



Nanded Education Society's

SCIENCE COLLEGE, NANDED.

COURSE OUTCOMES

B.Sc III- Analytical Chemistry

Course Outcome(s)

CO- I Learn basic knowledge of IR spectroscopy & operation of IR instrument

CO-II Get basic knowledge of ¹H NMR its operation and applications

CO-III Understand fundamental knowledge of Mass spectrometry and applications

CO-IV Familiar with fluorometer and its applications

B.Sc III- Chemistry

Course Outcomes

CO1 After completion of this course, student will be able to Organic reaction and mechanism pathways.

CO2 Nomenclature of various heterocycles

CO3 Recognize and comment on different synthetic drugs and dyes

CO4 Able to discuss the uses and synthesis of some vitamins and pesticides

CO5 Understand the basic principle and application of coordination complexes

CO6 Know the application of elements in Medicine

B.Sc III- Computer Science

Knowledge of RDBMS

Knowledge about the Use of SQL & PL/SQL for RDBMS

B.Sc III-Electronics

1. Understanding of communication systems.
2. Working of analogue modulation techniques.
3. Understanding of analogue pulse modulation.
4. Understanding of digital pulse modulation.

B.Sc III-Microbiology

1. Microbial Genetics course makes students to understand the evidence given to prove DNA and RNA as genetic material, properties of DNA as genetic material, and structure of prokaryotic chromosome. They also comprehend knowledge of the DNA replication process in prokaryotes, genetic recombination, and genetic material transfer among the microorganisms through transformation, conjugation and transduction.

2. Microbial Metabolism course makes students to get the knowledge of enzymes, physicochemical properties of enzymes, nomenclature and classification of enzymes, mechanism of action of enzyme and factors affecting the enzyme activity. Students become capable of differentiating the catabolic and anabolic process and also defining the role of different pathways in generating the ATP, different fermentation products such as ethanol, lactic acid etc.

3. Nitrogen Metabolism course makes students understand
- The role of nitrogen fixers in environmental Nitrogen Cycle,

- Microbiology and biochemistry of oxidation of Ammonia. Nitrite and Denitrification.
- Biosynthesis of purine, pyrimidine, and catabolism of nucleotides
- Different pathway to synthesis the amino acids

4. Molecular Biology course makes students understand

- Characteristics of genetic code, structure of RNAP and ribosome, and gene expression in term of transcription and translation process
- The concept of mutation, types of mutation and repair of DNA
- Gene regulation at transcriptional and translational level, the Lac Operon and Trp Operon of *E. coli*
- Tools and the methods for genetic engineering

5. By Industrial Microbiology course the students

- Are capable of describing a large number of substrates that are used for the industrial fermentation processes
- Have developed an understanding of different types of reactors or fermenters which are used for laboratory, pilot and industrial scale fermentations and their processes parameters.
- Has acquired a fairly good knowledge of how microbes are used in the fermentative production of organic acids, alcohols, enzymes, antibiotics and various foods in the industry
- Has acquired knowledge of various physical parameters which affect production of industrial products by the microorganisms and the safety aspects of the production and use of these products.

6. By Pharmaceutical Microbiology course the students

- Acquired detailed knowledge of antimicrobial agents, their chemical nature, and mechanism of action and basis of resistance of microbes to these antimicrobials, formulations involving different antimicrobials, stabilization of formulations
- Developed understanding of different types of disinfectants/antiseptics and their specific uses, and evaluation of their bactericidal and bacteriostatic actions, basic knowledge of cell cultures.
- Developed practical skills for testing pharmaceutical products for sterility testing and pyrogenicity testing using different methods

7. By this annual practical course, the students

- Acquired the practical skill for extraction, purification, and study of DNA Profile.
- Developed understanding and skill for studying the effect of different mutagens on growth of *E. coli*
- Acquired the practical skill for extraction and purification of RNA from *S. cerevisiae*
- Developed understanding and skill for studying genetic material transfer by conjugation and transduction
- Developed practical skills for determination of MIC and LD50 of Streptomycin

8. Specific Course Outcome:

By the end of this annual practical course, the students

- Have acquired the skill for primary screening of antibiotic producer, amylase producer and organic acid producer.
- Have acquired a detailed knowledge and skill of number of products which are produced by industrial fermentation processes, like citric acid, penicillin, wine etc.
- Have acquired the knowledge to study the enzymes, production of enzymes

9. By the end of this skill course, the students

- Have developed a particularly good understanding of sources of enzymes and their applications in various fields.
- Have developed skill for isolation, Purification, and Immobilization of enzymes.
- To understand the importance of enzymes in day today life.

10. By the end of this skill course, the students

- Have acquired good understanding of enzymes involved in genetic engineering, hybridization techniques, cloning vector, cloning methodologies.
- Have acquired the skill required for handling procedures of genetic engineering.

11. By the end of this skill course, the students

- Have acquired good understanding of bioprocesses involved in manufacture of agro based products
- Have acquired skill for production of food and dairy products.
- Have acquired good knowledge of industrial waste treatment.

12. By the end of this skill course, the students

- Have acquired good understanding of GMP and GLP.
- Have acquired practical skill to carry sterilization of Pharmaceutical Products.

B.Sc III- Statistics

B.Sc III- Zoology

B.Sc III-Fishery Science

B.Sc III-Geology

B.Sc II- Mathematics

After successful completion of the course student will be able to

1. Understanding the basic concept of sets and their properties.
2. Understanding the concept of a neighborhood of a point, interior points of a set, open set.
3. Understanding concept of limit points of a set, closed set, closure of a set, dense set.
4. Understanding the basic concept of sequences, subsequences, bounds of sequences, limit point of sequences, general principle of convergence, different types of sequences.

5. Understanding the concept of infinite series, different types of series, the general principle of convergence
6. Use the results to solve some problems.
7. Understanding the difference

After successful completion of the course student will be able to

1. Understand the concepts on an equivalence relation.
2. Find the examples of equivalence relation.
3. Check whether the given set, is a group for the given operation or not.
4. Understand the general properties of groups.
5. Solve problems on groups.
6. Understand the concepts of the cyclic group.
7. Use Lagrange's theorem to solve the problems in number theory.
8. Form a quotient group.
9. Find the kernel of a group homomorphism.

After successful completion of the course student will be able to

1. Understanding concept of solution of differential equations, order and degree.
2. Transform the equations into variable separable form.
3. Transform first-order non-homogeneous equation in x and y to homogeneous equation in x and y and solve it.
4. Find the equations that can be resolved into components equation and solve it.
5. Solve Clairaut's equation.
6. Find the solutions when the auxiliary equations are equal, different, repeated, and imaginary roots.
7. Find the solution of the exact differential equation, rules of finding the integrating factor.
8. Transform non-linear equation to linear equation and solve it.
9. Find integral corresponding to a term of the form e^{ax} ; x^m ; $\sin ax$ or $\cos ax$, $e^{ax}V$; x^mV ; x^2V in the second member.
10. Find the solution of linear equation with variable coefficients.
11. Transform the equations to the homogeneous linear form.
12. Transform the homogeneous linear equation with constant coefficient by changing the independent variable x to z by putting $x = ez$ or $Z = \log x$

After successful completion of the course student will be able to

1. Understand the meaning of interval, subinterval, partitions, and their refinement.
2. Understanding the basic concept of upper integral and lower integral and Riemann integral.
3. Understanding difference between upper sum, lower sum and Riemann sum
4. Acquire the idea about Riemann Integrability and Riemann Integration
5. Understand various theorems associated with Riemann Integration
6. Develop a knowledge about Riemann Integration and applies to problems
7. Understand the meaning of improper integral.
8. Determine convergence of improper integrals with discontinuities in their domain or infinite limits of integration.

9. Develop skill in checking the convergence of improper integral using various tests of convergence
10. Understanding distinguishes between convergence and absolute convergence of improper integral.
11. Use comparison test with a corresponding improper integral with other improper integral to decide whether improper integral converge or diverge
12. Use the results to solve some problems.

After successful completion of the course student will be able to

1. Understand given algebraic structure is a Ring or not.
2. Construct the examples of ring with known examples of ring.
3. Differentiate between zero-divisors and non-zero-divisors in a given ring.
4. Check whether given two rings are isomorphic or not.
5. Check whether the given ideal of a ring is a principal ideal or not.
6. Understand the concepts on principal ideal ring
7. Understand concepts on Euclidean rings.

After successful completion of the course student will be able to

1. Classification of PDE.
2. Solve linear as well as non-linear PDE of first and second order.
3. Apply PDE techniques to predict the behavior of certain phenomena.
4. Solve real problems by identifying them approximately from the perspective of PDE.
5. Mathematical formation of real problem precisely.
6. Solve problem using boundary conditions.

B.Sc III- Mathematics

After successful completion of the course student will be able to

1. Demonstrate an understanding of metric spaces and subspaces by proving unseen results.
2. Produce examples and counterexamples illustrating the mathematical concepts.
3. Understand the concepts of open and closed sets.
4. Understand the concepts and develop skill to check the positions of a point in the space.
5. Understand the concepts of convergences and completeness.
6. Understand the concepts of fixed point and Banach principle.
7. Understand the concepts of continuity and uniform continuity.
8. Understand the concepts of compact and non-compact sets with various properties.
9. Understand the concepts of Lebesgue Number for Covers and connectedness of sets.
10. After completion of this course student can aware with basic concepts of functional analysis.

After successful completion of the course student will be able to

1. Understand and prove algebraic statements about vector spaces, subspaces, basis,

Inner product spaces.

2. Determine a basis and the dimension of finite dimensional space.
3. Understand and prove statements about linear transformations.
4. Find the kernel, range, rank and nullity of linear transformation.
5. Determine eigen values and eigen vectors.
6. Interpret a matrix as a representation of linear transformation.

After successful completion of the course student will be able to

1. Formulate a given simplified description of a suitable real-world problem as a linear programming.
2. Sketch a graphical representation of a two-dimensional linear programming problem.
3. Solve a two-dimensional linear programming problem graphically
4. Use the simplex method to solve simple linear programming models by hand.
5. Understanding transportation problem and solve simple assignment problems.

After successful completion of the course student will be able to

1. Understand concepts of motion, force and its importance in Physical Sciences.
2. After learned this course , Student will be interested in Applied Mathematics.
3. Develop research oriented skills in Applied Mathematics
4. Know the principles of equilibrium of two forces.
5. To realize the forces acting on a particle , forces acting on a rigid body and its derivations.
6. Analyze the equilibrium state of a particle and rigid body.
7. Obtain the equivalent force - couple system of a given system.

After successful completion of the course student will be able to

1. Estimate the value of a function under certain assumptions.
2. Find the missing terms in the given data using numerical techniques.
3. Apply numerical derivation and numerical integration methods.
4. Investigate numerical solutions of differential equations.
5. Find the integration of a functions using numerical methods.
6. Find the solutions of ordinary differential equations.

After successful completion of the course student will be able to

1. Operate basic mathematical operations with complex numbers in Cartesian and polar forms.
2. Demonstrate the ability of limit, continuity, analyticity of a function.
3. Find the derivative and integral of a complex variable function.
4. Work with exponential and logarithmic functions.
5. Use Cauchy integral theorem and Liouville's theorem.
6. Use Taylor and Laurent's series.

After successful completion of the course student will be able to

1. Understand the concept of Integral Transforms
2. Identify integral transforms by their integration limits and kernels
3. Obtain integral transforms of functions
4. Know the formulae for integral transforms of standard functions
5. Understand various properties of integral transforms
6. Apply the integral transforms for evaluating integrals
7. Apply the integral transforms along with their inversion formulae for solving differential equations with initial conditions
8. Apply the integral transforms along with their inversion formulae for solving systems of simultaneous differential equations with initial conditions

After successful completion of the course student will be able to

1. Understand Concept of Topological spaces.
2. Understand Topological Properties of Sets.
3. Understand the concept of order Topology and product topology.
4. Understand concept of Subspace topology.
5. Understand Concept of Closed and Open sets, limit points.
6. Understand of continuity, Concept of Homeomorphisms, Imbedding's.
7. Understand the separation properties like Hausdorff Spaces and T1 Axioms.
8. Understand basic Concept of Connected Spaces and compact Spaces.
9. Understand Utility of Connected and compactness.

