understand the properties of nucleic acids (DNA &amp;RNA) and their synthesis.</li> <li>• To understand the mechanism of protein synthesis and gene regulation.</li> </ul>
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Biotechnology	<ul style="list-style-type: none"><li>• To develop analytical skills using different instruments and other techniques in biotechnology.</li><li>• Understand the fundamentals of Recombinant DNA Technology.</li><li>• To know about the Genetic Engineering.</li><li>• to understand the mechanism of protein synthesis and gene regulation.</li></ul>
Plant Tissue Culture	<ul style="list-style-type: none"><li>• Students gain the knowledge of plant tissue culture techniques and micro propagation</li></ul>
Bioinformatics	<ul style="list-style-type: none"><li>• knowledge and awareness of the basic principles and concepts of biology, computer science and mathematics</li><li>• understanding of the intersection of life and information sciences,</li><li>• gene expression, and database queries</li></ul>

## Department of Zoology

## B. Sc. - I Semester

<b>COURSE</b>	<b>OUTCOME</b>
<b>UNIT -I</b>	
<b>Taxonomy protozoa</b>	<ul style="list-style-type: none"> <li>• To understand the basic concepts of non-chordates.</li> <li>• To develop the skill of identification, naming and classification of animals for investigating new living species in research field.</li> <li>• Students will learn the basics of systematic and understand hierarchy of different categories.</li> <li>• An ability to develop each Graduate with an understanding of locomotion, nutrition, and reproduction in microorganism's organisms.</li> <li>• To impart the knowledge of protozoan parasites which are harmful to the hosts.</li> </ul>
<b>UNIT-II</b>	
<b>Porifera coelenterata</b>	<ul style="list-style-type: none"> <li>• After studying the sponges, students will understand the anatomical details like spicules, gemmules and canal system.</li> <li>• An ability to develop each student to gain the knowledge of life history of a well known polymorphic example like obelia and physalia.</li> <li>• To impart the knowledge of deep sea coelenterates like home of corals and coral reefs which is the home of many living marine animals</li> </ul>
<b>UNIT-III</b>	
<b>Platyhelminthes Aschelminthes</b>	<ul style="list-style-type: none"> <li>• To impart the knowledge of flat worms and round worms parasites like Fasciola hepatica, Taenia solium, schistosoma haematobium, Ascaris lumbricoides, Wuchereria bancrofti and Dracunculus medinensis, where students are emphasized on the parasitic adaptations, natural habit and habitat, mode of transmission pathogenicity and control measures</li> </ul>
<b>UNIT-IV</b>	
<b>Annelida Arthropoda</b>	<ul style="list-style-type: none"> <li>• An ability to develop each student to learn about segmented worms like earthworm, leech etc about vermiculture and clinical importance of leech.</li> <li>• To develop the skill of identification and classification of largest invertebrate group of animals like peripatus, limulus etc.</li> <li>• To gain the knowledge of beneficial insects- honey bee, silkworm, and lac insect etc.</li> <li>• Harmful insects-Mosquito, Locust etc</li> </ul>

<b>UNIT-V</b>	
<b>Mollusca Echinodermata</b>	<ul style="list-style-type: none"> <li>To impart the knowledge of soft bodied animals like chiton, pila where students are emphasised on detail anatomical structure of pila globosa.</li> <li>Students are able to obtain an overview of phylogentic relationships and evolutionary trend of echinoderms larvae.</li> </ul>
<b>UNIT-VI</b>	
<b>Minor phyla</b>	<ul style="list-style-type: none"> <li>To gain the knowledge of ctenophore, rotifera as minor phyla to understand how these animals are related to each other and differ from other invertebrate phyla.</li> </ul>
<b>Practicals</b>	
	<ul style="list-style-type: none"> <li>On completion of the course, students are able to: An ability to develop each student to gain anatomical aspects in animals with practical approach through models, specimens, charts, audio –visual aids animations and group discussions.</li> <li>Develop the skill of identification, naming, and classification of invertebrates.</li> </ul>

### B. Sc. - II Semester

<b>COURSE</b>	<b>OUTCOME</b>
<b>UNIT-I</b>	
<b>Phylum chordata Subphylum- protochordata</b>	<ul style="list-style-type: none"> <li>Knowledge of classification of protochordates and chordates along with studies on various physiological functions and interactions of chordate organisms with examples.</li> </ul>
<b>UNIT-II</b>	
<b>Subphylum-vertebrata Class-Cyclostomata Superclass-Pisces</b>	<ul style="list-style-type: none"> <li>To impart the Knowledge of Vertebrate adaptations in relation to their environment.</li> <li>To gain the knowledge of different types of fishes, migratory fishes and their types of scales and fins.</li> </ul>
<b>UNIT-III</b>	
<b>Amphibia</b>	<ul style="list-style-type: none"> <li>To gain the knowledge of osteology in frog and axolotl larva and its significance.</li> </ul>
<b>UNIT-IV</b>	
<b>Reptiles Aves</b>	<ul style="list-style-type: none"> <li>Students will learn the geological time scale for studying of Mesozoic reptiles and also they can differentiate poisonous and non-poisonous snakes with first aid treatment for snake bite.</li> <li>To develop the skill of identification, naming and classification of birds they also learn migratory birds with</li> </ul>

	their flight adaptive characters.
<b>UNIT-V</b>	
<b>Mammalia</b>	<ul style="list-style-type: none"> <li>An ability to develop each student to gain the knowledge of largest group of animals i.e mammalia by their detailed classification with specific example for each sub group and detailed anatomical study of typical mammal rabbit.</li> </ul>
<b>Practical</b>	<ul style="list-style-type: none"> <li>On completion of the course, students are able to : Develop the skill of identification, naming, and classification of vertebrates.</li> <li>Students learn osteology part in vertebrates</li> </ul>

### B.Sc. III Semester

<b>Course</b>	<b>Outcome</b>
Comparative Anatomy	<ul style="list-style-type: none"> <li>Helps students to understand comparative anatomy of vertebrates, their origin and evolutionary significance.</li> </ul>
Histology	<ul style="list-style-type: none"> <li>Helps students to understand basic animal tissues, gives an idea about structure and functions of different mammalian organs.</li> </ul>
Ecology	<ul style="list-style-type: none"> <li>Helps students to acquire knowledge about ecology and develops the relationship between biotic and abiotic factors.</li> <li>To impart knowledge to the students about conservation of natural resources.</li> </ul>
Habitat	<ul style="list-style-type: none"> <li>It gives an ability to gain knowledge about different natural habitats and animals adoption.</li> </ul>
Population Ecology	<ul style="list-style-type: none"> <li>It gives an understanding about population Ecology-density, Natality, Mortality and Age distribution.</li> <li>Imparts knowledge about community ecology, ecological succession , Importance of Bio-geo chemical cycles, Eco-toxicology-its harmful effects on nature and its natural resources.</li> </ul>
<b>Practicals</b>	<b>OUTCOME</b>
	<ul style="list-style-type: none"> <li>Observation of permanent histological slides they get a clear picture of the arrangements of various cells in the tissues.</li> <li>Study natural habitats and ecosystem and also to evaluate various important parameters of water which are a key aspect to know the portability of water for various purposes.</li> </ul>
	<b>BSc IV SEMESTER</b>
<b>COURSE</b>	<b>OUTCOME</b>
Biochemistry	<ul style="list-style-type: none"> <li>Gives knowledge of the various bio-molecules present in human body and their importance .</li> <li>It also gives a view of how the energy currency ATP is cycled in the body.</li> </ul>

Animal Physiology	<ul style="list-style-type: none"> <li>Provides knowledge about how various vital processes essential for life take place in living beings and different components involved in carrying out these processes.</li> </ul>
Nervous co-ordination.	<ul style="list-style-type: none"> <li>It gives brief information about the working of two most important control systems in the human body(Nervous and Endocrine)and how they control various aspects of our day to day life.</li> </ul>
Immunology	<ul style="list-style-type: none"> <li>Gives an idea about the organization and functioning of the defense system in our body.</li> </ul>
Developmental Biology	<ul style="list-style-type: none"> <li>Provides knowledge about how life develops from a tiny single cell and reaches to its complex form .</li> <li>Provides knowledge about various developmental stages in chick embryo.</li> <li>Gives a knowledge of events occurring post fertilization in human beings and the latest trends in reproduction.</li> </ul>
<b>Practicals</b>	<b>OUTCOME</b>
	<ul style="list-style-type: none"> <li>The various qualitative tests which they perform help them to analyze some very important, basic parameters of human body, which if go out of proportion the natural balance of body is lost.</li> <li>The observation of permanent histological slides of frog and chick embryo ,helps them to understand tissue structure and developmental stages.</li> </ul>

**V SEMESTER PAPER I/II**

<b>COURSE</b>	<b>OUTCOME</b>
<b>PAPER-I</b>	
Genetics	<ul style="list-style-type: none"> <li>Helps to understand the various principles of Inheritance, blood groups and blood transfusion in humans and the various disorders that are caused due to genes.</li> </ul>
Cell biology	<ul style="list-style-type: none"> <li>Gives an understanding of the basic unit of life. cell and the various organelles, nuclear material and about Cancer.</li> </ul>
Microbiology	<ul style="list-style-type: none"> <li>Helps to understand the structure and functioning of the microscopic life forms on earth, their culturing, maintenance and benefits to Human beings.</li> </ul>

Parasitology	<ul style="list-style-type: none"> <li>It gives us a clear idea of the various parasites that affect human beings, their life cycle, treatment and preventive measures.</li> </ul>
<b>Practicals</b>	<b>OUTCOME</b>
	<ul style="list-style-type: none"> <li>Students develop skills of preparing permanent slides and detecting blood groups which are a routine procedure in any laboratory.</li> <li>Observation of slides, charts and models of various breeds and parasites, they get a clear picture about morphology and anatomy of organs.</li> </ul>
<b>PAPER-II</b>	
Applied Zoology: Aquaculture, Pisciculture, Sericulture, Apiculture, Poultry and Dairy	<ul style="list-style-type: none"> <li>Gives the students knowledge of how various animals can be cultured in bulk so that the animals themselves and their by-products can give the culturist a source of income.</li> </ul>
Insect Pest Management	<ul style="list-style-type: none"> <li>Gives a brief knowledge about common household agricultural pests and different control measures.</li> </ul>
Lab Techniques	<ul style="list-style-type: none"> <li>Provides the knowledge of various instruments used in routine lab procedures and their working principles.</li> </ul>
Biostatistics	<ul style="list-style-type: none"> <li>The ability to interpret and analyze the data pertaining to biology and is also useful in preparing for competitive</li> </ul>

	exams.
<b>Practicals</b>	<b>OUTCOME</b>
	<ul style="list-style-type: none"> <li>• Skill development through because various experiments as per theory which are useful in understanding concepts.</li> <li>• There is a much detailed and specific study of various pests and breeds through project works which allow students to go for field visit. Because of this they get a better understanding of the topic.</li> </ul>