After successful completion of the course student will be able to

1. Understand Newton's Laws of Motion and its importance in Physical Sciences.
2. Develop research oriented skills in Applied Mathematics.
3. Understand the expressions for Velocity and Acceleration, Components of Velocity and Acceleration and principles of equilibrium of two forces.
4. To realize the forces acting on a particle, forces acting on a rigid body and its derivations.
5. Analyze the Impulsive Force and its Impulse, Conservation of Linear Momentum and, Impact of two bodies.
6. Find the Motion of Projectile and Derivation of Equation of its trajectory, Cartesian Equation of the path of Projectile, equivalent force - couple system of a given system.

After successful completion of the course student will be able to

1. Apply different methods of proofs including induction, contradiction, counter examples to verify mathematical assertions.
2. Explain basic concepts like divisibility, greatest common divisor, congruences, linear congruences.
3. Solve systems of Diophantine equations using the Euclidean algorithm and Chinese remainder theorem
4. Demonstrate knowledge and understanding of prime numbers.

5. Use Fermat's theorem and Wilson's theorem.

B.Sc.II- Analytical Chemistry

CO-I

Understand the concepts of Qualitative inorganic analysis & spot test procedures.

CO-II

Aware the knowledge of Semi-micro Determination of Elements in the Organic Compounds and functional determination.

CO-III

Illustrate the main constituents in ores by Metallurgical Analysis.

CO-IV

Aware the composition of metals and alloys

CO-I Understand basic fundamentals of Spectroscopic techniques.

CO-II Learn the Photometric titrations and Atomic Spectroscopy.

CO-III Understand the Microscopic techniques used for scanning.

CO-IV Aware the knowledge of Atomic Force Microscope.

CO-I Understand Radiochemical Methods of Analysis.

CO-II Learn the Thermal methods and Its Correlation with extensive and Intensive property of substance

CO-III Know the Optical methods used to check purity of optically active compounds

CO-IV Aware the modern methods of separation Techniques and its application for Quantification of analyte in different samples.

CO-I Students become aware of preparation of sample, Standardization of solution, determination / estimation of analyte in consumable and non-consumable materials

CO-I Students become aware of Standard Operating Procedure of Instruments and its application in quantification of analyte in consumable and non-consumable materials

1. Able to handle hazardous chemicals with safety.
2. Able to perform tests to know the quality of drinking water and soil in surrounding areas.

1. Understand the SI units, units of concentration and standards / components of foods, adulterations in food.

B.Sc III- Botany

1. Students will gain the knowledge of water and nutrient uptake, movement in plants, role of mineral elements, translocation of sugars, Role of various plant growth regulators, phytochrome in plants.

2. Students shall learn different types of biomolecules and secondary metabolites
3. Students will learn the flowering physiology, vernalization and seed dormancy in plants.

1. This course will be able to demonstrate foundational knowledge in embryology of plants.
2. Students will be able to understand the development of pollen, Ovule, and fertilization and palynological information.

1. Students will be able to understand the various metabolic processes such as photosynthesis, respiration, Nitrogen metabolism etc. which are important for life.
2. Students shall be become familiar with the gene cloning and its transfer in plants
3. Students shall learn different databases and their applications

B.Sc II-Chemistry

- Learn the mechanism of name reactions
- Know the Synthesis, and Reactions of Aromatic Carboxylic and Sulphonic acids
- Know the Synthesis, and Reactions of Organometallic compounds
- Learn the synthesis, mechanism, applications of active methylene compounds
- Gathering basic knowledge of Oils, Fats, Soaps and Detergents
- Understand the basic principle and application of Qualitative Analysis
- Know the Classification, Properties of Non- aqueous solvents

After completion of these courses students should be able to,

- Write an expression of Davisson-Germer experiment.
- Derive Schrodinger wave equation.
- Understand De-Broglie's hypothesis and uncertainty principle.
- Solve the numerical problems based on De-Broglie.
- Understand concept of entropy.
- Understand statements of first, second and third law of thermodynamics.
- Know the meaning of phase, component and degree of freedom.
- Know the nuclear structure & different energy of nuclear.
- Understand the different steps & procedure in the gravimetric separation method.

- Learn basics of thin layer chromatography and distillation.
- Learn fundamentals of organic qualitative analysis.
- Learn about organic estimations.
- Basics of volumetric analysis.
- Learn the stereoisomerism of Chiral compounds.
- Know the Classification, and Reactions of carbohydrates.
- Know the Synthesis, and Reactions of Nitrogen Compounds.
- Gathering applications of Reagents in Organic Synthesis.
- Understand the Characteristics of d-Block Elements.
- Know the Characteristics of d-Block Elements.

After completion of these courses students should be able to,

- Know the rate constant and factors affecting rate of reactions.
- Write an expression for rate constant (K) for first order, second order reaction.
- Know the terms cell constant, specific conductivity, equivalent conductivity and molar conductivity.
- Know the applications of Kohlrausch's law.
- Compare between thermal and photochemical reactions.
- Discuss different types of photochemical process.
- Know the preparation, properties, structure & application of different compounds.
- Discuss different inter halogen compounds by preparation, properties, structure and uses.

After completion of this course students should be able to,

- Calculate normality and strength of the solution using potentiometer and conductivity meter.
- Find pka value on pH meter.
- Verify Lamberts-Beer's law colorimetrically and determine unknown concentration of the solution.
- Determine energy of activation.
- Determine heat of solution.
- Study the effect of solute on CST of phenol-water system.
- Determine the enthalpy of ionization of weak acid / weak base.
- Determine partition coefficient.
- Separations of elements from each other & analysis by volumetric method.

B.Sc II- Computer Science

1. Students will be able to the basic components of a computer Operating System.
2. Upon compilation of this course, students will able to do programming independently and will also be able to built small applications.

3. Students will be able to understand the main features of the SCILAB program development environment, to implement simple mathematical functions/equations in numerical computing environment such as SCILAB.
4. Students would have knowledge of computer hardware and peripherals , their installation, PC assembly, trouble shooting.
5. Students would be able to chose, escalate and establish a computer network
6. On completion of the course the student would be able to use Java integrated development environment to write, compile, run, and test simple object-oriented Java programs. Further, they would be able to make elementary modifications to Java programs that solve real-world problems.
7. Knowledge of website development and design specialization
8. Student will be able to use essential skills for digital media
9. Student will be able to understand the basic components of a Linux operating system, and the interactions among the various components. Further, they will be able to independently program in C++ .
10. Students will gain expertise in some specific areas of networking such as the design and maintenance of individual networks. On completion of the course the student would be able to, use an integrated development environment to write, compile, run, and test simple object oriented Java programs.

B.Sc II-Electronics

1. Knowledge of transistor biasing.
 2. Analysis of small signal amplifier using h-parameters and designing of CE amplifier.
 3. Concept of an ideal amplifier, knowledge of IC 741 and its applications.
-
1. Knowledge of microprocessor based systems.
 2. Knowledge of Instruction set of 8085 and ALP skills.
 3. Working and applications of ICs 74LS373 and Intel 8255.
-
1. Understanding of positive and negative feedback.
 2. Knowledge of working of an oscillator.
 3. Working principle of multivibrators and applications of IC 555
 4. Knowledge of various time base circuits.
-
1. Knowledge of internal architecture of 8051 and function of each block.
 2. Instruction set of 8051 and ALP skills.
 3. Knowledge of SFRs, Timers and Interrupts of 8051.

B.Sc II-Fishery Science

B.Sc II-Geology

1. Minerals are fundamental units of earth crust and rocks are aggregate of minerals, understanding of minerals help to explore the chemistry of the Earth.
2. The surface features of the earth depend on internal activities and behavior of magma.
3. The knowledge of dynamic processes and igneous rocks help in understanding the crystal dynamics of the earth.
4. The study of structures helps in understanding the process of deformation of rocks and dynamic history of the region.
5. The study of sedimentary and metamorphic rocks helps in understanding the earth material in relation to the environmental condition during process of formation.

B.Sc III-Physics

B.Sc II-Physics

B.Sc I-Analytical Chemistry

CO 1

Understand the scope and importance of analytical chemistry

CO2 Learn about the preliminary operation carried out in quantitative analysis.

CO3 Learn about mole concept and concentration unit.

CO4 Learn about the aspect and uses of coordination compound in chemical analysis

CO1 Learn basic concept about measurement of mass and their instruments.

CO2 Learn about the measurement of volume.

CO3 Get the knowledge about the principles of volumetric analysis.

CO4 Learn about the different types of titrations.

CO1 Understand about the errors in chemical analysis.

CO2 Learn about the statistical treatment of analytical data.

CO3 Get the basic knowledge about chromatography techniques.

CO4 Learn about the purification methods like distillation and crystallization.

Learn basic concept about methods of gravimetric analysis and precipitation process.

CO2 Familiar and learn the different types of precipitation process.

CO3 Get the knowledge about the precipitants and their application in chemical analysis.

CO4 Learn about the different types of solvent and reagent used in gravimetric analysis.

Learn basic ideas about the calibration of glassware and handling of glassware and laboratory instruments. Students are get trend in carry out different titration and estimations.

B.Sc I-Botany

1. Understand the morphology, structure and importance of the various organisms
2. Differentiate between various groups of Algae, Fungi, Bacteria, Viruses, and Lichens & Mycorrhiza
3. Learn the life cycles of individuals belonging to Algae, Fungi, Bacteria, Viruses, Lichens & Mycorrhiza

1. Able to understand the ecological principles , interactions taking place in the Ecosystems and the flow of energy
2. Learn about the concept of phytogeography and its relations with other disciplines

1. Learn the life cycles of individuals belonging to Bryophytes, Pteridophytes and Gymnosperms
2. Learn about process of fossil formation and fossils plants

1. Proficiency with the basic terminology of plant morphology
2. Able to identify the major families of plants and their economic importance
3. Understand the methods of collecting and preserving plants

B.Sc I-Chemistry

After completion of syllabus students will be able to understand following outcomes.

1. Student should learn basic concept of organic chemistry, Nomenclature.
2. Student get well acquainted with functional group in organic chemistry.
3. To understand the basic concepts and differences aliphatic hydrocarbons.
4. To know about term cycloalkane , cycloalkene and diene.
5. Learn and practice about organic compounds with their names.
6. Students learn some exceptional electronic configuration, trends and Periodicity in the following properties like atomic size, ionization energy, electron affinity & electronegativity.
7. To understand the inert gases forms compounds, different fluoride compounds of xenon.

After completion of syllabus students will be able to understand following outcomes.

1. Learning and understanding rules of logarithm, Rules of drawing graph, Derivatives, Integration , different mathematical concept and SI units, and their use in solving numerical.
2. Learning surface phenomena at heterogeneous surfaces.
3. Student will learn the basic knowledge of gas phase, Kinetic molecular theory, critical phenomenon , liquefaction and molecular velocities.
4. To impart knowledge about solid phase, crystallography and some crystal structure.
5. General characteristics of s-block elements, oxides, hydroxide, carbonate & its complexes
6. Study the oxidation and reduction by different methods.

After completion of syllabus students will be able to understand following outcomes.

1. Student should learn the concept of aromatic hydrocarbons, Aromaticity and antiaromaticity.
2. Student should understand the phenols and synthesis of phenols
3. Student knows about the haloalkene and haloarenes compounds.
4. To know the concepts of carboxylic acids and their derivatives.
5. To know about the types of alcohols and reaction of epoxide.
6. To study the different properties of P- block elements.
7. To know the acids & Bases by different concepts.

After completion of syllabus students will be able to understand following outcomes.

1. To impart knowledge of atomic structure, different theories of atomic structure, rules of electronic configuration and quantum numbers.
2. Learning of properties of liquid phase as surface tension, Viscosity and parachor.
3. Student will learn the basic knowledge of colloidal state, types, preparation, properties and applications of colloidal state.
4. Learning and understanding of catalysis, types of catalysis and characteristics of catalyzed reactions.
5. To understanding the chemical bond and its different types of bonds.
6. Learning the Concept of hybridization and study of VSEPR & Molecular Orbital theory.

B.Sc I- Computer Science

1. Student will be able to design algorithms to solve different problems
2. Student will understand how to solve problems using computers

1. Be able to *use* the HTML programming language
2. Understand the principles of creating an effective web page.

1. To develop application using data structures.
2. Students develop knowledge of applications of data structures including the ability to implement algorithms for the creation, insertion, deletion, searching etc.

1. Course is designed to provide complete knowledge of C language to develop logics which will help them to create programs, applications in C.
2. Introduces the more advanced features of the C language.