## VI SEMESTER PAPER I /II

<b>COURSE</b>	<b>OUTCOME</b>
<b>PAPER-I</b>	
Evolution	<ul style="list-style-type: none"> <li>• It helps students to understand the evolutionary concepts and their importance, it gives them the knowledge of how life originated on the earth, evolved and reached its present state.</li> </ul>
Biodiversity and conservation	<ul style="list-style-type: none"> <li>• It helps students to acquire knowledge about the rich biodiversity on the planet and biodiversity hotspots in India ,it also creates awareness about wild life depletion and various government and non-government organizations which thrive to conserve them.</li> </ul>
Zoogeography	<ul style="list-style-type: none"> <li>• It gives them a brief idea about the six major realms of the world based on the flora ,fauna and the climatic conditions .</li> </ul>
Paleontology	<ul style="list-style-type: none"> <li>• Gives the information about the timescale of the planet since its origin through the study of radiometric dating of fossils and the study of living fossils, connecting links and their importance.</li> </ul>
Biotechnology	<ul style="list-style-type: none"> <li>• It provides students the knowledge of how living organisms can be manipulated and cultured by applying various techniques for human welfare.</li> </ul>
<b>Practicals</b>	<b>OUTCOME</b>
	<ul style="list-style-type: none"> <li>• Students get an opportunity to study the biodiversity in the best way by study visits to Sanctuaries and National parks.</li> <li>• They learn to locate important biodiversity hotspots on maps which enables them to understand the distribution of animals around the world and in India.</li> </ul>
<b>PAPER-II</b>	
Ethology	<ul style="list-style-type: none"> <li>• It helps students to understand the contributions of noble laureates pertaining to animal behavior. It also gives knowledge about various kinds of behavior which animals exhibit, social organization in various groups of animals and different means by which animals communicate .</li> </ul>

Environmental Issues and Human welfare	<ul style="list-style-type: none"><li>• Helps students understand the major threats to the environment and ways to overcome these threats .</li></ul>
Bioinformatics	<ul style="list-style-type: none"><li>• Gives the knowledge about the various tools to analyze large amount of molecular data can be handled . It also provides a platform for the exchange and further analysis of data.</li></ul>
Research Methodology	<ul style="list-style-type: none"><li>• Helps students to develop interest in research field. It also gives them an idea about collecting data for research work, analyze it and draw a conclusion to write the final report.</li></ul>
Bioinstrumentation	<ul style="list-style-type: none"><li>• Gives students a brief idea about the working principle of bioinstruments and their uses in various fields .</li></ul>
<b>Practicals</b>	<b>OUTCOME</b>
	<ul style="list-style-type: none"><li>• They observe specimens and models which help them to understand the theory aspects in a much better way.</li><li>• Their visit to various hospitals and instrumentation centers gives them a better understanding of the working.</li></ul>

## Department Statistics

<b>SEMESTER-I</b>	
<b>Course Title: Descriptive Statistics, Probability and Index Number</b>	
<b>Name of the unit</b>	<b>Course outcome</b>
Basic Statistics	➤ Organize, manage and present data.
Measures of Central Tendency	➤ Analyze statistical data graphically using frequency distribution and cumulative frequency distributions.
Measures of dispersion, skewness & Kurtosis	➤ Analyze statistical data using measures of central tendency, dispersion and location.
Introduction to Probability Theory	➤ Use the basic probability rules, including additive and multiplicative laws, using the terms, independent and mutually exclusive models.
Index Number	➤ Understand the origins and basic features of axiomatic, economic approaches to price and quantity by index number.
<b>SEMESTER-II</b>	
<b>Course Title: Random variable, Discrete Probability distribution, Correlation and Regression and Time series</b>	
<b>Name of the unit</b>	<b>Course outcome</b>
Random variable and Mathematical Expectation	➤ Explain the concepts of probability mass function, probability density function, expectation, conditional expectation and also moment generating and cumulative generating function.
Discrete Probability distribution-I	➤ Use discrete probability distributions, including mean and variance, and making decisions.
Discrete Probability distribution-II	➤ Use Binomial, Poisson, Negative Binomial, Geometric, Hyper geometric distributions to solve statistical problems.
Correlation and Regression	➤ Find the correlation between different statistical measures by using scatter diagram, Karl Pearson's correlation coefficient.
Time Series	➤ Predict the statistical measures by using regression analysis.

<b>B. Sc. Second Year</b>	
<b>SEMESTER-III</b>	
<b>Course Title: Continuous Probability distribution, Estimation and multiple and partial correlation.</b>	
<b>Name of the unit</b>	<b>Course outcome</b>
Continuous Probability distribution-I	➤ Use continuous probability distributions like Normal, Uniform distribution in day to day life.
Continuous Probability distribution-II	➤ Use continuous probability distributions like Beta, Gamma and Exponential distribution in day to day life.
Estimation	➤ Understand problem of statistical inference, problem of point estimation.
Method of Estimation	➤ Obtain estimators using estimation methods such as methods of moments, Maximum likelihood and etc... for discrete and continuous distributions.
Multiple and Partial correlation	➤ Obtain the correlation between more than one independent variables.
<b>SEMESTER-IV</b>	
<b>Course Title: Testing of Hypothesis, Sampling Distribution, Non-parametric test and SPRT</b>	
<b>Name of the unit</b>	<b>Course outcome</b>
Test of Significance	➤ Understand problem of statistical inference.
Exact Sampling Distribution	➤ Explain critical regions.
Testing of Hypothesis and Likelihood Ratio Test	➤ Explain Likelihood ratio test.
Non-Parametric Test	➤ Use various one sample tests such as Sign test.
Sequential Probability Ratio Test	➤ Understand Sequential testing and construct SPRT for Binomial.

<b>B.Sc Final year</b>	
<b>PAPER-I SEMESTER-V</b>	
<b>Course Title: Sampling Technique and Non-Parametric test</b>	
<b>Name of the unit</b>	<b>Course outcome</b>
Introduction to Sampling Theory	➤ To apply various sampling method for different types of data.
Simple Random Sampling	➤ To explain and to compare various allocations using stratified random sampling.
Stratified Random Sampling	➤ To draw a conclusion about the best sampling procedure.
Order Statistics	➤ To estimate the estimators.
Non-Parametric tests	➤ Use various one sample tests such as Sign test, Kolmogorov Smirnov test.
<b>PAPER-II SEMESTER-V</b>	
<b>Course Title: Operations Research – I</b>	
<b>Name of the unit</b>	<b>Course outcome</b>
Linear Programming Problem	➤ Understand the concept of optimization problem, theory of duality.
Simple method	➤ Solve Linear programming problem using graphical and simplex method.
Transportation Problem	➤ Solve Transportation and Assignment problems to obtain optimum solution.
Assignment Problem	➤ Gain knowledge about sequencing problem, travelling salesman problem.
Simulation Technique	➤ Understand the concept of simulation technique by Monte Carlo and Box mullar transformation.
<b>PAPER-I SEMESTER-VI</b>	
<b>Course Title: Operations Research – II</b>	
<b>Name of the unit</b>	<b>Course outcome</b>
Network Analysis	➤ Understand the different concepts of Network analysis, Construct Network diagrams, draw conclusion from Network using PERT analysis and CPM analysis.
Inventory Problem	➤ Understand basic concepts of inventory problems and solve various types of EOQ models.
	➤ Understand basic concepts of

Replacement Problem	replacement problems solve without considering and with considering change in money value and group replacement.
	➤ Understand basic concepts of decision theory and Laplace criterion, minimax/maximax criterion, savage criterion, Hurwitz criterion.
	➤ Understand basic concepts of game theory and methods of solving game problems.

<b>PAPER-II SEMESTER-VI</b>	
<b>Course Title: Design of experiment and SQC</b>	
<b>Name of the unit</b>	<b>Course outcome</b>
Analysis of Variance	➤ Apply various designs for agricultural data. Explain their efficiency.
Design of Experiments	<ul style="list-style-type: none"> <li>➤ Use factorial experiment for agricultural data.</li> <li>➤ Describe the concept of confounding for different experiment.</li> </ul>
Statistical Quality Control-I	➤ Draw various types of control charts such as $\bar{X}$ -chart, R – chart, s – chart, p – chart and c – chart.
Statistical Quality Control-II	➤ Different performance measures of control chart such as OC
Econometrics	➤ Use the econometrics model and predict a economic value using simple and multiple linear regression.

## Department of Physics and Electronics

### I/II Semester

Course	Outcome
Basic Electronics	<ul style="list-style-type: none"> <li>• CO1. Circuit analysis using basic network theorems</li> <li>• CO2. Conversion of AC to DC using rectifiers and Filters.</li> <li>• CO3. Designing of different biasing circuits using transistor configurations.</li> <li>• CO4. To learn the basic model of voltage regulator using zener diode and linear voltage regulator using IC's</li> <li>• CO5. Study the construction and working of optoelectronic devices and experimental knowledge of their IV - characteristics.</li> </ul>
Amplifiers & Oscillators	<ul style="list-style-type: none"> <li>• CO1. Mathematical analysis of network parameters &amp; designing of constant k – type filters.</li> <li>• CO2. To study the frequency response of single stage amplifier and power amplifier.</li> <li>• CO3. To understand the basic construction of feedback circuits &amp; their application in oscillators.</li> <li>• CO4. Study the types, construction and working of FET and experimental knowledge of drain &amp; transfer characteristics.</li> <li>• CO5. Study the industrial applications of power control devices such as SCR, DIAC, TRIAC and UJT</li> </ul>

### III/IV Semester

Course	Outcome
Linear integrated circuits, IC 555 timer, Laplace Transform & Discrete time signals	<ul style="list-style-type: none"> <li>• CO1. To understand basic differential amplifier</li> <li>• CO2. To study and impart experimental knowledge on the specific applications of Op-amp such as oscillators, wave generators &amp; active filters.</li> <li>• CO3. Study of block diagram of IC 555 timer and its applications such as multivibrators and Schmitt trigger.</li> <li>• CO4. Learn applications of LT in R, L &amp; C circuits.</li> <li>• CO5. To acquire knowledge about the interconnection of elements in a system, classification of signals &amp; basic operations on signals.</li> </ul>
Digital Electronics	<ul style="list-style-type: none"> <li>• CO1. Study the number system to develop logic circuits.</li> <li>• CO2. To analyse the logic circuits using Boolean Algebra.</li> <li>• CO3. Know about different logic families</li> <li>• CO4. Impart knowledge about Boolean algebra, combinational and sequential logic circuits.</li> <li>• CO5. Impart experimental knowledge about digital circuits used in modern electronic gadgets.</li> </ul>

**V/VI Semester**

<b>Course</b>	<b>Outcome</b>
Microprocessor 8085 & Microcontroller 8051	<ul style="list-style-type: none"> <li>• CO1. To understand the basic architecture of 8-bit microprocessor(8085) and microcontroller(8051)</li> <li>• CO2. Identifying the addressing modes of an instruction</li> <li>• CO3. Develop the programming skills in assembly level language on 8085<math>\mu</math>p &amp; 8051<math>\mu</math>c based systems.</li> <li>• CO4. To understand the basic interfacing concepts of 8085.</li> <li>• CO5. Learn the architecture of 8255 (Programmable Peripheral Interface) &amp; 8253 (Programmable Interval) and their interfacing techniques</li> </ul>
Analog Communication & Antennas	<ul style="list-style-type: none"> <li>• CO1. Learn the concepts of communication system.</li> <li>• CO2. To know the various modulation and demodulation techniques for long distance communication.</li> <li>• CO3. Understand the transmission lines theory</li> <li>• CO4. To understand antenna theory used in communication system.</li> <li>• CO5. Learn about Radio Wave Propagation.</li> <li>• CO6. Practical knowledge on different communication systems and antennas.</li> </ul>
C and MATLAB Programming	<ul style="list-style-type: none"> <li>• CO1. To learn the basics of C – Programming</li> <li>• CO2. Develop the programming skills using C – language</li> <li>• CO3. To study the basics of MATLAB</li> <li>• CO4. Develop the program skill to write simple MATLAB programs</li> </ul>
Digital, optical fiber, satellite and mobile communication.	<ul style="list-style-type: none"> <li>• CO1. To gain knowledge about the digital communication systems &amp; modulation techniques.</li> <li>• CO2. To learn the functioning of Fiber Optic Communication System, latest field of science and technology</li> <li>• CO3. Know about the principles and working of satellite and mobile communication.</li> <li>• CO4. Impart experimental knowledge about digital communication systems.</li> </ul>

## Department of Biotechnology

### Bsc.III sem

Course	Outcome
<b>Microbiology</b> Introduction and scope of microbiology:	Understand the historical perspective of microbiology Understand the importance and scope of microbiology as modern science. Able to understand the branches of microbiology.
Microbial taxonomy:	Understand the Classification of microbes Understand the Haeckel,s and Whittakar’s kingdom concept.
Methods of Microbiology:	Understand the methods of sterilization and staining techniques. Able to isolate,culture,preserve and maintenance the microorganisms. Understand the Ultra structure of bacteria and Virus.
Microbial growth:	Knowledge of nutritional requirements of microorganisms. Able to understand the concept of bacterial growth curve,factors affecting growth and counting of bacteria.
Microbial diseases:	Able to understand the bacterial diseases, viral diseases and fungal diseases.
<b>Immunology</b> Introduction to Immunology:	Understand the History and scope of immunology Knowledge of immunity and its types.
Cells of immune system:	Able to understand the different types of immune cells.
Antigens:	Understand the types of antigens and blood group antigens.
Antibodies:	Understand the structure, types, properties and functions of the antibodies.
Antigen Antibody reaction:	Able to understand the mechanism of precipitation,agglutination, compliment fixation and immune toxin reaction

	<p>Understand concepts of immune blotting and immune fluorescence.</p> <p>Knowledge of process of RIA and ELISA techniques.</p>
Hypersensitivity :	Able to understand the types of hypersensitivity reactions.
Microbiology	<p>Students learn to prepare the media for culturing of micro organisms.</p> <p>Understand the isolation and culturing of microbes by methods like stab,point,streak,pour plate and spread plate method.</p> <p>Staining and sensitivity of bacteria to antibiotics is studied.</p> <p>Response of micro organisms to various chemicals is studied by performing biochemical tests.</p>
Immunology	<p>To study different blood groups by antigen and antibody reactions.</p> <p>To count total RBC and WBC using haemocytometer.</p> <p>To estimate the haemoglobin content in every student individually.</p> <p>To study enzyme linked immunosorbent assay through demonstration.</p>

### B. Sc. IV semester

Course	Outcome
<p><b>Molecular Biology</b></p> <p>Intoduction and scope of molecular biology:</p>	Understand the experimental proof of DNA and RNA as genetic material.
Molecular structure of gene:	<p>Able to understand the structure of prokaryotic and eukaryotic gene.</p> <p>Understand the concept of genetic code , properties and deciphering.</p>

DNA replication,damage and repair and recombination:	<p>Knowledge of replication in prokaryote and eukaryotes, theta and rolling circle model.</p> <p>Understand the causes and mechanism of DNA damage, photo reactivation and repair mechanisms.</p> <p>Able to understand the concepts of transformation, conjugation and transduction.</p>
Protein synthesis:	<p>Understand the process of transcription, factors of transcription and post transcription modification.</p> <p>Able to understand the process of translation, translation factors and post translation modification.</p>
Regulation of gene expression:	<p>Understand the process of regulation and expression of gene in prokaryotes and eukaryotes.</p>
Gene organization and expression:	<p>Able to understand the gene expression and regulation in mitochondria and chloroplast.</p>
Proteomics and genomics	<p>Knowledge of basics of proteomics and genomics.</p> <p>Able to understand the applications .</p>
Molecular biology	<p>To study extraction and estimation of protein</p> <p>To study mutants in drosophila</p> <p>Able to understand characterization of DNA</p>

### B. Sc. I Semester

Course	Outcome
Cell Biology An overview of Biotechnology:	<p>Understand the historical perspectives of biotechnology .</p> <p>Understand the scope and branches of biotechnology.</p>
Transport across cell membrane:	<p>Able to understand the active and passive transport.</p>
Cell division:	<p>Understand the process of cell cycle, mitosis and meiosis.</p>
Cytoskeleton:	<p>Able to understand the structure and functions of</p>

	microtubules and microfilaments.
Cell signaling:	Understand the concept of cAMP dependent pathway. Knowledge of cell senescence and programmed cell death.
Tumor Biology:	Able to understand the causes of cancer and the types of cancers. Understand the role of oncogenes in cancer.
<b>Biophysical Techniques:</b>	
Microscopy:	Understand the principle of microscope and the types.
Centrifugation:	Able to understand the principle of centrifugation. Understand the types and applications of centrifugation.
Electrophoresis:	Understand the concept of SDS PHAGE, paper electrophoresis, cellulose electrophoresis and isoelectricfocusing.
Chromatography:	Able to understand the chromatography principle and different types of chromatography. Understand the concept of malditoff.
Spectroscopy:	Understand the Beer Lambert's Law,principle and applications of different types of spectroscopy.
Radioisotopes:	Able to understand the definition, counters and significance.
<b>Practicals</b>	<b>Outcome</b>
Standard operating procedures.	To study the operating procedures for important instruments in the laboratory.
Squash preparation	To study mitosis and meioses using onion root tips.
Micrometry	To measure the dimensions of desired micro organisms under microscope using the micrometer scale.
Chromatography	To study the principle and methods of different chromatographic techniques

**B. Sc. II Semester**

Course	Outcome
Introduction to Biochemistry:	Understand the physical properties and structure of water. Able to understand the concept of pH and buffers. Understand the types of chemical bonding.
Carbohydrates:	Able to understand the structure, classification and properties of glucose, fructose, maltose, galactose and starch.
Amino acids and proteins:	Understand the classification and structure
Lipids:	Able to understand the classification, properties and functions .
Nucleic acids and Hormones:	Understand the structure , classification and functions.
Vitamins:	Able to classify water soluble and fat soluble vitamins. Understand the dietary sources and functions.
Alkaloids and Pigments:	Understand the classification, structure and properties of alkaloids and pigments.
Enzymology:	Able to understand nomenclature, classification and properties of enzymes. Understand the mechanism and process of enzyme inhibition. Knowledge about factors influencing enzyme catalyzed reaction, purification process and industrial applications.
Bioenergetics:	Able to understand the principle and ATP as universal currency of free energy.  Understand the carbohydrate metabolism and ETC.
Qualitative Analysis	To study the different carbohydrates and amino acids present in the given sample

Colorimeter estimation	To estimate proteins by Biuret method To estimate the blood sugar by Folin Wu method.
Estimations	To estimate amino acids by ninhydrin method To estimate creatinine in urine sample.
Assay	To study amylase activity.

### B. Sc. V Semester (Paper I)

Course	Outcome
<b>Plant Biotechnology:</b> Introduction and Scope:	Understand the Laboratory facilities, design and development.
Invitro culture methods:	Able to understand the preparation of different media Understand the use of growth regulators.
Culture techniques:	Understand the culture techniques and applications of Organogenesis, callus, Embryo and Endosperm culture. Able to understand the concept of somatic embryogenesis and In vitro haploid production. Understand the protoplast culture and fusion methods.
Micropropagation:	Able to understand the method and applications of clonal propagation ,axillary bud and meristem culture.
<b>Animal Biotechnology:</b> Introduction and Scope:	Understand the laboratory design and maintenance.
Basic techniques of animal cell culture:	Able to understand the preparation and sterilization of glassware and preparation of animal material
Animal cell culture media:	Understand the preparation ,advantages and disadvantages of different types of animal cell culture media.
Cell lines:	Understand the concept of primary and established cell lines. Able to understand the whole embryo culture.
Stem Cells:	Understand the stem cell culture techniques and

	applications. Able to understand the artificial skin and bone tissue engineering.
Animal Biotechnology in reproduction:	Able to understand the Invitro fertilization and nuclear transfer technique.
Transgenic animals:	Understand the production , importance and applications of transgenic animals.
Applications of animal biotechnology:	Able to understand the production and applications of hybridoma technology. Understand the production of pharmaceutical products produced by mammalian cells.
Preparation of plant tissue culture media-MS media	To study the macro and micro nutrients essential for growth of micro organism using MS media.
Seed culture, Callus culture-suspension culture, Anther culture.	In vitro method for the development of and new individual plant.
Protoplast isolation from mesophyll cells.	To isolate protoplast using protoplast isolation solutions.
Preparation of synthetic seeds.	To study encapsulation of seeds for future use.
Preparation of BSS	To prepare salt solution of specific pH.
Cell viability test using Tryphan blue exclusion method.	To determine the ability of cells to maintain or recover viability.

### B. Sc. VI Semester (Paper-I)

Course	Outcome
<b>Industrial Biotechnology</b> Fermentation technology:	Understand the screening of industrially important micro organisms, media for industrial fermentation. Able to understand the types of fermentation.
Fermentors:	Understand the Design of typical fermentors Able to understand the concept of aeration, agitation, airlift, tubular bioreactor.

Downstream processing:	Able to understand the recovery and purification of fermentation products.
Production of industrially important products:	Understand the production of alcohol, penicillin, lactic acid, cheese, etc. Able to understand the production of SCP, and mushroom.
<b>Environmental Biotechnology</b>	
Bioremediation:	Understand the process of bioremediation. Able to understand the process of phytoremediation.
Waste management:	Understand the solid waste management, treatment of municipal waste and industrial effluents.
Biomining:	Able to understand the process of microbial ore leaching and recovery.
Biofuel:	Understand the importance of biofuel. Able to understand the production of biogas and biodiesel from jatropha.
<b>Practicals</b>	<b>Outcome</b>
Production of wine and estimation of alcohol content	To study the different steps of wine preparation and calculate the percentage of wine produced.
Estimation of lactic acid, lactose	Analysis of lactic acid and lactose content in milk
Milk analysis MBRT	To assess the microbiological quality of raw and pasteurized milk.
Production of mushroom	To grow mushroom in the laboratory conditions.
Analysis of DO, BOD, COD of water samples.	To measure the oxygen content, various chemicals present in water sample.

**B. Sc. V Semester (Paper II)**

<b>Course</b>	<b>Outcome</b>
<b>Genetic Engineering</b> Introduction and scope of genetic engineering	To understand the areas where in genetic engineering has played a vital role. To understand the depth of the subject.
Tools of genetic engineering	Students understand the meaning and uses of enzymes like restriction endonucleases, DNA ligases, DNA modifying enzymes. The nomenclature and classification of enzymes is studied. Students understand the different types of vectors and their uses as tools for genetic engineering.
Gene transfer techniques	Students learn different ways of gene transfer by physical, chemical, electrical and biological means.
Detection of right clone	Students learn how to identify the right organism for cloning by screening methods.
Cells for cloning	Cells like E.coli, B. subtilis S. cerevisiae and mammalian fertilized egg cells are studied considering their important characteristics from biotechnological point of view.
Gene Libraries	The initiation and synthesis of two important genomic libraries namely cDNA and genomic library are studied.
Mapping the DNA	The locus of a gene and distance between genes can be studied using techniques like restriction mapping, Chromosome Walking and DNA finger printing.
DNA sequencing	The order of the nucleotides in DNA can be studied using different methods of DNA sequencing.
Techniques in rDNA technology	Techniques like PCR, SDM, Microarray and Blotting techniques are studied in detail including the meaning, methodology and applications of each of them.
Applications of rDNA technology	Production of recombinant insulin, Hepatitis B vaccine and hGH Somatotrophin are studied as major applications of rDNA technology in human health.
Human Genome Project	To identify and map all the genes of human genome from both physical and functional point of view.
Biosafety guidelines	Various biosafety and ethical guidelines with regards to rDNA technology are explained

Isolation of DNA and RNA from plant, animal source and quantification	To study the process of purification of DNA and RNA in stepwise manner using specific chemicals and then quantifying using spectrophotometer.
Agarose gel electrophoresis of DNA	To study the preparation of agarose gel and separation of DNA bands using electrophoresis.
Isolation of plasmid from E.coli	To extract plasmid from E.coli cells using extraction buffers.
Southern Blotting	To study detection of a specific DNA sequence in DNA sample.
Study of transformation and conjugation by kits.	To study DNA uptake and transfer in the bacteria.
Study of gene cloning through charts	To study process of DNA location and copying from a specific locus.
Restriction digestion	To study the process of cutting DNA molecules using restriction enzymes.
Demonstration of PCR	To show PCR machine and the study the process of amplification of DNA using PCR.