1. Practical approach to understand the principles of creating an effective web page.
2. The course is designed to provide complete knowledge of C language to develop logics which will help them to create programs,

B.Sc I- Electronics

1. able to identify variety of electronic components viz. resistors, inductors capacitors and their types & uses.
2. able to understand I-V characteristics of basic electronic components.
3. able to apply network theorems to simplify given network.
4. able to distinguish between DC/AC sources, relate various characteristics of sinusoidal voltage and understand use of resonant circuits.

1. able to distinguish between analogue & digital signal/data.
2. able to draw logic circuit for a given Boolean expression.
3. able to analyse, transform, minimize Boolean expression & implement it.

1. able to understand I-V characteristics of various semiconductor diodes.
2. able to understand input/output characteristics of transistor.
3. able to distinguish between unregulated & regulated power supply and its significance.
4. able to demonstrate the use of multi-meter & CRO.

1. able to distinguish between JK Flipflop & JKMS Flipflop; between T Flipflop & D Flipflop.
2. acquire the skill of using FFs for given application such as register, counter etc.
3. able to present the use of MUX, DMUX.
4. able to understand the uses of ADC & DAC.

B.Sc I-Fishery Science

B.Sc I-Geology

B.Sc I- Mathematics

Paper I: Calculus-I (Deferential Calculus)

1. Understanding concept of Limit, Continuity of Single and two variable Functions.
2. Find the Higher order derivatives of Product of Functions

3. Expand functions in terms of innate series.
4. Find Equation of Tangent, Normal and Length of Tangent, Normal, Sub-tangent, Sub-normal.
5. Understanding of Mean Value Theorem concepts.
6. Understand the concept of Partial differentiation.
7. Use the results to solve problems.
8. Differentiate deference between derivative of single variable and two variables.

Paper II: Algebra and Trigonometry

1. Add, Subtract and Multiply two Matrices.
2. Recognize the deferent types of Matrices.
3. Find the Inverse of invertible Matrices.
4. Determine the Rank of a Matrix.
5. Transform matrix to Row Echelon form
6. Solve the System of Linear Equations.
7. Find the Characteristic Roots and Characteristic Vectors of a Square Matrix.
8. Check that every square matrix satisfies its own Characteristic Polynomial.

Paper III: Calculus-II (Integral Calculus)

1. Apply method of integration to and the integral of function.
2. Solve examples of definite integrals using Properties definite integrals.
3. Find the area and volume of given shape.
4. Understanding concept of Gamma and Beta Functions.
5. Solve problems on Multiple Integrals.

Paper IV: (Geometry)

1. Understanding concepts on Three Dimensional Geometry.
2. Find equations of Right lines, Planes, Spheres, Cones and Cylinders.
3. Find the Direction cosines of any line under the deferent given conditions.
4. Understand the intersection of any two or three, three dimensional geometrical configures.
5. Transform the equation of a plane to the normal form.
6. Transform equation of line from the unsymmetrical to the symmetrical form.
7. Find the length of perpendicular from a point to a plane.
8. Find the angle of intersection of two spheres.
9. Understanding concepts of plane of contact.

Paper V: (PRACTICAL PAPER)

1. Verify associativity of matrix addition, left distributive law and right distributive law of matrices.
2. Find determinant, eigen values, eigen vectors, inverse, powers and characteristics polynomial of a square matrix.
3. To draw the graph of di_ erent functions with the help of MATLAB software and related Freeware.

B.Sc. I Year Microbiology

B.Sc. I Year Physics

CCP I - (Section A) P-I Core Course: *Mechanics and Properties of Matter*
Credits: 02 Periods: 45 Total Marks: 50 (CA=10, ESE=40)

Learning objectives: *The objective of this course is to introduce the students to the world of mechanics and properties of the matter that exists in different phases i.e., solid, liquid and gas. Laws of motion and its applications to various systems studied in this paper is of fundamental nature and enable the students to handle different types of problems and is the pre-requisite for several other advanced courses in physics and chemistry. The pre-requisite for this course is knowledge of calculus, wave theory and modern physics. This course is the core course and every student pursuing B Sc with physics as one of the optional is required to study this course.*

CCP I - (Section B) P-II Core Course: *Mathematical Methods in Physics*

Learning objectives: *The objective of this course is to introduce the students to the world of mechanics and properties of the matter that exists in different phases i.e., solid, liquid and gas. Laws of motion and its applications to various systems studied in this paper is of fundamental nature and enable the students to handle different types of problems and is the pre-requisite for several other advanced courses in physics and chemistry. The pre-requisite for this course is knowledge of calculus, wave theory and modern physics. This course is the core course and every student pursuing B Sc with physics as one of the optional is required to study this course.*

CCP I - (Section B) P-II Core Course: *Mathematical Methods in Physics*

Learning objectives: *This course is also aimed to develop knowledge in mathematical physics and its applications, to develop expertise in mathematical methods required in the study of Physics, to develop critical thinking and problem solving skill. After completion of this course students will be able to apply the concept of vectors and complex variables to various physical quantities. This course will also enable the students to solve the problems related to partial differentiation. Fourier Analysis unit will enable the students to analyze the periodic functions.*

CCP II - (Section A) P-III Core Course: *Heat and Thermodynamics*

Learning objectives: *This course will introduce the students to the world of heat and thermodynamics and the behaviour of the physical systems at different thermodynamical conditions. After completing this course students will understand the difference in the behaviour of the ideal and real gases, transport phenomenon in gases. Students will also understand the working of various heat engines and the ways to increase their working efficiency.*

CCP II - (Section B) P-IV Core Course: *Electricity and Magnetism*

Learning objectives: *The objective of this course is to introduce the students to the concepts of static and dynamical electrical magnetic fields, the sources for generating such fields, polarization and induction effects, understand the basic difference between the DC and AC circuits and their functioning. This course is of most applied nature and will enable the students*

to understand the role of electricity in everyday life, relate electrical conduction, relate using Ohm's law and will also enable the students to understand the working principles of various electrical components and gadgets.

CCPP I (Section A & B) : Laboratory Course (P-V) : Physics Practical Paper

Learning Objectives: *Objective of this Laboratory course is to introduce the students to the practical applications of the four core courses in Physics that the students have studied in Semester I and II. The Laboratory course also includes experiments based on the computational methods applicable for solving problems in physical situations. The course will consist of lectures (both theory and practical) in the Computer Lab. Evaluation of the computational method does not include the programming skill of the students but will only analyze the basis of formulating the problem. Each student appearing for examination must produce a journal showing that he has completed not less than 12 experiments during the year; out of which at least two should be based on the computational methods.*

B.Sc. I Year Statistics

Title of Paper: Paper-I : Biodiversity of Invertebrates

Outcome of the Course:

1. The student will be able to identify a given invertebrate upto class level.
2. Ability to understand the contribution of Invertebrates in the biodiversity index of any given habitat.
3. Ability to understand and appreciate the ecological and economic importance of invertebrates and vertebrates.
4. Ability to identify and describe external morphology and internal anatomical features of representative invertebrate species.

Title of Paper: Paper-II : Biodiversity of Chordates

Outcome of the Course:

1. The student will be able to identify and understand the Biodiversity of Chordates.
2. Ability to understand anatomical relation between different vertebrate classes.
3. The learner will be able to understand the economic importance of Chordates.

Title of Paper: Paper-III: Comparative Anatomy of Vertebrates

Outcome of the Course:

1. The student will be able to identify and understand comparative anatomical structure of vertebrate organ systems.
2. The learner will be able to understand the evolution of various organs and systems in the vertebrate body according to its environment.
3. Understand the plasticity of organ systems to adapt to the environment and acquire different novel forms.

Title of Paper: Paper-IV :Developmental Biology of Vertebrates

Outcome of the Course:

1. The student will be able to explain the basics processes of vertebrate embryonic development.
2. Ability to describe the various steps in vertebrate development.
3. Identify and explain about the different embryonic structures.
4. Describe the functions of different extra-embryonic structures.
5. Understanding of the Assisted Reproductive Technologies.

Title of Paper: Practical Paper V:Biodiversity of Invertebrates and Chordates & Comparative Anatomy and Developmental Biology of Vertebrates(Based on P-I,II,III&IV)

Outcomes:

1. Ability to understand the anatomical organization of organs and systems in representative species.
2. Ability to identify and describe structure and functions of different body parts of invertebrates and vertebrates.
3. Students would be able to prepare temporary and permanent mountings of biological material.
4. Students would be able to relate different bones and be able to articulate them to form an skeleton.
5. Students would make observations of organisms in their natural environment and document them.

B.Sc. II Year Microbiology

Paper Name: Applied Microbiology (P-VI) CCMB III (Section A)

Specific Course Outcome:

Applied microbiology trains students for gaining expertise in the microbial world and the way it interacts with humans. It looks at how we can harness and utilize the powers of the microbes in areas ranging from air, water and sewage microbiology to Milk Microbiology and extends to industrial applications. A wide range of microbial by-product production, quality assessment and health hazard monitoring is possible by students who get well versed in this course.

Paper Name: Immunology (P-VII) CCMB III (Section B)

Specific Course Outcome:

Understand the basic components of the immune system and how this system serves to protect the host against disease-causing microbes. Understand Concept related to cells and organs related to immune system, Immunity, Immune response and immune mechanism of both Immunity & Hypersensitivity.

Paper Name: Food, Soil Microbiology and Microbial Ecology (P-VIII) CCMB IV

Specific Course Outcome:

To apply the knowledge of microorganisms causing food spoilage, pathogens that may cause disease post cooked or storage, those used to produce fermented foods such as cheese, yogurt, bread, beer, and wine, meat and meat products, fruits vegetables and those with other useful roles such as producing probiotics. Understand of principles of soil science, microbiology, and the chemistry and physics of natural elemental cycles, which maintain the balance of our ecosystem. Describe significance of soil fertility, appreciate role of soil microorganisms which play essential roles in the nutrient cycles that are fundamental to life on the planet. Illustrate and explain how

microbes are responsible for cycling nutrients through the environment, creating important symbiotic relationships, providing energy in the absence of sunlight, and digesting the food we eat.

Paper Name: Medical microbiology (PIX) CCMB IV (Section B)

Specific Course Outcome:

Impart Knowledge of the diverse places where microbiology is involved. Understanding of diverse Microbiological processes. Basic skills such as culturing microbes, maintaining microbes, safety issues related to handling of microbes, Good Microbiological practices etc. Moderately advanced skills in working with microbes such as Pathogens.

Paper Name: Annual Practical's based CCMBP II [CCMB III & IV (Section A)]

Paper Number: Practical's based on P-VI & P-VIII (P-X)

Specific Course Outcome:

Acquire skills of handling microorganisms in the laboratory and study their characteristics. Has developed laboratory skills in isolating and detecting microbes from soil and water. Laboratory skills of testing microbial load in Food and milk. Has developed skills for growing microorganisms in the laboratory to produce different enzymes.

Paper Name: Annual Practical's based CCMBP III [CCMB III & IV (Section B)]

Paper Number: Practical's based on P-VII & P-IX (P-XI)

Specific Course Outcome:

Acquire skills of handling microorganisms in the laboratory and study their characteristics. Has developed laboratory skills in detecting enzymes antigen and antibodies using diagnostic kits Laboratory skills of staining blood and enumerate RBCs and WBCs in whole blood. Has developed skills for growing Pathogenic microorganisms in the laboratory and identifying them on basis of various biochemical tests and perform antibiotic sensitivity tests.

Paper Name: Public Health Microbiology SECMB - I (Section A)

Specific Course Outcome:

Have developed a very good understanding of practical aspects diagnosis of common human waterborne infections, preventive measures for human waterborne infections by the use of antibiotics and vaccines, Gain skills food and milk quality testing.

Paper Name: Microbial Biofertilizers SECMB - I (Section B)

Specific Course Outcome:

Have developed a very good understanding of practical aspects production of biofertilizers.

Paper Name: Diagnostic Microbiology SECMB - II (Section A)

Specific Course Outcome:

Have developed a very good understanding of practical aspects of collection of different clinical samples, their transport, culture and examination by staining, and molecular and immunological diagnostic methods for diagnosis of microbial diseases.

Paper Name: Medical Laboratory Techniques SECMB - II (Section B)

Specific Course Outcome:

Have developed a very good understanding of practical aspects of collection of different clinical samples, their transport, culture and examination by staining, and molecular and immunological diagnostic methods for diagnosis of microbial diseases.