### B.Sc VI Sem (Paper II)

Course	Outcome
<b>Agricultural Biotechnology</b> Importance and Scope	To understand the extent to which biotechnology can be applied to improve the crop production and yield.
Molecular Markers	To study the procedure and application of RAPD, RFLP, AFLP molecular markers.
Biofertilizers	To study the use of micro organisms like rhizobium, acetobacter and others as biofertilizers to enhance the sustainability and health of the soil.
Biopesticides	To study B.thuriengensis, Baculovirus as biological agents to control soil pollution
Transgenic crop	Using transgenic technology for crop development. Developing resistant varieties of crops.
Agroindustrial applications	To study production of secondary metabolites and edible vaccines. To understand cryopreservation technique.
Antisense RNA technology	To study the use of antisense RNA technology for extending the shelf life of fruits and flowers.
Biotechnology and IPR	To understand concepts like patent, trade secrets, choice of IPR, plant breeder's right and farmer's right.
<b>Medical Biotechnology</b> Introduction	To understand the role of biotechnology in human health.

Vaccines	To study the production of bacterial and viral vaccines.
Antibiotics	To study the general antibiotics like streptomycin, tetracycline and their production.
Enzymes used in diagnosis and therapy	To study important enzymes and their therapeutic applications.
Therapeutic proteins	To study somatostatin, cytokines, Interleukin, Interferon, Human factor-VIII and IX as important therapeutic proteins.
Biosensors in clinical diagnosis	To use biosensors as analytical devices in clinical trials and treatment of diseases.
Human gene therapy	To study in vitro and in vivo somatic and germ line gene therapies with examples.
Introduction to Bioinformatics	To study history of bioinformatics. To study NCBI and EMBL as information sources. To study databases like- SWISSPORT (Protein databank), MBGD, FASTA and BLAST. To study Phylogentic relationships.
Introduction to Nano biotechnology	To study the synthesis of nanoparticles. To study protein and DNA nanostructure. To study various applications of nano biotechnology.
Isolation of soil micro organisms- Rhizobium and azatobacter	To isolate soil micro organisms by serial dilution and then culturing on agar plates.
Seed inoculation with rhizobium culture.	To practice covering of seed surface with rhizobium prior planting it.
Estimation of soil alkalinity and organic matter	To determine the pH and carbon content of the soil.
Study of R:S ratio	To calculate the microbial population in the rhizosphere and non rhizosphere of the given sample.
Analysis of acid and alkaline phosphatase from serum sample	To study the amount of 4-nitrophenol liberated per unit time and enzyme activity.
Estimation of serum cholesterol	To measure the cholesterol content in given sample.
Extraction and quantification of secondary metabolites	To extract and quantify secondary metabolites from given sample.
BLAST similarity search	To find regions of local similarity between DNA sequences
Phylogenic analysis	To study evolutionary relationships among various biological species.

**K.L.E Society's  
Raja Lakhamagouda Science Institute, Belagavi**

**Department of Languages  
(English, Hindi and Kannada)**

**Course Outcomes  
B.Sc I/II/III/IV Semester  
(MIL)**

The Department of Languages enables the students to learn communicative skills, analyze representative texts, elements of grammar, translation etc. On completion of the course, the students should be able to:

- Understand the relationship between Science and Literature.
- Familiar with representative literary and cultural texts within a significant number of historical, geographical and cultural contexts.
- Apply critical and theoretical approaches to the reading and analysis of literary and cultural texts in, multiple genres.
- Understand language in a wide range of a context's and become proficient communicators in target language.
- Understand nuances of listening, speaking and reading of a target language.
- Platform for communicative skills to choose alternative carriers like film making, theater arts, translator, journalist, content writer, public speaker, anchor and so on.
- Appreciate, interpret and critically evaluate a piece of literature such as drama/play, short story, novel, poems, travelogue, biography, one-act play, grammar and comprehension, writing scientific essays and translation of Science text to a target language
- All this helps an individual to contribute for the development of society.

**BCA Program Specific outcomes**

1. The ability to apply standard practices and strategies in software project development to deliver a quality product for business success.
2. To equip students with practical, technical & IT skills, by intensive and meaningful teaching methods.
3. The ability to design computer-based systems, in the areas related to web design, algorithm, data analytics, and networking.
4. To bridge the gap between the IT industries and the institutes by imparting in depth knowledge of cutting edge technologies.

<b>BCA</b>	
<b>Course</b>	<b>Course outcome</b>
<b>BCA I Semester</b>	
Programming in C	<ul style="list-style-type: none"> <li>• Understand the fundamentals of C programming.</li> <li>• To convert the algorithms/flowcharts to C programs</li> <li>• To code and test a given logic in C programming language</li> <li>• Use functions to solve the given problem.</li> <li>• Implement file Operations in C programming for a given application.</li> <li>• To use structures and Union to write C programs</li> </ul>
Web Technology-I	<ul style="list-style-type: none"> <li>• Implement interactive web page(s) using HTML, CSS and JavaScript.</li> <li>• Design a responsive website using HTML5 and CSS3.</li> <li>• Create anonymous functions and closures, and use them to store and access local data.</li> <li>• Create event listeners and callbacks to respond to user-interface and network events.</li> <li>• Creating valid HTML web pages and Cascading Style Sheets, based on the specifications of W3C.</li> <li>• Learning to display XML documents using CSS.</li> <li>• Programming XML with DOM and SAX.</li> </ul>

<p>Unix &amp; Shell Programming</p>	<ul style="list-style-type: none"> <li>• To understand the basic concepts of single &amp; multiuser Operating</li> <li>• System, basic structure of UNIX kernel and its subsystems,</li> <li>• To study the concept of file subsystem.</li> <li>• To study process control subsystem,</li> <li>• To understand memory management subsystems viz. swapping and demand paging.</li> <li>• To learn command structure of UNIX, various types of shells and types of commands</li> <li>• To learn editors available in UNIX and the detailed working on the most Vi editor.</li> <li>• To implement shell programming, wild cards and how to write simple shell programs,</li> </ul>
<p>English</p>	<ul style="list-style-type: none"> <li>• Build academic vocabulary</li> <li>• Make use of contextual clues to infer meanings of unfamiliar words from context</li> <li>• Summarize and paraphrase information in a text</li> <li>• Distinguish main ideas from specific details</li> <li>• Distinguish facts from opinions</li> </ul>
<p>Indian Constitution</p>	<ul style="list-style-type: none"> <li>• The study of the Indian political system is a window to understanding politics in society.</li> <li>• The course will present you about the way Indian political system has been working and the way it shapes institutions India.</li> <li>• This course is not about legal provisions and technical details of in Indian constitution.</li> <li>• The course will introduce you to the idea of political system and the account of the making and working of constitutional institutions.</li> <li>• This course responds to the curiosity about why a particular arrangement in the constitution was adopted and why not some other, how the institutions grow in the company of actual politics</li> </ul>
<p><b>B.C.A II Semester</b></p>	
<p>Data Structures Using C</p>	<ul style="list-style-type: none"> <li>• Have a comprehensive knowledge of the data structures and algorithms on which file structures and data bases are based.</li> <li>• Understand the importance of data and be able to identify the data requirements for an application.</li> <li>• Have an understanding and practical experience of algorithmic design and implementation</li> <li>• Have practical experience of developing applications that utilize databases.</li> <li>• Understand the issues involved in algorithm complexity</li> </ul>

	and performance.
Web Technology-II	<ul style="list-style-type: none"> <li>• Develop a dynamic webpage by the use of java script and DHTML.</li> <li>• Write a well formed / valid XML document</li> <li>• Understand the various steps in designing Creative and dynamic website.</li> </ul>
Computer Networks	<ul style="list-style-type: none"> <li>• Understand basics of computer network, architecture, TCP/IP and OSI reference models.</li> <li>• Describe data link protocols, multi-channel access protocols and IEEE 802 standards for LAN</li> <li>• Understand network security and define various protocols such as FTP, HTTP, Telnet, DNS</li> </ul>
Human Rights and Environmental Studies	<ul style="list-style-type: none"> <li>• Understanding the scope and importance of Multi disciplinary nature of Environmental Studies and Ecosystem.</li> <li>• Effects of water management and water conservation.</li> <li>• Understand the social issues and the environment.</li> <li>• Understanding Human Rights in India</li> </ul>
English	<ul style="list-style-type: none"> <li>• Knowledge of the basic concepts, theories, and perspectives important to English studies.</li> <li>• The ability to write clear, grammatical sentences and well-organized texts that reflect an attention to audience and genre.</li> <li>• The ability to evaluate information sources and employ those sources professionally in their own work.</li> </ul>
<b>B.C.A III Semester</b>	
Computer Organization and Architecture	<ul style="list-style-type: none"> <li>• Study basic computer organization, design and micro-operations.</li> <li>• Understanding of CPU functioning and computer arithmetic.</li> <li>• Learning various methods and techniques of memory organization.</li> </ul>
OOPS Using C++	<ul style="list-style-type: none"> <li>• Be able to understand the difference between object oriented programming and procedural oriented language and data types in C++.</li> <li>• Be able to program using C++ features such as composition of objects, Operator overloading, inheritance, Polymorphism etc.</li> <li>• Describes the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects</li> </ul>
Discrete Mathematical Structures	<ul style="list-style-type: none"> <li>• Be able to understand logical arguments and logical constructs. Have a better understanding of sets, functions, and relations.</li> </ul>

	<ul style="list-style-type: none"> <li>• Understand the notion of mathematical thinking, mathematical proofs, and algorithmic thinking, and be able to apply them in problem solving.</li> <li>• Be able to use effectively algebraic techniques to analyse basic discrete structures and algorithms.</li> <li>• Understand asymptotic notation, its significance, and be able to use it to analyse asymptotic performance for some basic algorithmic examples.</li> </ul>
Introduction to Unix	<ul style="list-style-type: none"> <li>• Understand the basic concepts of chemical analysis</li> <li>• Knowledge of different types of volumetric titrations</li> <li>• Understand the concept of indicators and applications</li> </ul>
Technical Communication & Ethics	<ul style="list-style-type: none"> <li>• Gain an overview of the technical skills required by professional communicators</li> <li>• Develop professional work habits, including those necessary for effective collaboration and cooperation with other students, instructors and Service Learning contact representatives.</li> </ul>
Additional English	<ul style="list-style-type: none"> <li>• Summarize and paraphrase information in a text</li> <li>• Distinguish main ideas from specific details</li> <li>• Distinguish facts from opinions</li> </ul>
<b>B.C.A IV Semester</b>	
Design And Analysis Of Algorithms	<ul style="list-style-type: none"> <li>• Analyze algorithms and improve the efficiency of algorithm.</li> <li>• Apply different designing methods for development of algorithms realistic problems, such as divide and conquer, greedy method and etc.</li> <li>• Analyze and estimate the performance of algorithm.</li> </ul>
Java Programming	<ul style="list-style-type: none"> <li>• List and use Object Oriented Programming concepts for problem solving.</li> <li>• Solve the inter-disciplinary applications using the concept of inheritance</li> <li>• Apply JDBC to provide a program level interface for Communicating with database using java programming.</li> </ul>
System Software	<ul style="list-style-type: none"> <li>• To understand the basics of system programs like editors, compiler, assembler, linker, loader, interpreter</li> <li>• To understand the various phases of compiler and compare its working with assembler.</li> <li>• To understand how linker and loader create an executable program from an object module created by assembler and compiler.</li> <li>• To know various editors and debugging techniques.</li> </ul>
Software Engineering	<ul style="list-style-type: none"> <li>• Plan a software engineering process life cycle , including the specification, design, implementation, and testing of software systems that meet specification, performance</li> <li>• Able to elicit, analyze and specify software requirements</li> </ul>

	<p>through a productive working relationship with various stakeholders of the project</p> <ul style="list-style-type: none"> <li>Analyze and translate a specification into a design, and then realize that design practically, using an appropriate software engineering methodology.</li> </ul>
VB.NET	<ul style="list-style-type: none"> <li>Analyze program requirements</li> <li>Design/develop programs with GUI interfaces</li> <li>Code programs and develop interface using Visual Basic .Net</li> <li>Perform tests, resolve defects and revise existing code</li> </ul>
Additional English	<ul style="list-style-type: none"> <li>Think analytically and critically about literature and language</li> <li>Recognize and analyze the perspectives and assumptions that they and other readers and critics bring to texts and interpretations</li> <li>Distinguish facts from opinions</li> </ul>
<b>BCA V Semester</b>	
Operating System	<ul style="list-style-type: none"> <li>Understand the basics of operating systems like kernel, shell, types and views of operating systems</li> <li>Describe the various CPU scheduling algorithms and remove deadlocks.</li> <li>Use disk management and disk scheduling algorithms for better utilization of external memory</li> </ul>
Web Technology	<ul style="list-style-type: none"> <li>Understand the various steps in designing Creative and dynamic website.</li> <li>Write HTML, JavaScript, CSS and PHP.</li> <li>Understand hierarchy of object oriented programming.</li> </ul>
Database Management Systems	<ul style="list-style-type: none"> <li>Demonstrate the basic elements of a relational database management system.</li> <li>Design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL</li> </ul>
Computer Network	<ul style="list-style-type: none"> <li>Understand computer network basics, network, architecture, TCP/IP and OSI reference models.</li> <li>Describe data link protocols, multi-channel access protocols and IEEE 802 standards for LAN</li> <li>Understand network security and define various protocols such as FTP, HTTP, Telnet, DNS</li> </ul>
.Net Framework Using C#	<ul style="list-style-type: none"> <li>Be able to understand use of C# basics, Objects and Types, Inheritance</li> <li>To develop, implement and creating Applications with C#</li> <li>To understand and be able to explain Security in the .NET framework and Deployment in the .NET.</li> </ul>
<b>BCA VI Semester</b>	

<p>Software Testing Principles And Practices</p>	<ul style="list-style-type: none"> <li>• Various test processes and continuous quality improvement</li> <li>• Types of errors and fault models</li> <li>• Methods of test generation from requirements</li> </ul>
<p>Business Intelligence</p>	<ul style="list-style-type: none"> <li>• Describe the concepts and components of Business Intelligence (BI).</li> <li>• Critically evaluate use of BI for supporting decision making in an organisation.</li> <li>• Understand and use the technologies and tools that make up BI (e.g. Data warehousing, Data reporting and use of online analytical processing (OLAP)).</li> <li>• Understand and design the technological architecture that underpins BI systems</li> </ul>
<p>J2EE</p>	<ul style="list-style-type: none"> <li>• Identify advance concepts of java programming with database connectivity.</li> <li>• Design and develop platform independent applications using a variety of component based frameworks</li> <li>• Able to implement the concepts of Hibernate, XML&amp; EJB for building enterprise applications.</li> </ul>



**K.L.E.SOCIETY'S  
RAJA LAKHAMAGOUDA SCIENCE INSTITUTE (AUTONOMOUS), BELAGAVI.  
Department of PG – Physics**

**Program Outcome of M.Sc. (Physics)**

- **PO-1:** It provides the knowledge, general competence, analytical skills on an advanced level, needed in industry, consultancy, education and research.
- **PO-2:** Students are able to correlate the structure and physical properties (mechanical, electrical, optical & thermal) of materials
- **PO-3:** To introduce the classical formulation approaches like Lagrangian and Hamiltonian dynamics and to study their application in mechanical systems and solving of problems. Also to review the fundamental concepts of relativity and to create an understanding of their applications
- **PO-4:** To provide an understanding of principles of quantum mechanics and to introduce to the ideas of Dirac formulation, Time-independent perturbation theory and approximation methods in Quantum Mechanics.
- **PO-5:** Students will be able to apply the concepts on Mathematics in solving specific problems in the areas like Quantum mechanics, Nuclear physics, Optics & Electronics.
- **PO-6:** Students will be able to understand the concepts on properties of materials, phenomenon of superconductivity, its properties, different techniques used for synthesis and fabrication of nano-materials.
- **PO-7:** The project work enables students to develop experimental skills and motivate them to research field.
- **PO-8:** The seminars/workshops/conferences organized by the department motivate the students to develop interest and curiosity which further makes them to take up career in scientific organizations like ISRO, DRDO, DAE, HAL, NAL etc as scientific officers/scientists etc.

**Course Outcome**

<b>Course</b>	<b>Topic</b>	<b>Outcome</b>
MSc I Semester	1.1- Mathematical Physics and Computer programming	CO1: In this course Series solution method is used to study special functions like Legendre, Bessel, Laguarre functions, etc CO2: Matrix representation of linear operators and their eigen values and eigen vectors provide knowledge that is useful in applications of physical problems. CO3: Fourier, Laplace and inverse transformations are studied in order to solve major problems in physics. CO4: Study of types of tensors. CO5: Knowledge of C-programming to design software, simulators, network devices, compilers, etc
	1.2- Classical Mechanics	CO1: Indepth understanding of Newton's laws. CO2: To solve the Newton Equations for simple configurations using various methods. CO3: The foundations of chaotic motion.
	1.3- Electronics	CO1: Students will understand the current and voltage characteristics of semiconductor devices. CO2: They will be able to analyze the circuits and relate ac models of semiconductor devices with their physical operation. CO3: Will be able to design and analyze electronic circuits. CO4: To evaluate frequency response to understand the behavior of electronic circuits. CO5: To study digital system of design, circuit theory and networks.
	1.4- Solid state physics (General)	CO1: To analyze the crystal structure. CO2: To study the structural property relations. CO3: To understand thermal properties of the materials. CO4: To study the elemental and compound semiconductor. CO5: To study the defects in crystal structures.
MSc II Semester	2.1- Quantum mechanics I	CO1: Quantum mechanics is important because it plays a fundamental role in explaining how the world works. It governs the behavior of microscopic systems. CO2: It governs the behavior of all physical systems regardless of their size. CO3: quantum mechanics is tool used to design optical and electronic components.

	2.2- Atomic, molecular and optical physics( General)	CO1: To Overview the Salient features of atomic spectra and coupling schemes. CO2: To study lasers, their kinetics and applications. CO3: To acquire knowledge of Raman, Microwave, infrared and electronic spectroscopy for future studies in atomic and molecular physics.
	2.3- Nuclear Physics ( General)	CO1: To study the basic properties of nucleus and experimental determination of certain properties. CO2: Various decays/ transitions in the nuclei and the liquid drop model are studied. CO3: Study of elementary particles in the nuclei provides deeper knowledge about their structure. CO4: Interaction of radiations with the matter and their detection.
	2.4- Probability theory	CO1: Study of basic statistics. CO2: Mathematical analysis of theory of probability. CO3: Various sampling techniques and hypothesis formulations are studied for the use in research areas.

Course	Topic	Outcome
MSc III Semester	3.1- Statistical Mechanics	<p>CO1: Introduction to statistical methods, formulation and interactions of macroscopic systems.</p> <p>CO2: Basic methods, results and simple applications of statistical mechanics.</p> <p>CO3: Acquire knowledge of distribution functions like Maxwell-Boltzmann, Bose – Einstein and Fermi Dirac and corresponding consequences.</p> <p>CO4: Statistical thermodynamics provides platform for the study of Brownian motion, Langevin equation, Fourier analysis, Fluctuations and Onsager relations.</p>
	3.2- Mathematical methods of physics II	<p>CO1: They study the applications of linear integral/differential equations &amp; their relation with Volterra’s equation. Hence they offer a powerful technique for solving practical problems.</p> <p>CO2: Inhomogeneous differential equations can be solved using Green’s function to describe variety of phenomena ranging from motion of complex mechanical oscillators to the emission of sound waves from loudspeakers.</p> <p>CO3: Numerical methods such as iteration, bisection, Newton-Raphson method provide solution of algebraic and transcendental equations</p> <p>CO4: Study of group theory provides ability to generate a representation, to reduce it to its irreducible components &amp; to use symmetry arguments to understand geometry of molecules.</p>
	3.3- Solid state physics I (special subject)	<p>CO1: Band energy calculations by APW method and k-p method.</p> <p>CO2: Hall effect study for nature of charge carriers and carrier concentration.</p> <p>CO3: Study of magneto resistance phenomena.</p> <p>CO4: Study of Integer Quantum Hall Effect (IQHE) and fractional Hall effect.</p> <p>CO5: Boltzmann Transport Equations to study electrical/ thermal conduction.</p>
	3.4- Physics of nanomaterials	<p>CO1: Study the basics of Nanoscience including historical background, types of nano materials and quantum confinement.</p> <p>CO2: Basics of quantum mechanics such as Wave-particle duality, Heisenberg uncertainty principle, Schrodinger wave equations etc.,</p> <p>CO3: Physical and chemical methods of synthesizing nano materials enables students to synthesize a compound for its further studies.</p> <p>CO4: Learning the characterization techniques enables them to implement those practically during their project work.</p>

		CO5: Mechanical, Electrical, Optical and magnetic properties of nano materials are studied, gaining the efficiency to differentiate various nano compounds.
MSc IV Semester	4.1- Classical electrodynamics	CO1: To acquire basic knowledge of electrostatics and magnetostatics. CO2: Various laws, equations and transformations of electrodynamics are studied. CO3: Electromagnetic waves and radiations along with their interactions and importance in other branches of physics are studied. CO4: To study the behavior of plasma in magnetic field.
	4.2- Quantum mechanics II	CO1: Linear vector algebra forms base to machine learning in the field of engineering. CO2: Study of approximation methods has applications in molecular physics. CO3: Relativistic quantum mechanics provides information about the interconnection of quantum mechanics with other branches of physics.
	4.3- Solid state physics II (special subject )	CO1: Study of dielectric ferroelectric and piezoelectric materials. CO2: Study of spin-spin, spin-lattice relaxation using magnetic resonance. CO3:Optical properties of semiconductors. CO3: Solar cells and their efficiencies.
	4.4- Solid state physics III (special subject )	CO1: Applications of low dimensional semiconductor structures. CO2: Methods of thin film deposition. CO3: Study of high Temperature superconductors. CO4: Properties of nano-structured materials. CO5: Spintronic materials