B.Sc. II Year Statistics

CCS III Applied Statistics P-IV

Learning objectives: To learn this paper is to develop scientific view towards variation of the data about specific perspective. To learn this paper is to develop statistical skills for data analysis.

Continuous Probability Distributions (P-VII)

Learning objectives: To learn this paper is to develop scientific view to understand the nature of the data about specific perspective.

Statistical Inference & Computing Using -R (P-VIII)

Learning objectives: To learn this paper is to develop scientific view to understand theoretical foundation and analyzing data through R software about specific perspective. To learn this paper is to develop computing statistical skills for data analysis.

Exact Sampling Distributions (P-IX)

Learning objectives: To learn this paper is to develop theoretical foundations of exact distributions.

B.Sc. III Year Botany

DSCB-I: CELL AND MOLECULAR BIOLOGY

Learning Outcomes:

1. The students will be able to understand ultra structure of a cell, cell wall, cell membrane, cell organells and chromosomes, cell cycle and cell division.
2. The students will be able to understand in detail the structure of DNA and RNA, protein synthesis, gene structure, gene mutation and related diseases.

3. Students will acquire knowledge of cell and molecular biology

DECB-I: PLANT PATHOLOGY-I

Learning Outcomes:

1. The students will be able to understand fundamentals of plant pathology.
2. The students will be able to understand in detail the process of plant disease development.
3. Students will acquire knowledge of different plant diseases in different plants.

DECB-I: SYSTEMATIC BOTANY-I

Learning Outcomes:

1. The students will be able to understand fundamentals of classification of angiosperms.
2. The students will be able to understand in detail the principles of plant taxonomy.
3. Students will acquire knowledge of different families of polypetalae, gamopetalae and apetalae.

DECB-I: HERBAL TECHNOLOGY-I

Learning Outcomes:

1. The students will be able to understand fundamentals of medicinal and aromatic plants.
2. The students will be able to understand in detail the crude plant drugs and pharmacognocny.
3. Students will acquire knowledge of standardization of drugs.

DSCB-I: GENETICS AND PLANT BREEDING

Learning Outcomes:

1. Understand Mendelian genetics, gene interaction.
2. Learn the sex determination, linkage, sex linked inheritance and genetic variations.
3. Understand various crop improvement methods in plant breeding.

DECB-I: PLANT PATHOLOGY-II

Learning Outcomes:

1. The students will be able to understand fundamentals of aerobiology and seed pathology.
2. The students will be able to understand in detail the process of plant Defence mechanism and management.
3. Students will acquire knowledge of different plant diseases in different plants.

DECB-I: SYSTEMATIC BOTANY-II

Learning Outcomes:

1. Students will acquire knowledge of different families of monocotyledons
2. The students will be able to understand principles of taxonomy
3. The students will be able to understand in detail the origin of angiosperms.

DECB-I: HERBAL TECHNOLOGY-II

Learning Outcomes:

1. The students will be able to understand fundamentals of herbal formulation, drug constituent and biosynthetic pathway.
2. The students will be able to understand in detail about the analytical and chromatographic techniques.

3. Learner will get information about drug constituents and biosynthetic pathways.

Practical paper-XVI: Practicals based on theory paper-XII&XIV

(Cell and molecular biology & Genetics and plant breeding)

1. Understand Cell biology
2. Learn the molecular biology
3. Understand genetics and plant breeding

Practical paper-XVII: Practicals based on theory paper-XIII&XV

(Plant Pathology-I&II)

Learning Outcomes:

1. The students will be able to understand working operating of laboratory equipments.
2. The students will be able to understand in detail the pathogenicity, symptoms and causal organisms of plant diseases, effect of temperature and pH on plant pathogens.
3. Students will acquire knowledge of different culture media, isolation and identification of pathogens from diseased plant parts and from air.

Practical paper-XVII: Practicals based on theory paper-XIII&XV

(Systematic Botany-I&II)

Learning Outcomes:

1. The students will be able to describe a flowering plant for its taxonomic details
2. The students will be able to understand in detail the floras, and able to prepare plant identification for the identification of locally available plants.
3. Students will acquire knowledge of pollen grains of different plants.

Practical paper-XVII: Practicals based on theory paper-XIII&XV

(Herbal Technology-I&II)

Learning Outcomes:

1. The students will be able to know about Ayurvedic medicines, medicinal plants
2. The students will be able to understand in detail the different drugs
3. Students will acquire knowledge of preparation of herbal formulations

B.Sc. II Year Zoology

Title of Paper: Paper- VI: Physiology

Outcome of the Course:

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

1. Monitor their blood pressure and identify blood groups.
2. Understand function and types of heart & circulatory system.
3. Appreciate the basic function of kidney, main function of nerves.
4. Acquire knowledge on the nature and functions of hormones and learn the mechanism of hormone action.
5. Learn the structure and functions of Endocrine glands.
6. Understand the structure, development and function of reproductive organs in human.

Title of Paper: Paper- VII : Biochemistry

Outcome of the Course:

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

1. Understand the chemical structure and functions of various biomolecules
2. Learn the signaling of biomolecules in cell membrane.
3. Understand the correlation between metabolism of different types of biomolecules.

Title of Paper: Practical Paper X: Physiology and Biochemistry (Practical based on P-VI & VII)

Outcomes:

1. Students able to improve the skills in microscopy, slide preparation, observations, drawings and laboratory techniques.
2. To acquaint the students with operations of the different laboratory equipment.
3. Ability to understand the detection of blood groups of humans.
4. Ability to Understand the estimation of blood cell counts, Haemoglobin content in humans.
5. To acquaint the students with operation of clinical procedures for blood & urine analysis.

Title of Paper: Paper- VIII: Cell Biology and Genetics

Outcome of the Course:

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

1. Understand the structure and function of the cell as the fundamentals for understanding the functioning of all living organisms.
2. Understand structures and various cellular functions associated with the macromolecules found in cells.
3. Acquire knowledge of Mendelian Genetics and its Extension.
4. Graduates will be able to explain and interpret various processes, phenomena, states and evolutionary tendencies at a biological system level.

Title of Paper: Paper- IX: Evolutionary Biology and Genetic Engineering

Outcome of the Course:

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

1. Understand the theories and concepts of evolution.
2. Learn the process of evolution in animals.
3. Understand the patterns of evolutionary changes in animals.
4. Understand the organization and functions of genetic material in the living world.
5. Understand the Recombinant DNA Technology.

Title of Paper: Practical Paper XI: Cell Biology, Genetics, Evolutionary Biology and Genetic Engineering (Practical based on P-VIII & IX)

Outcomes:

1. Students would be able to prepare temporary squash preparations of onion root tips for mitosis.
2. Demonstrate the genetic traits in Man.
3. Ability to culture Drosophila flies in the laboratory.

4. Ability for mounting of salivary glands of *Drosophila* larvae.
5. Students are able to understand the outline of Genetic Engineering.
6. Ability to Learn the role of Genetic Engineering in biology.

Skill Enhancement Course (SEC)

SECZ –I (A): HAEMATOLOGY

Outcomes

1. Ability to explain composition and functions of blood.
2. Knowledge about compounds used in processing and storage of blood.
3. Skill to be able to use different techniques used in study of blood cells.
4. Ability to collect, preserve and analyze blood samples.
5. Knowledge of changes in blood composition in disease.

Skill Enhancement Course (SEC)

SECZ –I (B): URINOLOGY

Outcomes

1. Ability to describe function of human urinary system.
2. Skill to collect, preserve, process and store urine samples.
3. Skill to perform physical, chemical and microscopic examination of urine samples.
4. Ability to document findings of urine examination/analysis.

Skill Enhancement Course (SEC)

SECZ –II (C): HISTO-TECHNOLOGY

Outcomes

1. Ability to identify different types of tissues and distinguish between different components of cells.
2. Skill related to fixation of tissue samples and microtechnic processing of tissues.
3. Ability to identify, handle and catalogue slides of different tissues.
4. Students' skill in operating and maintaining different types of microtomes.

Skill Enhancement Course (SEC)

SECZ- II (D): APICULTURE

Outcomes

1. Ability to understand and describe the life stages and social organization of honey bee species.
2. Ability to correctly explain and perform bee rearing, farming and harvesting practices.
3. Appreciate the economic importance of derivative benefits and byproducts of apiculture.
4. To identify and take remedial measures against the different bee diseases and predators.

M.Sc. I Year Matheamtics

Paper-I Abstract Algebra-I (Group and Ring Theory)

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Identify the concept of Normal subgroups, Quotients groups and Isomorphism.

CO2: Analyze Permutation groups and cyclic decomposition.

CO3: Explain Fundamental theorem of finite Abelian group and its applications.

CO4: Provide information on ideals and Quotient rings, Integral domain, PID, UFD and ED.

Paper-II Real Analysis

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Identify the concepts of continuity, differentiability and Integrability of functions.

CO2: Discuss the concept of pointwise and uniform convergence.

CO3: Apply the Stone-Weierstrass theorem and to solve the problems.

CO4: Enumerate the derivative, directional derivative, inverse and implicit function theorem.

Paper-III Ordinary Differential Equations

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Identify the linear differential equations with constant and variable coefficients.

CO2: Discuss the concept of Wronskian, linear dependent and Independent, Legendre equation.

CO3: Comprehend the Euler equations, the Bessel equation and Regular singular points.

CO4: Examine the existence and uniqueness of solutions to first order linear differential equations.

Paper No-IV Complex Analysis- I

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Describe the Rectangular and Polar representation of Complex numbers.

CO2: Comprehend the various mappings and complex functions.

CO3: Analyze C-R Equations, Analytic functions, harmonic functions.

CO4: Evaluate the line integrals and different forms of Cauchy's Theorem.

Paper-V (A) Discrete Mathematics

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Explain design and implementation of digital network and switching circuits.

CO2: Analyze Hamiltonian paths, circuits, Euler graphs, connected and disconnected graphs.

CO3: Discuss the different properties of trees and fundamental circuits.

CO4: Establish the matrix representation of graphs.

Paper-V (B) Dynamics and Continuum Mechanics-I

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Define vector moment about a point and scalar moment about an axis.

CO2: Explain Newton's law of motion, various forces and angular momentum.

CO3: Compare the theorem of parallel and Perpendicular axes.

CO4: Describe the law of motion, the law of conservation of energy and impulsive motion.

Paper-V (C) Theory of Probability

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Discuss the multiplication theorem of probability for independent events and its Examples.

CO2: Explain Moment Generating function Technique and its applications.

CO3: Compare recurrence relation for moments of binomial and Poisson distribution.

CO4: Analyze the normal distribution as a limiting form of binomial distribution.

Paper-V (D) **Differential Geometry of Manifolds-I**

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Define tangent spaces, Jacobian map.

CO2: Discuss the Lie-derivative, exterior algebra and derivative.

CO3: Analyze the topological groups, Lie groups and algebra.

CO4: Identify the homomorphism and isomorphism of Lie transformation groups.

Paper-VII **Linear Algebra**

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Identify the concepts of Linear Independence, bases and Dual spaces.

CO2: Discuss Algebra of Linear Transformations and Characteristics roots.

CO3: Explain canonical forms and Cayley-Hamilton Theorem.

CO4: Analyze rational canonical forms and Determinants.

Paper-VIII **Measure and Integration Theory**

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Comprehend the measurable sets, Lebesgue measure, Fatou's Lemma, Lebesgue's Dominated Convergence and Integration of series.

CO2: Discuss the four derivatives, Functions of bounded variations.

CO3: Define the Hereditary class and Measure spaces.

CO4: Explain signed measure and their derivatives.

Paper-IX **Partial Differential Equations**

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Analyze the origin of first order partial differential equations and solving them using Charpit's method.

CO2: Justify non-linear first order partial differential equation.

CO3: Classify second order partial differential equations.

CO4: Discuss boundary value problems and classification in the case of n -variables.

Paper No-X **Complex Analysis- II**

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Define Liouville's Theorem, Picard Theorem, Maximum Modulus Theorem.

CO2: Analyze the concepts of Laurent Series, Singularities, Principle & analytic part of Laurent Series.

CO3: Compare Residue theorem and the argument principle.

CO4: Discuss Conformal Mapping, Meromorphic Functions.

Paper-XI (A) **Combinatorics**

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Comprehend the rules of Sum and Product of Permutations and Combinations.

CO2: Identify Solutions by the technique of Generating Functions.

CO3: Discuss the Recurrence relations, Divide and conquer relations.