**K.L.E Society's  
Raja Lakhamagouda Science Institute, Belagavi**

**Department of Chemistry**

**Programme Outcome**

- Demonstrate, solve and an understanding of major concepts in all disciplines of chemistry
- Solve the problem and also think methodically, independently and draw a logical conclusion about chemicals science concepts
- Employ critical thinking and the scientific knowledge to design, carry out, record and analyze the results of chemical reactions
- Create an awareness of the impact of chemistry on the environment, society, and development outside the scientific community
- Find out the green route for chemical reaction for sustainable development
- To inculcate the scientific temperament in the students and outside the scientific community
- Use modern techniques, decent equipments and Chemistry software's
- Develop the ability to communicate scientific information and research results in written and oral formats.
- Learn professionalism, including the ability to work in teams and apply basic ethical principles
- Gain the knowledge of Chemistry through theory and practical's
- To explain nomenclature, stereochemistry, structures, reactivity, and mechanism of the chemical reactions
- Identify chemical formulae and solve numerical problems
- Use modern chemical tools, Models, Chem-draw, Charts and Equipments
- Know structure-activity relationship
- The student will acquire knowledge of Chemical Thermodynamics, Kinetics, Electrochemistry, Atomic Structure, Organic Chemistry, Spectroscopy and Skill in Industrial Chemistry
- Understand good laboratory practices and safety
- Develop research oriented skills
- Make aware and handle the sophisticated instruments/equipments

## Course outcome

<b>M. Sc. Chemistry</b>	
<b>Course- Inorganic Chemistry</b>	<b>Course outcome</b>
<b>M.Sc. I Semester (CHIT-1.1)</b>	
<b>Chemical Bonding</b>	<ul style="list-style-type: none"> <li>• Understand the basic concepts, nature and properties of ionic, covalent and metallic bonding</li> <li>• Rationalize the nature of bonding and shape</li> <li>• Appreciate how chemical substances can be described in terms of structure and bond type</li> <li>• Able to use different Theories to explain Structure and type of bond</li> </ul>
<b>Chemistry of Non Transition Elements</b>	<ul style="list-style-type: none"> <li>• Learn about naming and classifications of Boranes</li> <li>• How to assign STYX code for given Boranes</li> <li>• Wade's rule &amp; its applications.</li> <li>• Know about preparative methods of Boranes, Carboranes and Metallocarboranes</li> </ul>
<b>Acid Base Concepts and Non Aqueous Solvents</b>	<ul style="list-style-type: none"> <li>• Understand the basic concepts and theories of Acids and Bases</li> <li>• Knowledge of HSAB</li> <li>• Understand the importance, classification and properties of non aqueous solvents</li> <li>• Knowledge of types of reactions</li> </ul>
<b>Data Analysis</b>	<ul style="list-style-type: none"> <li>• Understand the concept of accuracy and precision</li> <li>• Knowledge of errors and its types</li> <li>• Able to do statistical data and evaluation</li> <li>• Identify proper use and care for measurement</li> </ul>
<b>M.Sc. II Semester (CHIT-2.1)</b>	
<b>Symmetry and Group Theory</b>	<ul style="list-style-type: none"> <li>• Understand the concept of symmetry and point group of molecules</li> <li>• Ability to generate a representation and reduce it to irreducible components</li> <li>• Ability to use symmetry argument to understand bonding and geometry of molecules</li> <li>• Able to predict IR and Raman spectra of molecules</li> </ul>
<b>Coordination Chemistry-I</b>	<ul style="list-style-type: none"> <li>• Understand the concept of coordination compound</li> <li>• Able to use CFT to understand structure, bonding and magnetic properties</li> <li>• Understand bonding in complexes and to recognize the typed of isomers</li> </ul>
<b>Organometallic Compounds-I</b>	<ul style="list-style-type: none"> <li>• Understand the concept of organometallic compounds and its classification</li> <li>• Evaluate total electrons of complexes</li> <li>• Able to learn about structure and bonding in Metal-nitrosyl and Metal-Carbonyl</li> <li>• Understand quadrupole bonding and calculate M-M bonds</li> </ul>

<b>Bio-Inorganic Chemistry</b>	<ul style="list-style-type: none"> <li>• Learn about the essential, trace and toxic elements</li> <li>• Study the structure and functions iron and copper protein</li> <li>• Acquire the information and analysis Fe-S cluster structure</li> <li>• Understand the process and benefits of nitrogen fixation</li> </ul>
<b>M.Sc. III Semester (CHIT-3.1)</b>	
<b>Electronic Spectra of Transition Metal Complexes</b>	<ul style="list-style-type: none"> <li>• Understand the concept Terms, Microstates and</li> <li>• Know various selection rules</li> <li>•</li> <li>• Able to analyze nature of spectral line band</li> <li>• Understand concept and analysis of various transitions of Orgel diagram</li> <li>• Acquire knowledge interpretation of Tanabe Sugano diagram</li> <li>• Know what are charge transfer transitions, its types and analysis of different CT transitions</li> </ul>
<b>Coordination Chemistry-II</b>	<ul style="list-style-type: none"> <li>• Able to understand the concepts of ligand substitution reactions in octahedral and square planar complex</li> <li>• Know the principle and applications of trans effect</li> <li>• Basic understand the concept and mechanism of redox reactions</li> <li>• Understand the concept of stepwise and overall step formation</li> </ul>
<b>Organometallic Compounds-II</b>	<ul style="list-style-type: none"> <li>• Understand the synthesis and properties</li> <li>• Able to know the reactivity of organometallic compound and its applications</li> <li>• Understand key mechanistic steps catalyst and its industrial applications</li> </ul>
<b>Environmental Chemistry</b>	<ul style="list-style-type: none"> <li>• Able to understand the concept of solid distribution in solvents</li> </ul>
<b>M.Sc. IV Semester (CHIT-4.1)</b>	
<b>Solid State Chemistry</b>	<ul style="list-style-type: none"> <li>• Understand the different types of bonding concept (Ionic, Covalent, Coordinate, Metallic)</li> <li>• Understand different bonding theories</li> <li>• Able to understand molecular orbital diagrams to interpret bonding</li> </ul>
<b>Nuclear Chemistry</b>	<ul style="list-style-type: none"> <li>• Know the importance of nuclear chemistry and its applications</li> <li>• Able to calculate the rate of nuclear decay of short lived isotopes</li> <li>• Understand the basics of nuclear chemistry applications</li> </ul>

<b>Electro analytical Techniques</b>	<ul style="list-style-type: none"> <li>• Understand the basic concepts of electroanalytical techniques</li> <li>• Able to explain the principle, instrumentation and applications of Amperometry, Coulometry and Cyclic voltametry</li> <li>• Able to identify the most appropriate analytical techniques for specific analysis</li> </ul>
<b>Thermal Methods of Analysis</b>	<ul style="list-style-type: none"> <li>• Understand the principles of thermoanalytical techniques</li> <li>• Acquire knowledge of experiment conditions and methodology</li> <li>• Able to compare different thermoanalytical techniques</li> <li>• Analyze and present the results of the measurements</li> </ul>

<b>M. Sc. Physical chemistry</b>	
<b>Course: Physical Chemistry</b>	<b>Course outcome</b>
<b>I Semester(CHPH-1.3)</b>	
<b>Unit-I: Quantum Chemistry-I</b>	<ul style="list-style-type: none"> <li>• Students able to know atomic structure, molecular structure and properties, as well as chemical reactivity</li> <li>• Understand Physical significance of and characteristics of wave function</li> </ul>
<b>Unit-II: Thermodynamics-I</b>	<ul style="list-style-type: none"> <li>• Understand review of basic principles of thermodynamics</li> <li>• Students able know the different types thermodynamics derivations</li> <li>• Understand Thermodynamic equations &amp; its applications</li> </ul>
<b>Unit-III: Electrochemistry-I</b>	<ul style="list-style-type: none"> <li>• Students able to know conductance properties, specific conductance, theory of ionic conductance in solutions</li> <li>• Understand the fundamentals of batteries &amp; classification of batteries</li> <li>• Students able to know construction and working of hydrogen-oxygen and methanol-oxygen fuelcells.</li> </ul>
<b>Unit-IV: Polymer Chemistry-I</b>	<ul style="list-style-type: none"> <li>• Understand the basic concepts, classification and molecular weight determination of polymers</li> <li>• Understand Kinetics of polymerization and Thermodynamics of polymer solutions</li> </ul>

<b>II Semester(CHPH-2.3)</b>	
<b>Unit-I: Atomic structure and Atomic spectra</b>	<ul style="list-style-type: none"> <li>• Able to understand alkali and alkali like spectra</li> <li>• To know the multiple structure of alkali spectra</li> <li>• To know various effect on atomic spectra</li> </ul>
<b>Unit-II: Molecular Spectroscopy</b>	<ul style="list-style-type: none"> <li>• Student will know information on molecular method(IR, Raman, Electronic Spectra)</li> <li>• Understand the electromagnetic radiation and its interaction with matter</li> <li>• Understand the rotational &amp; vibrational spectra of polyatomic molecules</li> </ul>
<b>Unit-III: Thermodynamics-II</b>	<ul style="list-style-type: none"> <li>• Know the variation of activity &amp; chemical potential with respect to temperature &amp; pressure</li> <li>• Know the derivation of Gibbs-Duhem, Duhem-Margules equations</li> <li>• Understand applications of phase rule for three components systems</li> </ul>
<b>Unit-IV: Reaction Kinetics</b>	<ul style="list-style-type: none"> <li>• Understand critical account of collision and transition state theories</li> <li>• To students able to know kinetic and mechanism of unimolecular theory</li> <li>• Knowledge of Electro kinetics phenomenon &amp; Enzyme catalysis</li> </ul>
<b>III Semester(CHPH-3.3)</b>	
<b>Unit-I: Diffraction studies</b>	<ul style="list-style-type: none"> <li>• Able to understand of theoretical, principle and structure analysis of the materials</li> <li>• Able know structure factor calculation of the material</li> </ul>
<b>Unit-II: Chemistry of materials</b>	<ul style="list-style-type: none"> <li>• Knowledge of nanaoparticle: synthesis, properties &amp; its applications</li> <li>• Knowledge of Carbon nanotube: synthesis, properties &amp; its applications</li> <li>• Knowledge of Aerogels: synthesis, properties &amp; its applications</li> </ul>
<b>Unit-III: Electrochemistry-II</b>	<ul style="list-style-type: none"> <li>• Understand the concept of polarization &amp; overvoltage</li> <li>• Able to know the derivation of Buler-volmer, Tafel equations</li> <li>• Understand the theories of overvoltage( Bubble formation, combination of atoms, ion discharge and proton transfer as slow process)</li> </ul>
<b>Unit-IV: Photochemistry and photodegradation</b>	<ul style="list-style-type: none"> <li>• Know the review of laws of photochemistry</li> <li>• Students able to know the properties &amp; photochemical process</li> </ul>

<b>IV Semester(CHPH-4.3)</b>	
<b>Unit-I: Superconductors and Magnetochemistry</b>	<ul style="list-style-type: none"> <li>• Understand the semiconductors properties</li> <li>• Knowledge of superconductor's theory &amp; its uses</li> <li>• Knowledge of Magnetochemistry &amp; its susceptibility</li> </ul>
<b>Unit-II: Catalysis</b>	<ul style="list-style-type: none"> <li>• Knowledge of different types of catalysis</li> <li>• Able to know the concept of activity &amp; selectivity of the catalysis</li> <li>• understand the preparation and characterization of catalysis</li> </ul>
<b>Unit-III: Surface Chemistry</b>	<ul style="list-style-type: none"> <li>• To know basic principles of Adsorption theory</li> <li>• Understand the kinetic of surface reactions</li> <li>• To know applications of adsorptions</li> </ul>
<b>Unit-IV: Polymer Chemistry-II</b>	<ul style="list-style-type: none"> <li>• Understand the reactions of polymer</li> <li>• Students able to know the crosslinking reactions</li> <li>• Understand the thermal characterizations</li> </ul>
<b>M. Sc. Analytical chemistry</b>	
<b>Course: Analytical chemistry</b>	<b>Course outcome</b>
<b>I Semester(CHAT-1.5)</b>	
<b>Unit-I: Separation Techniques</b>	<ul style="list-style-type: none"> <li>• Understand the process ion exchanges and its applications</li> <li>• Ability to analyze the separation system of multi-components mixtures</li> <li>• Ability to select appropriate separation techniques for intended problem</li> </ul>
<b>Unit-II: Chromatography</b>	<ul style="list-style-type: none"> <li>• Ability to analyze general principles and classification of chromatographic methods</li> <li>• Understand the principles, instrumentation, stationary phases and types of carrier gas used in GC and its applications.</li> </ul>
<b>Unit-III: Corrosion and its control</b>	<ul style="list-style-type: none"> <li>• Ability to know the electrochemical theory of corrosion</li> <li>• To know different types of corrosion &amp; factors effect on rate of corrosion</li> <li>• Understand different methods of corrosion control</li> </ul>
<b>Unit-IV: Petroleum chemistry</b>	<ul style="list-style-type: none"> <li>• Understand the processing of petroleum</li> <li>• Students ability to know different techniques of synthetic petroleum</li> <li>• Ability to know basic properties of lubricating oils &amp; additives and its applications</li> </ul>