CO4: Analyze the Inclusion-exclusion principle and Rook polynomials.

Paper-XI (B) **Dynamics and Continuum Mechanics-II**

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Define the basic concept of indices, tensor, scalar and vector fields.

CO2: Discuss the description of motion of a Continuum, rate of deformation.

CO3: Analyze strain component, stress tensor, components of symmetry of stress Tensor.

CO4: Explain the Newtonian fluids, mathematical principles.

Paper-XI(C) **Operation Research**

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Explain Graphical Method, Simplex Method, Big-M method, Two Phase method.

CO2: Apply Duality to solve problems in Linear Programming.

CO3: Analyze the test of optimality for Degeneracy by using Transportation Algorithms.

CO4: Discuss the Assignment Problem and its Applications, game theory.

Paper-XI (D) **Differential Geometry of Manifolds-II**

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Define principle fibre bundle, tangents bundle.

CO2: Discuss the curvature tensors, sectional curvature and Geodesics in a Reimannian Manifolds.

CO3: Explain Gauss formula, Weingarten equation and lines of curvature.

CO4: Analyze generalized Gauss and Mainardi Codazzi equation and contravariant and Covariant almost analytic vector field.

M.Sc. II Year Mathematics

Paper-XIII **Functional Analysis**

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Identify Normed Linear Space, Banach Space, continuous Linear transformations, Conjugate space, Banach Algebra, Graph of L.T., Hahn-Banach Theorem and it's

applications, Open Mapping and Closed Graph Theorems.

CO2: Analyze Hilbert space, Orthogonal and Orthonormal vectors and sets, Orthogonal Compliments and conjugate space H^* , Schwartz Lemma, Bessel's Inequality and Riesz representation theorem.

CO3: To Identify, Self Adjoint, Normal, Unitary and Positive operators and to analyze the invariant subspace and reducible transformations.

CO4: To Provide information on Eigen Value, Eigen Vectors, Eigen Spaces and Spectrum of T.

Paper-XIV **Topology**

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Understand basics of Topological Spaces and their properties.

CO2: Study Continuous functions, Metric Topology, Connected Spaces, Limit Point, Compactness, Local Compactness, Limit point Compactness.

CO3: Achieve the zenith in treating Countable Axioms, Separable, Regular and Normal spaces.

CO4: Understand the Urysohn's Lemma, Urysohn's Metrization Theorem and their applications.

Paper-XV (A) **Analytical Number Theory**

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Understand the concepts of congruence and their properties, solve systems of linear congruence's with different moduli using the Chinese Remainder Theorem.

CO2: Analyze primitive roots and indices.

CO3: Discuss Legendre symbol and its properties, Quadratic reciprocity law.

CO4: Study arithmetical functions and Dirichlet multiplication.

Paper-XV (B) **Theory of Linear Operators-I**

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Understand the Spectral properties of bounded linear operators, Resolvent and Spectrum.

CO2: Analyze the concept of Linear Operators on Normed Spaces.

CO3: Discuss the Spectral Properties of Compact Linear Operators.

CO4: Study Spectral Properties of Bounded Self-Adjoint Linear Operators, Projection Operators.

Paper-XV(C) **Fuzzy Sets and their Applications-I**

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Understand the concepts of Crisp sets and fuzzy sets.

CO2: Analyze the operations on fuzzy sets.

CO3: Discuss Crisp and fuzzy relation.

CO4: Study Fuzzy relation equation.

Paper – XVI(A) **Fluid Mechanics – I**

Course Outcome(s):

After completing this course, the student will be able to:

- CO1:** Visualize the fluid flow pattern.
- CO2:** Assimilate the meaning of continuity equation.
- CO3:** Solve flow problems.
- CO4:** Acquire command on stream function.

Paper – XVI(B) **Difference Equations - I**

Course Outcome(s):

After completing this course, the student will be able to:

- CO1:** Understand the role of differential operator in differential calculus.
- CO2:** Analyze the linear and nonlinear difference equations.
- CO3:** Study the stability of linear and nonlinear systems.
- CO4:** Discuss asymptotic methods for solving of linear and nonlinear systems.

Paper – XVI(C) **Mathematical Softwares-I (Modeling and Simulation in Scilab/Scicos)**

Course Outcome(s):

After completing this course, the student will be able to:

- CO1:** Understanding the concepts of Scilab programming, input and output functions.
- CO2:** Analyze the types of models and simulation tools.
- CO3:** Solve Nonlinear Equations using Scilab.
- CO4:** Create mathematical Modeling and Simulation in Scilab.

Paper – XVII (A) **Integral Transforms**

Course Outcome(s):

After completing this course, the student will be able to:

- CO1:** Classify the different types of integral transforms they come across.
- CO2:** Formulate the physical problem under consideration in terms of different types of ordinary and partial differential equations with initial and boundary conditions.
- CO3:** Solve the initial value problems and boundary value problems using the appropriate integral transform.
- CO34:** Analyze the nature of the solution of the initial value problems and boundary value problems.

Paper-XVII (B) **Financial Mathematics**

Course Outcome(s):

After completing this course, the student will be able to:

- CO1:** Understand the concept of Simple Discrete Financial market model.
- CO2:** Analyze the first and second fundamental theorem of Asset model.
- CO3:** Study Black-Scholes Model.
- CO4:** Discuss the Multi-dimensional Black-Scholes Model.

Paper-XVII (C) **Fractional Calculus and its Applications-I**

Course Outcome(s):

After completing this course, the student will be able to:

- CO1:** Understand the Gamma, Mittag-Leffler, Wright functions of the fractional calculus.
- CO2:** Study Riemann-Liouville and Caputo's fractional derivative.
- CO3:** Analyze the integral transform methods of solution of fractions differential equations.

CO4: Study existence and uniqueness theorem of fractions differential equations.

Paper-XIX Numerical Analysis

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Identify the roots of equations and to obtain them by using different iteration Methods. Also to obtain rate of convergence of Iteration Methods.

CO2: Analyze the direct methods to solve the the system of n equations in n unknowns by using different direct methods

CO3: Identify the Iteration Methods to Solve the System of n Equations in n Unknowns, Eigen Value problems and to obtain Bounds on Eigen Values.

CO4: Provide information on Interpolations and Approximations for the given function.

Paper-XX Abstract Algebra- II (Field Theory)

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Understand the main algebraic properties of fields.

CO2: Analyze properties of Finite, Algebraic, Normal, Simple, Cyclic & Separable extension and Splitting Fields.

CO3: Compute Galois groups in simple cases and to apply the group-theoretic information to comprehend results about fields and field extensions.

CO4: Develop knowledge of some classical Greek problems.

CO5: Understand the concepts Cyclotomic polynomials, Polynomials solvable by radicals, symmetric functions, ruler and compass construction to Develop abstract mathematical thinking about field.

Paper-XXI (A) Classical Mechanics

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Understand D' Alembert's Principle and applications of the Lagrangian Formulation.

CO2: Distinguish the concept of the Hamilton Equations of Motion and the Principle of Least Action.

CO3: Analyze the Fundamental lemma of calculus of variations.

CO4: Solve problems of calculus of variations using Euler's equation.

Paper –XXI(B) Theory of Linear Operators -II

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Understand the Spectral properties of bounded self-adjoint linear operators.

CO2: Analyze the concept of Unbounded Linear Operators and their Hilbert-Adjoint Operators.

CO3: Discuss the Spectral Representation of Self-Adjoint Linear Operators.

CO4: Study Unbounded Linear Operators in Quantum Mechanics.

Paper XXI(C) Fuzzy Sets and their applications-II

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Understand the concepts of fuzzy measures.

CO2: Study types of uncertainty.

CO3: Discuss Uncertainty & information and complexity.

CO4: Study the application of Fuzzy in different fields.

Paper – XXII(A) Fluid Mechanics –II

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Apply Milne-Thomson circle theorem

CO2: Identify appropriate governing equation for particular flow.

CO3: Explain stress strain relations.

CO4: Evaluate the velocity of fluid flow.

Paper-XXII(B) Difference Equations-II

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Study self adjoint equation..

CO2: Analyze sturm-liouville problem for difference equations.

CO3: Understand the Lipschitz case and existence of solutions.

CO4: Discuss the boundary value problem for nonlinear equations.

Paper-XXII(C) Programming in C++

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Identify the basic concept of Tokens, Expressions and Control structures-Functions in C++

CO2: Analyze Classes and Objects..

CO3: Understand Constructors and Destructors

CO4: Apply the concept of Extending classes-Pointers, Virtual Functions and Polymorphism.

CO5: Study practical course.

Paper-XXIII (A) Integral Equations

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Acquire sound knowledge of different types of Integral equations.

CO2: Obtain integral equations from ODEs and PDEs arising in applied mathematics and different engineering branches and solve accordingly using various method of solving integral equation.

CO3: Demonstrate a depth of understanding in advanced mathematical topics in relation to geometry of curves and surfaces.

CO4: Apply the knowledge of integral transformation like Laplace transformation, Fourier transformation to solve different types of integral equation.

Paper XXIII (B) Lattice Theory

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Describe the Lattices and some concepts of lattices.

CO2: Understand the concepts of distributive Lattices.

CO3: Analyze the Weak Projectivity and Congruence's, Standard, and Neutral ideals.

CO4: Study the modular and semi-modular lattices.

Paper XXIII(C)

Fractional Calculus and its Applications-II

Course Outcome(s):

After completing this course, the student will be able to:

CO1: Study the solution of the initial value problem for the Ordinary fractional linear differential

equation with constant coefficients using only its Green's function.

CO2: Understand the different methods for the solution of fractional order equations.

CO3: Analyze the numerical evaluation of fractional derivatives.

CO4: Study the numerical solution of fractional differential equations.

M.Sc. I year Analytical Chemistry

Inorganic Chemistry – I Paper : I (CH-411)

Outcome: Student will be able to

1. Learn various approaches in analyzing structures of simple molecules.
2. Understand the proposed pathways for reactions taking place in coordination complexes such as substitution reactions, redox reactions etc. and the various factors affecting to rates of these reactions.
3. Learn about mechanisms proposed for reactions taking place in coordination complexes, and will be able to understand to explain the product formation based on these mechanisms.
4. Understand how to construct molecular orbital diagrams for simple molecules as well as coordination complexes.
5. Draw molecular orbital diagrams for sigma and pi bond formation in coordination complexes and will be able to understand and explain the difference between respective molecular orbital diagrams.

Organic Chemistry – I Paper : II (CH-412)

Outcome: Student will be able to

- Understand the various types of Reaction Mechanism.
- Adopt the concept of Bonding in Organic Molecules.
- Learn the concept of Stereochemistry and to identify the Stereo chemical reactions.
- Explain the various problems of aromaticity, homoaromaticity and antiaromaticity.
- Familiarize the various types of Substitution reactions and their mechanism
- Gain knowledge of free radical reactions.
- Justifies the various effect of substrate.

Physical Chemistry – I Paper : III (CH-413)

Outcome: The students will be able to

- Explain basic concepts, laws and postulates of quantum mechanics
- Describe different wave functions and operators
- The Schrodinger wave equation for the calculation of Energies of rigid rotor and harmonic oscillator and solve it for hydrogen atom
- Explain the concept of angular momentum
- Describe the electronic structure of atoms
- Good overview of laws of thermodynamics, partial molar properties for different systems and concept and examples of non-ideal systems
- Discuss concept distribution with examples, they will be able to explain most probable distribution and thermodynamic probability
- Concept of partition functions and its significance
- Can relate and explain the entropy production in different system and understand Onsager's relations
- Solve problems related to quantum chemistry, will have large horizon of critical thinking and analytical reasoning

Physical Method in Chemistry Paper : IV (CH-414)

Outcome: Students will be able to

- Understand how to recognize symmetry elements in a molecule.
- Assign the point group to a molecule.
- Deal with degenerate and non-degenerate representations.

Bioorganic Chemistry (Elective) Paper : V (ECH-411)

Outcome:

The basic principles governing the metabolic reactions, energy pathways, functioning of catalytic systems, evolution of life and fundamental process governing it.

Inorganic Chemistry Paper : VI (CH-421)

Outcome: Students will be to

- Learn basic terms regarding electronic spectra of coordination complexes, interpretation of electronic spectra and various important parameters necessary for it, drawing of Orgel and T-S diagrams used for electronic spectra, prediction of possible electronic transitions present in electronic spectra of coordination complexes etc.
- He/she will understand magnetic nature of complexes, measurement of magnetic moment in coordination complexes, prediction of magnetic nature of complexes using spin only formula.
- He/she will learn the terms such as diamagnetic and paramagnetic nature of coordination complexes, difference between them, anomalous magnetic moments, spin cross over etc.
- He/she will understand the chemistry of carbonyl and nitrosyl molecules, their application as ligand molecules in complex formation, structure and bonding present in various carbonyl and nitrosyls complexes, applications etc.
- He/she will learn chemistry of boranes, carboranes and metal clusters, the concept of 3C-2e bond used to explain structural aspects in boranes and carboranes, polyhedral skeletal electron pair theory and its applications in explaining structures of metal clusters etc.

Organic Chemistry Paper : VII (CH-422)

Outcome: Students will be able to

- Gain the knowledge of addition reaction between a hetero atom and double bonded carbon compounds.
- Learn familiar name Reaction
- Obtain an outline about mechanism of Aromatic Substitution reactions
- Know synthetically the process relevant Organic –Chemical reactions and be able to discuss the mechanism of these reactions.
- Understand the skill of solving problems of pericyclic reactions
- Get the clear picture of about pyricyclic reactions

Physical Chemistry Paper : VIII (CH-423)

Outcome: Students will be able to

- Understand the basic concepts and properties of surfactants and macromolecules
- State and apply different laws, principles, theories related to the electrochemistry of the solutions.
- Discuss and apply the information about corrosion, its monitoring and presentation.
- Distinguish different theories of reaction rates.
- Understand the kinetics of complex reactions, catalysis etc.
- Perform the calculations and solve the numerical of electrochemistry and chemical kinetics.
- Develop skill in problems solving, critical thinking and analytical reasoning.

Principles of Spectroscopy Paper : IX (CH-424)

Outcomes: Students will be able to:

- Explain the basic principles of rotational, vibrational, electronic and Raman spectroscopy.
- Identify and explain factors that influence the strength and frequency of peaks in the Microwave, IR spectra.
- Describe the selection rule for rotational, Vibrational and electronic spectroscopy.
- Determine the vibrations for a molecule and identify whether they are active in infrared and/or Raman spectroscopy.
- Explain the difference between Stokes and anti-Stokes lines in a Raman spectrum and justify the difference in intensity between Stokes and anti-Stokes lines.
- Draw the Stokes and anti-Stokes lines in a Raman spectrum of a compound when given the energies of the different transitions.
- Understand the electronic spectra of atomic and diatomic molecular systems.
- Justify the absorption lines in atomic electronic spectra and the broad bands in molecular electronic spectra.
- Able to interpret the molecular electronic spectra and deduce the electronic structure information in ground and excited states of diatomic molecules.
- Importance of the Nuclear Quadrupole Resonance Spectroscopy in the characterizing organic and inorganic compounds.

- Know how the electric fields gradient in molecules influences NQR, and ESR spectra.

Biophysical Chemistry Paper : X (ECH-421)

Outcome :

- Students will learn biological organisation of cells, constituents of cell , structure and its functions in the living organisation.
- The biochemical processes such as oxidation, reductions, enzyme catalysis bioenergetics nerve conduction, muscle contraction in the human body are very much important thus the study of chemical basis of life and chemical reactions strengthen the knowledge of Biochemistry also.

Laboratory Course I (Inorganic Chemistry) Paper : XI (LCH-411)

Outcome: Students will be able to

- Learn synthesis methods for the preparation of various coordination complexes and will understand the basic principles involved in operational procedures while synthesizing the complexes to a deeper level.
- To characterize a synthesized complex using various characterization techniques such as melting point determination, solubility behavior in various solvents, molar conductance, magnetic susceptibility measurements, IR and electronic spectra etc.
- While following all these methods he/she will be able to understand operation procedures, care that should be taken while using these techniques and the practical utility of these techniques.
- Understand the basic principles lying behind inorganic analysis such as precipitation, solubility product, buffer solution, applications of buffer solution in maintaining pH, common ion effect etc. and this much information will be helpful while analyzing any inorganic compound in future.

Laboratory Course II (Organic Chemistry) Paper XII : (LCH - 412)

Outcomes : Students will be able to

- Learn the pilot separation of the binary mixture
- Familiarize the systematic procedure of organic mixture analysis
- The preparation involving nitration, bromination, Sandmayer reaction, and Aldol condensation
- Learn the test involving identification of special elements
- Learn the confirmatory test for various functional groups
- Understand the technique involving drying and crystallization by various methods
- Expertise the various techniques of preparation and analysis of organic substances
- Learn the estimation of various organic compounds.
- Understand micro scale technique.

Laboratory Course III (Physical Chemistry) Paper XIII : (LCH - 413)

Outcome: Student will be able to

- Apply their knowledge for setting various experiments based on the instrumentations studied
- Perform different qualitative and quantitative analysis.

Laboratory Course – IV (Analytical Chemistry) Paper XIV : (LCH - 414)

Outcome: Student will be able to

- Understand the basic principles and theory of different instruments used during the conduction of the experiments
- Perform the different experiments on conductometer, pH meter, potentiometer, colorimeter, polarimeter, flame photometry
- Apply their knowledge for setting various experiments based on the instrumentations studied
- Perform different qualitative and quantitative analysis.

M.Sc. II year Analytical Chemistry

Paper–XV, [CH-511] Advanced Spectroscopic Methods

Course Outcome(s)

CO -1 Learn the structure determination of organic molecules by spectroscopic methods. Know the use electronic spectroscopy to determine absorption maximum in dienes, enones and aromatic compounds

CO -2 Know the applications of IR spectroscopy for functional group determination.

CO - 3 Learn the structure elucidation of organic compounds by PMR spectroscopy.

CO - 4 Gathering basic knowledge to know the position of carbon in carbon compounds.

CO - 5 Recognize the molecular mass of the organic molecule by fragmentation pattern.

CO- 6 Know the complete structure of compounds using UV, IR, PMR, CMR and Mass spectroscopic methods.

Paper–XVI, [ACH-512] Fundamentals of Analytical Chemistry (FAC)

Course Outcome(s)

CO -1 Understand the tools and techniques used in analytical methods.

CO -2 To find errors in analytical data and to Evaluation of analytical data.

CO -3 Learn mole concept and chemical calculations.

CO - 4 Aware general concept of chemical equilibrium.

Paper–XVII, [ACH-513] Chromatography in Chemical Analysis I (CCA-I)

Course Outcome(s)

CO - 1 Know fundamentals of Chromatography.

CO - 2 Understand Paper Chromatography method of analysis.

CO - 3 To know the TLC technique used to check purity of sample.

CO - 4 Study the simple and widely used separation technique

CO - 5 Learn the advance separation techniques.

CO - 6 Aware the modern separation techniques.

Paper XVIII, [ACH-514] Instrumental Methods of Chemical Analysis – I (IMCA-I)

Course Outcome(s)

CO-I Understand the basic Fundamentals of Absorption and Emission Spectroscopy

CO-II Learn the Structural construction (Instrumentation), working and application of Flame Emission and Atomic Absorption Spectrophotometry.

CO-III Know the various Optical methods used to do analysis of optically active compounds

CO-IV Aware the Thermal methods and its application.

Paper–XV, [EACH-511] Techniques in Forensic Analysis (TFA)

Course Outcome(s)

CO-I Understand the basic principle and operation of commonly employed techniques in forensic laboratory.

CO-II Educate about Body fluid and hair analysis through biotechnology techniques and advanced analytical techniques

CO-III Learn about Systematic Drug Identification through various analytical strategies.

CO - IV Aware about Materials of interest for Forensic studies

CO-V Know the advanced analytical techniques for analysis of Fibre, paints and varnishes

Paper–XX, [ACH-516] Industrial Analytical Chemistry (IAC)

Course Outcome(s)

CO - 1 Understand analysis of Oils and Fats.

CO - 2 Learn about Pharmacopeia

CO - 3 Know Analysis of Plastics and Synthetic fibers

CO - 4 Aware Process and Analysis of sugar and fermentation industries

CO - 5 Learn aspects of Fuel Analysis

CO - 6 Know about Rubber Analysis

CO - 7 Aware about Analysis of Paints and Pigments

CO - 8 Know Modern methods of Analysis of Cement

Paper–XXI, [ACH-517] Analytical Methods (AM)

Course Outcome(s)

CO-I Study the classical analytical methods

CO-II Know about water and soil analysis

CO-III Acquire knowledge about Analysis of body Fluids and Drugs by using the aspect of clinical chemistry and drug analysis.

CO-IV Aware about Analysis of Food

Paper–XXII, [ACH-518]

Chromatography and Other Process in Chemical Analysis-II (CCA-II)

Course Outcome(s)

CO-I Understand the Instrumentation and working of HPLC

CO-II Learn the Principle and applications of Liquid-Liquid Extraction:

CO-III Aware about automatic analysis

Paper–XXIII, [ACH-519] Instrumental Methods of Chemical Analysis – II (IMCA-II)

Course Outcome(s)

CO - 1 Study the various aspects of UV & Visible Spectrophotometry

CO - 2 Learn Infra-red Spectrophotometry

CO - 3 Know about Mass spectrophotometry

CO - 4 Learn Potentiometry, Polarometry and Conductometry.

CO - 5 Study about Radio analytical chemistry

Paper–XX, [EACH-516] INDUSTRIAL SAFETY AND HAZARDOUS (ISH)

Course Outcome(s)

CO - 1 Understand the industrial laws, regulations and source models.

CO - 2 How to Apply the methods of prevention of fire and explosions?

CO - 3 Understand the relief and its sizing methods.

CO - 4 Understand the methods of hazard identification and preventive measures

Laboratory Course-V, Paper– XXV, ALCH-521

Course Outcome(s)

Students become aware of preparation of sample, Standardization of solution, determination / estimation of analyte in consumable and non-consumable materials.

Laboratory Course-VI, Paper– XXVI, ALCH-522

Course Outcome(s)

Students become aware of preparation of sample, Standardization of solution, separation/ determination / estimation of analyte in the sample.

Laboratory Course-VII, Paper– XXVII, ALCH-523

Course Outcome(s)

Aware of spectroscopic study of metal complexes, Potentiometry, Conductometry, Solvent extraction and Non-aqueous titration.

M.Sc. I year Organic Chemistry

Inorganic Chemistry – I Paper : I (CH-411)

Outcome: Student will be able to

1. Learn various approaches in analyzing structures of simple molecules.
2. Understand the proposed pathways for reactions taking place in coordination complexes such as substitution reactions, redox reactions etc. and the various factors affecting to rates of these reactions.
3. Learn about mechanisms proposed for reactions taking place in coordination complexes, and will be able to understand to explain the product formation based on these mechanisms.
4. Understand how to construct molecular orbital diagrams for simple molecules as well as coordination complexes.
5. Draw molecular orbital diagrams for sigma and pi bond formation in coordination complexes and will be able to understand and explain the difference between respective molecular orbital diagrams.

Organic Chemistry – I Paper : II (CH-412)

Outcome: Student will be able to

- Understand the various types of Reaction Mechanism.

- Adopt the concept of Bonding in Organic Molecules.
- Learn the concept of Stereochemistry and to identify the Stereo chemical reactions.
- Explain the various problems of aromaticity, homoaromaticity and antiaromaticity.
- Familiarize the various types of Substitution reactions and their mechanism
- Gain knowledge of free radical reactions.
- Justifies the various effect of substrate.

Physical Chemistry – I Paper : III (CH-413)

Outcome: The students will be able to

- Explain basic concepts, laws and postulates of quantum mechanics
- Describe different wave functions and operators
- The Schrodinger wave equation for the calculation of Energies of rigid rotor and harmonic oscillator and solve it for hydrogen atom
- Explain the concept of angular momentum
- Describe the electronic structure of atoms
- Good overview of laws of thermodynamics, partial molar properties for different systems and concept and examples of non-ideal systems
- Discuss concept distribution with examples, they will be able to explain most probable distribution and thermodynamic probability
- Concept of partition functions and its significance
- Can relate and explain the entropy production in different system and understand Onsager's relations
- Solve problems related to quantum chemistry, will have large horizon of critical thinking and analytical reasoning

Physical Method in Chemistry Paper : IV (CH-414)

Outcome: Students will be able to

- Understand how to recognize symmetry elements in a molecule.
- Assign the point group to a molecule.
- Deal with degenerate and non-degenerate representations.