<b>M. Sc. Organic Chemistry</b>	
Course	Course outcome
<b>Semester-I</b>	
<b>Unit-I: Basic Concepts and Reaction Mechanism</b>	<ul style="list-style-type: none"> <li>• Learn the fundamentals of reaction mechanisms.</li> <li>• Understand the concept of sp, sp<sup>2</sup> &amp; sp<sup>3</sup> hybridization.</li> <li>• Understand the concept of Aromaticity w.r.t. benzinoid, nonbenzinoid molecules by applying Huckle's rule.</li> <li>• Learn classical and non-classical carbocation, Neighbouring Group Participation by pi and sigma bonds.</li> <li>• Gain insights in to generation, stability and reactions of organic intermediates.</li> </ul>
<b>Unit-II: Substitution Reactions</b>	<ul style="list-style-type: none"> <li>• Understand the concept of Aromatic Electrophilic, Nucleophilic Substitution reactions.</li> <li>• Gain insights into Aliphatic Nucleophilic Substituion reactions.</li> </ul>
<b>Unit-III: Addition and Elimination Reaction</b>	<ul style="list-style-type: none"> <li>• Apply the Knowledge of mechanistic approach for various types of addition reactions.</li> <li>• Distinguish between type of addition and elimination reactions.</li> <li>• Solve the elimination problems.</li> </ul>
<b>Unit-IV: Stereochemistry</b>	<ul style="list-style-type: none"> <li>• Learn E and Z nomenclature in C, N, S, P containing compounds.</li> <li>• Learn the stereochemical principle, enantiomeric relationship and R, S nomenclature.</li> <li>• Determine the absolute and relative configurations of optical and geometrical isomers.</li> <li>• Describe the optical isomerism exhibited by the molecules, which are not having asymmetric carbon.</li> </ul>
<b>Semester-II</b>	
<b>Unit-I: Name Reactions</b>	<ul style="list-style-type: none"> <li>• Study the various Name reactions with example, which involved the bond formation between C-C, C-N, C-O &amp; C-Cl.</li> <li>• Identify and predict the mechanism of Name reactions.</li> </ul>
	<ul style="list-style-type: none"> <li>• Understand the basis of Oxidation reactions with</li> </ul>

<b>Unit-II: Oxidation and Reduction Reactions</b>	<p>examples.</p> <ul style="list-style-type: none"> <li>• Study the various application of chromium, magnesium series.</li> <li>• Understand the basis of Reduction reactions.</li> <li>• Study the catalytic hydrogenation-both heterogeneous and homogeneous metal hydride reactions.</li> </ul>
<b>Unit-III: Molecular Rearrangement Reactions</b>	<ul style="list-style-type: none"> <li>• Acquire the knowledge on rearrangement reactions like classification, general mechanistic treatment of nucleophilic, electrophilic and free radicals.</li> <li>• Appreciates the various steps involved in the molecular rearrangements.</li> </ul>
<b>Unit-IV: Heterocyclic Chemistry</b>	<ul style="list-style-type: none"> <li>• Gain firm knowledge on Aromatic nature, preparation, properties and applications of heterocyclic compounds.</li> <li>• Study of heterocyclic chemistry: 3, 4, 5, 6 &amp; 7 member heterocyclic with one or two hetero atoms.</li> <li>• Understand condensed five and six members heterocyclic compounds and its importance.</li> </ul>
<b>Semester-III</b>	
<b>Unit-I: Reagents in Organic Synthesis</b>	<ul style="list-style-type: none"> <li>• Gain the potential of organic reagents.</li> <li>• Learn the applications of organic reagents in organic synthesis and studied the functional group transformations.</li> <li>• Identify usage of organometallic reagents in the development of C-C bond helps to know the importance of organo metallic compounds in synthesis.</li> </ul>
<b>Unit-II: Photochemistry</b>	<ul style="list-style-type: none"> <li>• Acquire knowledge on photochemical excitation with reference to Norrish type-I, Norrish type-II reactions and Pterno Buchii reactions.</li> <li>• Gained knowledge on elaborated photochemical reactions of carbonyl compounds.</li> <li>• Gain insights into mechanistic aspects of important photochemical reactions with alkenes and aromatic compounds with 1-2. 1-3. 1-4 additions.</li> </ul>
<b>Unit-III: Pericyclic Reactions</b>	<ul style="list-style-type: none"> <li>• Acquire knowledge on Pericyclic reactions, Symmetry properties and Frontier molecular orbitals.</li> <li>• Gain knowledge on cycloaddition reactions mechanism and the stereo aspects for different types of reactions.</li> <li>• Describe Electrocyclic reactions mechanisms and stereo aspects.</li> </ul>

	<ul style="list-style-type: none"> <li>• Describe sigmatropic rearrangement and learn the ene reactions.</li> </ul>
<b>Unit-IV: Medicinal Chemistry</b>	<ul style="list-style-type: none"> <li>• Gain the importance of medicinal chemistry, the action and discovery.</li> <li>• Study the structure activity and drug targets.</li> <li>• Appreciates the role of antibiotics in everyday life.</li> <li>• Validates the crucial role of therapeutic agents and analyses the vibrant role of pharma chemistry.</li> </ul>
<b>Semester-IV</b>	
<b>Unit-I: Natural Products</b>	<ul style="list-style-type: none"> <li>• Study the synthesis of natural products, drugs and their nomenclature.</li> <li>• Learn biogenesis terpenoides and alkaloids.</li> <li>• Study structure and stereochemistry of various natural products.</li> </ul>
<b>Unit-II: Steroids and Prostaglandins</b>	<ul style="list-style-type: none"> <li>• Understand the principle role of vitamin in metabolism and deficiency diseases.</li> <li>• Determine the complex structure of steroids.</li> <li>• Learn the importance and role in metabolism of antibiotics and hormones.</li> </ul>
<b>Unit-III: Retrosynthetic Analysis</b>	<ul style="list-style-type: none"> <li>• Learn retrosynthesis to identify the reverse path for the synthesis of target molecule.</li> <li>• Design a reverse method to reconstruct the organic molecule, this helps the student to get the knowledge on the approach for the synthesis of organic molecule by using retrosynthetic analysis.</li> </ul>
<b>Unit-IV: Bioorganic Polymers</b>	<ul style="list-style-type: none"> <li>• Study of carbohydrates : introduction of sugar, structure of triose, tetrosa, panctose, hexoes, stereochemistry of glucose.</li> <li>• Study the classification, function, analysis of carbohydrates, proteins and nucleic acids.</li> <li>• Learn thr Crick model of DNA, role of DNA and RNAs in protien synthesis.</li> <li>• Learn genetic code-silent features.</li> </ul>

**K.L.E Society's  
Raja Lakhamagouda Science Institute, Belagavi  
Department of Mathematics**

**Programme: M. Sc. Mathematics**

**Programme Outcome:**

- Gain sound knowledge on fundamental principles and concepts of Mathematics and computing with their applications related to Industrial, Engineering, Biological and Ecological problems.
- Exhibit in depth the analytical and critical thinking to identify, formulate and solve real world problems of science and engineering.
- Competent to gain positions in industry and academic as well
- Recognize the need for continuous learning and will prepare himself appropriately for his/her all-round development throughout the professional care
- Develop and understand the value of proof, the single factor that distinguishes mathematics from all other disciplines, and will demonstrate proficiency in writing and understanding proofs.
- Gain experience investigating real world problems and learn how to apply mathematical ideas and models those problems.
- Investigate and solve unfamiliar mathematical problem

**COURSE OUTCOME**

<b>M.Sc I Semester</b>	
<b>Topology</b>	<ul style="list-style-type: none"> <li>• Understand the concept of topology in real world problems</li> <li>• Understand the concept of countability axioms</li> <li>• Understand the concept of locally compact and sequentially compact space</li> <li>• Applications of topological approach to study the qualitative properties of solutions of mathematical models arising in real world phenomena</li> <li>• Gain knowledge of normal, regular and completely regular spaces</li> </ul>
<b>Linear Algebra</b>	<ul style="list-style-type: none"> <li>• Apply the theory of linear algebra to specific research problems in mathematics and engineering</li> <li>• Find the eigenvalues and eigenvectors of a square matrix and to know diagonalizable matrix</li> <li>• Handle a non-diagonalizable matrix with the help of upper triangular form or Jordan canonical form</li> <li>• Understand the concept of positive and negative definite of matrices arising problems in optimization and engineering</li> <li>• Apply linear algebra to solve initial and boundary value problems for ordinary and partial differential equations</li> </ul>
<b>Group Theory</b>	<ul style="list-style-type: none"> <li>• Effectively write abstract mathematical proofs in a clear and logical manner and apply the theory of abstract algebra to specific research problems in mathematics or other fields</li> <li>• To extend result from Group theory to study the properties of Rings and Fields</li> <li>• Actively participate in the transition of important concept such as Homomorphism and isomorphism from Discrete mathematics to advance Abstract mathematics</li> </ul>

	<ul style="list-style-type: none"> <li>• Understand the concept of sylow theorems</li> <li>• Locate and use theorems to solve problems in number theory, use of ring theory to cryptography</li> </ul>
<p><b>Real analysis</b></p>	<ul style="list-style-type: none"> <li>• Develop the logical thinking to proof the basic results of real analysis</li> <li>• Apply Riemann Stieltjes Integration on different boundary value problems</li> <li>• Apply analysis on Topology</li> <li>• Able to understand the theorems such as Heine-Borel and Bolazano-Weierstrass theorems</li> <li>• Gain knowledge of fundamental theorem of calculus.</li> </ul>
<p><b>Ordinary Differential Equations</b></p>	<ul style="list-style-type: none"> <li>• Identify, analyze and subsequently solve physical situations whose behaviour can be describe by ordinary differential equations</li> <li>• Determine the solution of differential equations with initial and boundary value problems</li> <li>• Able to understand initial value problems for homogeneous equations</li> <li>• Knowledge of Greens function, Sturn Liouville theory</li> <li>• Enhance and develop the ability of using the language of mathematics in analyzing the real-world problems of sciences and engineering</li> </ul>
<p><b>Complex Analysis</b></p>	<ul style="list-style-type: none"> <li>• Gain the knowledge of line integral, Cauchy's theorem and integral formula</li> <li>• Able to represent the power series of an analytic function</li> <li>• Understand the open mapping theorem, Goursat's theorem, Hurwitz theorem</li> <li>• Able to classify the singularities of analytic functions</li> <li>• Able to apply Schwarz's lemma to characterize conformal maps</li> </ul>