Bioorganic Chemistry (Elective) Paper : V (ECH-411)

Outcome:

The basic principles governing the metabolic reactions, energy pathways, functioning of catalytic systems, evolution of life and fundamental process governing it.

Inorganic Chemistry Paper : VI (CH-421)

Outcome: Students will be to

- Learn basic terms regarding electronic spectra of coordination complexes, interpretation of electronic spectra and various important parameters necessary for it, drawing of Orgel and T-S diagrams used for electronic spectra, prediction of possible electronic transitions present in electronic spectra of coordination complexes etc.
- He/she will understand magnetic nature of complexes, measurement of magnetic moment in coordination complexes, prediction of magnetic nature of complexes using spin only formula.
- He/she will learn the terms such as diamagnetic and paramagnetic nature of

coordination complexes, difference between them, anomalous magnetic moments, spin cross over etc.

- He/she will understand the chemistry of carbonyl and nitrosyl molecules, their application as ligand molecules in complex formation, structure and bonding present in various carbonyl and nitrosyls complexes, applications etc.
- He/she will learn chemistry of boranes, carboranes and metal clusters, the concept of 3C-2e bond used to explain structural aspects in boranes and carboranes, polyhedral skeletal electron pair theory and its applications in explaining structures of metal clusters etc.

Organic Chemistry Paper : VII (CH-422)

Outcome: Students will be able to

- Gain the knowledge of addition reaction between a hetero atom and double bonded carbon compounds.
- Learn familiar name Reaction
- Obtain an outline about mechanism of Aromatic Substitution reactions
- Know synthetically the process relevant Organic –Chemical reactions and be able to discuss the mechanism of these reactions.
- Understand the skill of solving problems of pericyclic reactions
- Get the clear picture of about pericyclic reactions

Physical Chemistry Paper : VIII (CH-423)

Outcome: Students will be able to

- Understand the basic concepts and properties of surfactants and macromolecules
- State and apply different laws, principles, theories related to the electrochemistry of the solutions.
- Discuss and apply the information about corrosion, its monitoring and presentation.
- Distinguish different theories of reaction rates.
- Understand the kinetics of complex reactions, catalysis etc.
- Perform the calculations and solve the numerical of electrochemistry and chemical kinetics.
- Develop skill in problems solving, critical thinking and analytical reasoning.

Principles of Spectroscopy Paper : IX (CH-424)

Outcomes: Students will be able to:

- Explain the basic principles of rotational, vibrational, electronic and Raman spectroscopy.
- Identify and explain factors that influence the strength and frequency of peaks in the Microwave, IR spectra.
- Describe the selection rule for rotational, Vibrational and electronic spectroscopy.
- Determine the vibrations for a molecule and identify whether they are active in infrared and/or Raman spectroscopy.
- Explain the difference between Stokes and anti-Stokes lines in a Raman spectrum and justify the difference in intensity between Stokes and anti-Stokes lines.
- Draw the Stokes and anti-Stokes lines in a Raman spectrum of a compound when given the energies of the different transitions.

- Understand the electronic spectra of atomic and diatomic molecular systems.
- Justify the absorption lines in atomic electronic spectra and the broad bands in molecular electronic spectra.
- Able to interpret the molecular electronic spectra and deduce the electronic structure information in ground and excited states of diatomic molecules.
- Importance of the Nuclear Quadrupole Resonance Spectroscopy in the characterizing organic and inorganic compounds.
- Know how the electric fields gradient in molecules influences NQR, and ESR spectra.

Biophysical Chemistry Paper : X (ECH-421)

Outcome :

- Students will learn biological organisation of cells, constituents of cell , structure and its functions in the living organisation.
- The biochemical processes such as oxidation, reductions, enzyme catalysis bioenergetics nerve conduction, muscle contraction in the human body are very much important thus the study of chemical basis of life and chemical reactions strengthen the knowledge of Biochemistry also.

Laboratory Course I (Inorganic Chemistry) Paper : XI (LCH-411)

Outcome: Students will be able to

- Learn synthesis methods for the preparation of various coordination complexes and will understand the basic principles involved in operational procedures while synthesizing the complexes to a deeper level.
- To characterize a synthesized complex using various characterization techniques such as melting point determination, solubility behavior in various solvents, molar conductance, magnetic susceptibility measurements, IR and electronic spectra etc.
- While following all these methods he/she will be able to understand operation procedures, care that should be taken while using these techniques and the practical utility of these techniques.
- Understand the basic principles lying behind inorganic analysis such as precipitation, solubility product, buffer solution, applications of buffer solution in maintaining pH, common ion effect etc. and this much information will be helpful while analyzing any inorganic compound in future.

Laboratory Course II (Organic Chemistry) Paper XII : (LCH - 412)

Outcomes : Students will be able to

- Learn the pilot separation of the binary mixture
- Familiarize the systematic procedure of organic mixture analysis
- The preparation involving nitration, bromination, Sandmayer reaction, and Aldol condensation
- Learn the test involving identification of special elements
- Learn the confirmatory test for various functional groups
- Understand the technique involving drying and crystallization by various methods
- Expertise the various techniques of preparation and analysis of organic substances
- Learn the estimation of various organic compounds.
- Understand micro scale technique.

Laboratory Course III (Physical Chemistry) Paper XIII : (LCH - 413)

Outcome: Student will be able to

- Apply their knowledge for setting various experiments based on the instrumentations studied
- Perform different qualitative and quantitative analysis.

Laboratory Course – IV (Analytical Chemistry) Paper XIV : (LCH - 414)

Outcome: Student will be able to

- Understand the basic principles and theory of different instruments used during the conduction of the experiments
- Perform the different experiments on conductometer, pH meter, potentiometer, colorimeter, polarimeter, flame photometry
- Apply their knowledge for setting various experiments based on the instrumentations studied
- Perform different qualitative and quantitative analysis.

M.Sc. I Year Applied Mathematics

Paper-I Modern Algebra

Course Outcomes:

After completion of the course student will be able to

CO1: Define group and give examples of Group.

CO2: Attain mastery on Nilpotent group, alternating group etc.

CO3: Gain Command on Sylows theorem.

CO4: Solve problems based on rings, maximal and prime ideals.

Paper-II Real Analysis

Course Outcomes:

After completion of the course student will be able to

Co1: Verify continuity of functions.

CO2: Acquire the knowledge of L'Hospital rule, derivatives of higher order.

CO3: Analyse convergence of sequence and series of functions.

CO4: Construct proof of Stone-Weierstress theorem, Abels theorem.

Paper no. III Ordinary Differential Equations

Course Outcomes:

After completion of the course student will be able to

CO1: Gain the concept of differential equations.

CO2: Solve ordinary differential equations.

CO3: Assimilate the Meaning of existence and uniqueness theorem.

CO4: Solution of ordinary differential equations with the help of software.

Paper No. IV Complex Analysis

Course Outcomes:

After completion of the course student will be able to

- CO1: Solve problems on Mobius transformation,
- CO2: Gain command on analytic functions.
- CO3: Explain the Cauchy-Riemann equation, harmonic function.
- CO4: Identify different types of singularities.

Paper no. V(A) Discrete Mathematics and Applications

Course Outcomes:

After completion of the course student will be able to

- CO1: Explain Boolean algebra and its properties.
- CO2: Acquire mastery on Travelling Salesman Problem
- CO3: Assimilate spanning trees, network flows.
- CO4: Illustrate Matrix Representation of Graphs.

Paper No. V(C) Mathematical Software: I (LATEX)

Course Outcomes:

After completion of the course student will be able to

- CO1: Install Latex software.
- CO2: Typeset any document which involve Mathematical expressions.
- CO3: Insert images, graphs, tables using LATEX software.
- CO4: Prepare presentation using software.

Paper No. VII NUMERICAL LINEAR ALGEBRA

Course Outcomes:

After completion of the course student will be able to

- CO1: Analyse permutation, HessenbergCompanion, Non derogatory.
- CO2: Construct basic algorithms for computing Norm of a vector.
- CO3: Gain command over Householder Transformations and applications to QR factorization.
- CO4: Introduce Polynomial fitting method with applications

Paper-VIII Classical Mechanics

Course Outcomes:

After completion of the course student will be able to

- CO1: Define and understand basic mechanical concepts related to constraints, degree of freedom and generalize coordinates.
- CO2: Derive expression for Simple pendulum, Atwood machine etc
- CO3: Describe and understand the motion of mechanical system using Lagrange- Hamilton formulization.
- CO4: ExplainBrachistochrone Problem, Isoperimetric Problems.

Paper no. IX Partial Differential Equations

Course Outcomes:

After completion of the course student will be able to

- CO1: Classify partial differential equations.
- CO2: Solve of Partial Differential Equations to find complete integral.
- CO3: Gain command over Canonical Forms.
- CO4: Introduce boundary conditions and solve problems on it.

Paper No. X Numerical Techniques

Course Outcomes:

After completion of the course student will be able to

- CO1: Analyse rate of convergence.
- CO2: Solve system of equation using numerical methods.
- CO3: Solve problems on Gauss-Seidel Method, Jacobi Iteration Method, Successive Over Relaxation Method.
- CO4: Construct Langrange Interpolating Polynomial, Newton's Divided Difference Interpolating Polynomial.

Paper no.XI (A) Probability Distributions and Testing of Hypothesis

Course Outcomes:

After completion of the course student will be able to

- CO1: Solve problems on Multiplication theorem of probability, independent events.
- CO3: Analyse Distribution Function, Discrete and Continuous Random variable, Generating function.
- CO3: Apply knowledge of Poisson distribution to solve problems.
- CO4: Gain command on Students t-Distribution, Applications of F-distribution etc.

Paper no XI(B) Mathematical Software: II

Course Outcomes:

After completion of the course student will be able to

- CO1: Perform basic computations.
- CO2: Gain command on loops, solution difficulties while using software.
- CO3: Plot graphs and perform various operations using control expression.
- CO4: Solve differential equations using software.

M.Sc. II Year Applied Mathematics

Paper No- XIII Functional Analysis

Course Outcome:

After completing this course, the student will be able to:

- CO1:** Identify Normed Linear Space, Banach Space, continuous Linear transformations, Conjugate space, Banach Algebra, Graph of L.T., Hahn-Banach Theorem and it's applications, Open Mapping and Closed Graph Theorems.
- CO2:** Analyze Hilbert space, Orthogonal and Orthonormal vectors and sets, Orthogonal Compliments and conjugate space H^* , Schwartz Lemma, Bessel's Inequality and Riesz representation theorem.
- CO3:** To Identify, Self Adjoint, Normal, Unitary and Positive operators and to analyze the invariant subspace and reducible transformations.
- CO4:** To Provide information on Eigen Value, Eigen Vectors, Eigen Spaces and Spectrum of T.

Paper-XIV **Differential Geometry**

Course Outcome:

After completing this course, the student will be able to:

CO1: Explain directional derivatives of the functions.

CO2: Analyse unit-speed and arbitrary-speed curves.

CO3: construct the parametrizations of different surfaces.

CO4: formulate different types of curvatures of given surface.

Paper No – XV(A) **Programming in C**

Course Outcomes:

After completion of the course, student will be able to

CO1: Classify constants and operators.

CO2: Analyse appropriate loop and syntax.

CO3: Explain arrays and pointers.

CO4: Write correct C program for particular problem.

Paper No –XV(B) **Topics in Number Theory**

Course Outcome:

After completing this course, the student will be able to:

CO1: Understand the concepts of congruence and their properties, solve systems of linear congruence's with different moduli using the Chinese Remainder Theorem.

CO2: Analyze primitive roots and indices.

CO3: Discuss Legendre symbol and its properties, Quadratic reciprocity law.

CO4: Study arithmetical functions and Dirichlet multiplication.

Paper No – XV(C) **Field Theory**

Course Outcome:

After completing this course, the student will be able to:

CO1: Understand the main algebraic properties of fields.

CO2: Analyze properties of Finite, Algebraic, Normal, Simple, Cyclic & Separable extension and Splitting Fields.

CO3: Compute Galois groups in simple cases and to apply the group-theoretic information to comprehend results about fields and field extensions.

CO4: Understand the concepts Cyclotomic polynomials, Polynomials solvable by radicals, symmetric functions, ruler and compass construction.

Paper – XVI(A) **Data Science**

Course Outcomes:

After completion of the course, student will be able to

CO1: Explains data science process and its types.

CO2: Identify the sources of data and its management.

CO3: Write the basic machine learning algorithms.

CO4: Visualise data, encode the data and visualise encodings of data.