<b>M. Sc. II Semester</b>	
<b>Partial Differential equations</b>	<ul style="list-style-type: none"> <li>• Focuses on PDE model which will be developed in the context of modeling Heat and mass transport and in particular wave phenomena, such as sound and water waves</li> <li>• Establishes general structures, characterization and numerical solutions of PDEs</li> <li>• Able to solve partial differential equation using Charpit's method</li> <li>• Able to classify second order partial differential equations</li> <li>• Able to understand kelvin's Inversion theorem</li> </ul>
<b>Rings And Modules</b>	<ul style="list-style-type: none"> <li>• The importance of Rings as fundamental object in Algebra</li> <li>• Understand the homomorphism and isomorphism theorem of ring</li> <li>• Gain the knowledge of field, subfield, prime subfield and their related examples</li> <li>• Understand the concept of unique factorization domain and Einstein's criterion of irreducibility for polynomials</li> <li>• Locate and use theorems to solve problems in number theory, use of ring theory to Cryptography</li> </ul>
<b>Advance calculus</b>	<ul style="list-style-type: none"> <li>• Decide the behavior of sequences and series using appropriate tests.</li> <li>• Able to understand the various types of convergence of sequences</li> <li>• Knowledge of Directional derivatives and their continuity</li> <li>• Get an understanding of partial derivative and their applications in finding maxima and minima problems</li> <li>• Understand the sufficient condition for differentiability</li> </ul>

<p><b>Lebesgue Measure and Integration</b></p>	<ul style="list-style-type: none"> <li>• Understand the sigma algebra of lebesgue measurable sets</li> <li>• Apply measure theory on functional analysis.</li> <li>• Demonstrate a depth of understanding in advanced mathematical topics in relation to Biomathematics and engineering.</li> <li>• Able to understand the concepts of functions of Bounded Variations</li> <li>• Knowledge of Egoroff's theorem and Lusin's Theorem</li> </ul>
<p><b>Numerical analysis</b></p>	<ul style="list-style-type: none"> <li>• solve algebraic and transcendental equation using an appropriate numerical method</li> <li>• Able to solve Nonlinear system of equations using Iterative methods</li> <li>• Able to find the Eigen values and eigenvector of symmetric matrix</li> <li>• Understand the concepts of Chebyshev and Rational function approximation</li> <li>• Understand the concept of numerical differentiation and integration</li> </ul>
<p><b>Open elective course-I</b></p>	
<p><b>Statistical method and probability theory.</b></p>	<ul style="list-style-type: none"> <li>• Understand the conditional probability of random variables.</li> <li>• Analyze data statistically and interpretation of the results</li> <li>• Able to derive the Binomial distribution and Poisson distribution.</li> <li>• Knowledge of test of significance.</li> </ul>
<p><b>Mathematical Physics-I</b></p>	<ul style="list-style-type: none"> <li>• Understand the Bessel functions of first kind</li> <li>• Knowledge of Hermite polynomial and generating function</li> <li>• Able to apply Laplace transform for the solution of differential equation and problems in physics.</li> </ul>

<p><b>Computer Application</b></p>	<ul style="list-style-type: none"> <li>• Understand the basic knowledge of computer, its classification and its uses.</li> <li>• Understand the basic structure of C program.</li> <li>• Able to declare and initialize a string variables.</li> </ul>
<p><b>M.Sc. III Semester</b></p>	
<p><b>Functional analysis</b></p>	<ul style="list-style-type: none"> <li>• Understand the concept of Normed linear space in real world problems.</li> <li>• Able to derive Hahn-Banach theorem.</li> <li>• Understand the concept of Uniform boundedness principle.</li> <li>• Knowledge of Bessel's inequality</li> <li>• Able to derive Spectral theorem for finite dimensional Hilbert spaces.</li> </ul>
<p><b>Differential Geometry</b></p>	<ul style="list-style-type: none"> <li>• Compute the speed and length of the curve.</li> <li>• Able to derive and apply Frenet formulae.</li> <li>• Understand the concept of coordinate patches <math>\mathbb{R}^3</math>.</li> <li>• Understand the concept of Gaussian and mean curvature.</li> <li>• Knowledge of special varieties of curves.</li> </ul>
<p><b>General measure and integration</b></p>	<ul style="list-style-type: none"> <li>• Understand the fundamentals of measure theory and be acquainted with the proofs of the fundamental theorems underlying the theory of integration.</li> <li>• Able to integrate non negative measurable function</li> <li>• Able to derive Radon Nocodyan theorem and Lebesgue decomposition theorem.</li> <li>• Able to derive Riesz and Kantorovich</li> </ul>

	theorem <ul style="list-style-type: none"> <li>• Understand the concept of Fubini and Tonelli theorem.</li> </ul>
<b>Number Theory</b>	<ul style="list-style-type: none"> <li>• Able to derive the fundamental theorem of arithmetic</li> <li>• Understand the concept of congruence</li> <li>• Able to prove the Euler's generalization of Fermat's theorem</li> <li>• Compute the primitive roots</li> <li>• Understand the Legendre symbol and its properties</li> </ul>
<b>Fuzzy Mathematics</b>	<ul style="list-style-type: none"> <li>• Understand the basic concept of Fuzzy sets.</li> <li>• Able to derive the decomposition theorem</li> <li>• Gain knowledge of Fuzzy intersection</li> <li>• Understand the concept of combination of operators</li> <li>• Able to prove characterization theorem.</li> </ul>
<b>Open elective course</b>	
<b>Statistical Inference</b>	<ul style="list-style-type: none"> <li>• Understand the concept of various distribution and its application</li> <li>• Gain knowledge of Wald-Wolfowitz Run Test.</li> </ul>
<b>Applications of Mathematics in Physics</b>	<ul style="list-style-type: none"> <li>• Able to solve linear integral equations of the first and second kind</li> <li>• Understand the Euler's, picard's, milne's, runge-Kutta method</li> </ul>
<b>Computer Applications-II (MATLAB PROGRAMMING )</b>	<ul style="list-style-type: none"> <li>• Understand the History of MATLAB</li> <li>• Able to understand conditional statements and Loop</li> </ul>
<b>Research Methodology</b>	<ul style="list-style-type: none"> <li>• Understand the objective of Research</li> <li>• Knowledge of downloading the papers from web</li> </ul>

<b>Msc IV semester</b>	
<b>Graph theory</b>	<ul style="list-style-type: none"> <li>• Understand the basic concepts of graph theory</li> <li>• Identify the real life problems in terms of graph theory</li> <li>• Understand the Eulerian and Hamiltonian graphs</li> <li>• Understand the Kuratowski criterion for planarity</li> <li>• Gain the knowledge of Graph valued functions</li> </ul>
<b>Algebraic Topology</b>	<ul style="list-style-type: none"> <li>• Understand the orientation of Geometric Complexes</li> <li>• Knowledge of fundamental concepts and methods in algebraic topology, in particular singular homology</li> <li>• Understand the simplicial mappings and its properties</li> <li>• Able to prove Brouwer fixed point theorem</li> <li>• Understand the basic properties of covering spaces</li> </ul>
<b>Computational methods</b>	<ul style="list-style-type: none"> <li>• Able to understand Asymptotic expansions of integrals</li> <li>• Knowledge of vanderpol oscillator</li> <li>• Able to solve the singular perturbation problems</li> <li>• Able to classify the linear integral equations</li> <li>• Able to find the solution of volterra integral equations</li> </ul>
<b>Banach algebra</b>	<ul style="list-style-type: none"> <li>• Able to understand finite dimensional operators</li> <li>• Knowledge of spectra and the resolvent set</li> <li>• Able to prove spectral mapping theorem for polynomials</li> <li>• Understand the concept of fredholm alternative theory</li> <li>• Able to prove the spectral theorem for Bounded</li> </ul>

<b>Fuzzy relations and logic</b>	<ul style="list-style-type: none"><li>• Understand the concept of fuzzy equivalence relation.</li><li>• Knowledge of compatibility relations</li><li>• Understand the fuzzy relations equations</li><li>• Knowledge of qualified and quantified proposition</li><li>• Knowledge of approximate reasoning.</li></ul>
<b>Project</b>	<ul style="list-style-type: none"><li>• To lay a strong foundation in mathematics at PG level.</li><li>• To develop in students an inclination towards research as well as the skills required for research.</li><li>• Encourage students to take up projects in industry and research organizations.</li></ul>

## Department of Computer Science

### I and II Semester

Course	Outcome
I Semester OOPs with C++	CO1: Understand the basic concepts of OOPs and overview of C++ CO2: Know how to use control statements in C++. CO3: Understand about Classes and objects in C++. CO4: Understand the application of inheritance CO5: Understand the use of Virtual functions, Polymorphism and exception handling.
Practical(OOPs with C++)	Students can perform lab programs using different concepts in C++ Programming language.
II Semester Data Structures Using C++	CO1: Understand the use of Structures and Pointers. CO2: Know about basics of data structure and use of recursion. CO3: Able to apply different Sorting Techniques and use of queues. CO4: Understand how to use linked list. CO5: Understand the use of trees in data structure.
Practical(Data Structures Using C++)	Students can perform lab programs using different concepts of data structure in C++ Programming language.

### III and IV Semester

Course	Outcome
III Semester Database Management Systems (DBMS)	CO1: Understand the basics ,DBMS concepts and Architecture. CO2: Learn about ER models. CO3: Learn about Relational Data Model and Relational Algebra. CO4: Understand the Relational Databases design. CO5: Able to write SQL queries and know about transaction processing in DBMS.
Practical (Database Management Systems)	Students can Create database and write SQL queries.

IV Semester Core JAVA	CO1: Understand the introduction to Java programming language. CO2: Understand how to use Classes and objects, Inheritance, Arrays and Vectors in Java. CO3: Understand how to use Interfaces, Packages and Multithreaded Programming in Java. CO4: Understand the String handling, managing Input/output in Java. CO5: Learn how to use Applets and Graphics Programming in Java.
Practical (Core Java)	Students can perform lab programs using different concepts in Java programming language.

### V and VI Semester

Course	Outcome
V Semester(Paper I) Operating System	CO1: Understand the basics of operating system and process management. CO2: Understand about the Process synchronization and deadlocks. CO3: Understand about the memory management. CO4: Understand about the file management CO5: Understand about disk management and know about Protection and Security.
Practical (Operating System)	Students can perform lab programs using different concepts related to operating system.
V Semester(Paper II) Java Programming	CO1: Understand the introduction to Java programming language. CO2: Understand how to use Classes, Arrays, Strings and Vectors in Java. CO3: Understand how to use Interfaces, Packages and Multithreaded Programming in Java. CO4: Learn to Manage Exceptions and use Applet Programming. CO5: Learn about Graphics Programming and manage Input / Output in Java.
Practical (Java Programming)	Students can perform lab programs using different concepts in Java programming language.

<p>VI Semester(Paper I) Web Technology</p>	<p>CO1: Understand the Fundamentals of Web technology. CO2: Understand about the XHTML. CO3: Learn about basics of JavaScript. CO4: Able to write JavaScript and HTML Documents. CO5: Understand how to use Dynamic Documents with JavaScript and XML.</p>
<p>Practical (Web Technology)</p>	<p>Students can perform lab programs using different concepts in web technology.</p>
<p>VI Semester(Paper II) Database Management Systems (DBMS)</p>	<p>CO1: Understand the basics and Architecture of Database Management Systems. CO2: Learn about ER models. CO3: Learn about Relational Data Model and Relational Algebra. CO4: Learn about Functional dependencies and Normalization for Relational Databases. CO5: Understand about Relational Database Language and Transaction Processing in DBMS.</p>
<p>Practical (Database Management Systems)</p>	<p>Students can Create database and write SQL queries.</p>