Paper – XVI(B) **Fluid Dynamics – I**

Course Outcomes:

After completion of the course student will be able to

CO1: To visualize the fluid flow pattern.

CO2: Assimilate the meaning of continuity equation.

CO3: Solve two dimensional flow problems symmetric about an axis.

CO4: Acquire command on stream function and line doublets.

Paper No –XVI(C) Difference Equation – I**Course Outcome:**

After completing this course, the student will be able to:

CO1: Understand the role of differential operator in differential calculus.

CO2: Analyze the linear and nonlinear difference equations.

CO3: Study the stability of linear and nonlinear systems.

CO4: Discuss asymptotic methods for solving of linear and nonlinear systems.

Paper No – XVII(A) Soft Computing**Course Outcomes:**

After completion of the course, student will be able to

CO1: Explain soft computing and neural networks.

CO2: Define membership function, fuzzy interface system.

CO3: Discuss the adaptive networks, feed forward network and advances of neural networks.

CO4: Enumerate study of neural network toolbox and fuzzy logic toolbox.

Paper No - XVII(B) Integral Transforms and Their Applications**Course Outcomes**

After completion of the course student will be able to

CO1: Classify the different types of integral transforms they come across.

CO2: Formulate the physical problem under consideration in terms of different types of ordinary and partial differential equations with initial and boundary conditions.

CO3: Solve the initial value problems and boundary value problems using the appropriate integral transform.

CO4: Analyze the nature of the solution of the initial value problems and boundary value problems.

Paper No – XVII(C) Fractional Calculus**Course Outcome:**

After completing this course, the student will be able to:

CO1: Understand the Gamma, Mittag-Leffler, Wright functions of the fractional calculus.

CO2: Study Riemann-Liouville and Caputo's fractional derivative.

CO3: Analyze the integral transform methods of solution of fractions differential equations.

CO4: Study existence and uniqueness theorem of fractions differential equations.

Paper – XIX Mathematical Modelling**Course Outcomes:**

After completion of the course, student will be able to

- CO1: Define mathematical modelling and its classification.
- CO2: Gain command over mathematical modelling.
- CO3: Prepare model using differential equation.
- CO4: Construct model with the help of partial differential equation.

Paper- XX Optimization Techniques

Course Outcome:

After completing this course, the student will be able to:

- CO1:** Explain Graphical Method, Simplex Method, Big-M method, Two Phase method.
- CO2:** Apply Duality to solve problems in Linear Programming.
- CO3:** Analyze the test of optimality for Degeneracy by using Transportation Algorithms.
- CO4:** Discuss the Assignment Problem and its Applications, game theory.

Paper – XXI(A) Computational fluid dynamics

Course Outcome:

After completing this course, the student will be able to:

- CO1:** Explain experimental, theoretical and computational approaches .
- CO2:** Construct forward, backward and central difference formulae.
- CO3:** Analyse stability, convergence & consistency of finite difference schemes.
- CO4:** Solve problems in CFD using computer software.

Paper- XXI(B) Computational Geometry

Course Outcome:

After completing this course, the student will be able to:

- CO1: Explain transformations in homogenous coordinates.
- CO2: Analyse the concept of concatenation of transformations.
- CO3: classify conics, intersections of a conic with a line.
- CO4: Describe B-splines and properties of the B-spline curve

Paper – XXI(C) Combinatorics

Course Outcomes:

After completion of the course, student will be able to

- CO1: Comprehend the rules of sum and product of permutations and combinations.
- CO2: Identify the solution techniques of generating function.
- CO3: Discuss the recurrence relations, divide and conquer relations.
- CO4: Analyze the Inclusion exclusion principle and rook polynomials.

Paper – XXII(A) Data Warehousing and Data Mining

Course Outcomes:

After completion of the course, student will be able to

- CO1: Define data mining, mining data stream. Graph mining.
- CO2: Identify Transactional Patterns and other temporal based frequent patterns.
- CO3: Discuss the Trend analysis and Similarity search in Time-series analysis
- CO4: Explain Methodologies for stream data processing and stream data systems.

Paper – XXII(B) Fluid Dynamics –II

Course Outcomes:

After completion of the course, student will be able to

CO1: Apply Milne-Thomson circle theorem

CO2: Identify appropriate governing equation for particular flow.

CO3: Explain stress strain relations.

CO4: Evaluate the velocity of fluid flow.

Paper No – XXII(C) **Difference Equations – II**

Course Outcome:

After completing this course, the student will be able to:

CO1: Study self adjoint equation..

CO2: Analyze sturm-liouville problem for difference equations.

CO3: Understand the Lipschitz case and existence of solutions.

CO4: Discuss the boundary value problem for nonlinear equations.

Paper – XXIII(A) **Machine Learning**

Course Outcomes:

After completion of the course, student will be able to

CO1: Describe the concept of machine learning and its types.

CO2: Comprehend dimensionality reduction, principal component analysis, kernel PCA, matrix factorisation.

CO3: Analyze Bayes learning and inference, Bayesian network, bagging and boosting random forest.

CO4: Discuss deep learning feature representation learning, learning overview.

Paper-XXIII(B) **Integral Equations: Theory and Applications**

Course Outcomes:

After the completion of this course, the students will

CO1. Acquire sound knowledge of different types of Integral equations.

CO2. Obtain integral equations from ODEs and PDEs arising in applied mathematics and different engineering branches and solve accordingly using various method of solving integral equation.

CO3. Demonstrate a depth of understanding in advanced mathematical topics in relation to geometry of curves and surfaces.

CO4. Apply the knowledge of integral transformation like Laplace transformation, Fourier transformation to solve different types of integral equation.

Paper No – XXIII(C) **Dynamical Systems and Applications**

Course Outcomes:

After completion of the course student will be able to

CO1: Classify the different types of dynamical systems they come across.

CO2: Formulate the physical problem under consideration in terms discrete and continuous type of dynamical systems.

CO3: Describe more accurate solutions, analyze the nature of the solutions, study the long term behavior

of the dynamical system.

CO4: Explain the occurrence of chaos in real world and the control of chaos.

M.Sc. II Year Organic Chemistry

Paper–XV, [OCH-511] Advanced Spectroscopic Methods

Outcomes:

- Learn the structure determination of organic molecules by spectroscopic methods.
- Know the use electronic spectroscopy to determine absorption maximum in dienes, enones and aromatic compounds.
- Know the applications of IR spectroscopy for functional group determination.
- Learn the structure elucidation of organic compounds by PMR spectroscopy.
- Gathering basic knowledge to know the position of carbon in carbon compounds.
- Recognize the molecular mass of the organic molecule by fragmentation pattern.
- Know the complete structure of compounds using UV, IR, PMR, CMR and Mass spectroscopic methods.

Paper–XVI, [OCH-512] Natural Products

Outcomes:

1. Structure elucidation, degradation, applications, stereochemistry of Vitamins, Terpenoids, Steroids.
2. Synthetic methods for total synthesis of natural products
3. Medicinal Application of different natural products
4. Rotenones, pyretheroids, prostoglandins and their applications

Paper–XVII, [OCH-513] Organic Synthesis

Outcomes:-

- 1) To understand the Dakin reaction, Etard reaction, HVZ reaction, Umpolung synthesis and Stephen reaction .
- 2) To know about the Barton reaction, Jones oxidation, Oppenauer oxidation and Michel addition .
- 3) To familiarize the different types of reduction reaction .
- 4) To learn about the synthesis and applications of the organic reagents like 9-Borabicyclo(3.3.1)nonane (9-BBN) and n-butyl lithium .
- 5) To learn the synthesis and applications of the organic reagents like ceric ammonium nitrate (CAN), DCC, Grignard reagent, LDA, Gilman reagent, NBS and PCC.
- 6) To know about the complex metal hydrides, Hilman's reagent, lithium dimethyl cuprate and dicyclohexyl carbodimide, 1,3-dithiane.
- 7) To know the detail study of Woodward, provost hydroxylation, selenium dioxide, crown ethers and Peterson's synthesis, Wilkinson's catalyst and Baker yeast.

Paper–XVIII, [OCH-514] Medicinal Chemistry

Outcomes:

- Understand key component of drug discovery process and drug designing

- Understanding the role of medicinal chemist in development of medicinal agents
- Have understanding about functional group modification and their utility in SAR and QSAR.
- Analyze the recent research articles related with drug design of antimycobacterial agents and antibiotics.

Paper–XVIII, [EOCH-514] Elective: Green Chemistry

Outcomes:-

- 1) To learn about the different enzymes participating in the chemical reactions inside the body and their functions
- 2) To study about the different oxygen carriers present in the body with their structure and stereochemistry
- 3) To study in detail about nitrogen fixation reactions and microorganisms involved in nitrogen fixation reactions
- 4) To know about the biological redox systems and their classifications
- 5) To create awareness about metal toxicities, their detection and permissible levels in

Paper–XX, [OCH-521] Advanced Heterocyclic Chemistry

Outcomes:-

- 1) This course aims at giving a fundamental theoretical understanding of heterocyclic chemistry, including alternative general methods for ring synthesis and application of such methods for the preparation of specific groups of heterocyclic systems.
- 2) The student will get familiar with particular properties and reactions for the most important heterocycles as well as different systems of nomenclature.

Paper–XXI, [OCH-522] Advanced Organic Chemistry

Outcomes:

1. The basic Principles of Green Chemistry,
2. Applications and uses of Green catalysts and Reagents.
3. Use of Ionic Liquids and PTC in Green Synthesis.

Paper–XXII, [OCH-523] Organic synthesis: Retro synthetic Approach

Outcomes:

- 1) To persuade the subject specific knowledge as well as relevant understanding of the Retrosynthesis
- 2) The academic and professional skills required for Chemistry-based professions.
- 3) Learning experiences gained from this Disconnection approach is important for industrial purpose.

Paper–XXIII, [OCH-524] Medicinal Chemistry

Outcomes:

- Understand key components of drug discovery of Anti-cancer and Anti-AIDS agents, Hypoglycemic agents, Cardiac drugs, antiviral antimalarial agents

Paper–XXIII [EOCH-521] Elective: Environmental Chemistry

Outcomes:

- Familiar with environmental chemistry and its effects on living organisms.

Paper–XXV [LOCH-525] Mixture Analysis

Outcomes:

- Learn basics practical knowledge of qualitative analysis.
- Become skilled at organic compounds determination.

Paper–XXVI [LOCH-526] Synthesis of Organic Molecules

Outcomes:

- Learn basics practical knowledge of multistage synthesis of organic molecules.
- Learn fundamentals of organic synthesis in drug discovery.
- Learn about the one-pot organic synthesis by microwave techniques.

Paper–XXVIII [LOCH-527] Physico-Organic Estimations

Outcomes:

- Gain the knowledge of estimation of drugs by Titrimetric.
- Learn about the Isolation of natural products.
- Develops the techniques for the estimation of drugs by Instrumental Methods.

M.Sc. I Year Biotechnology

BT -I : Cell and Developmental Biology

Outcome:

Students will understand the basics of Cell Biology and developmental Biology and fundamentals of Cancer genetics. They will Identify the characteristics and basic needs of living organisms and ecosystems

BT -II: Microbiology and Virology

Outcome:

Students will understand the development of Microbiology and Virology. Also will learn the growth pattern of Microorganisms. They will know the methods of cultivation of bacteria and Viruses for Industrial and Human use

BT - III: Biochemistry

Outcomes:

Students will understand the Structure, classification and the properties of Biomolecules. They will acquire the basic laboratory skills for the isolation and separation of biomolecules

BT- IV A: Techniques in Biology

Outcome:

Students will learn the working principles of biological techniques like microscopy, electrophoresis, chromatography and spectroscopy. They will use these biological techniques in research and development.

BT-IV B : Plant Metabolism and Development

Outcome:

Students will learn the plant water relationship, mechanism of photosynthesis and respiration. They will explain the mechanism of plant reproduction.

BT V: Molecular Genetics**Outcome:**

Students will acquire the laboratory skills for the isolation of genetic material. They will learn the biochemistry of DNA and RNA. Students will analyze the gene interactions

BT VI: Immuno-technology**Outcome:**

Students will learn the various components and working of immune system. They will acquire the techniques for the development of vaccines

BT VII: Process Biotechnology**Outcome:**

Students will understand the various laboratory methods for the isolation and preservation of Microorganisms. They will learn the Industrial use of bioreactor and also become aware about the media optimization.

BT VIII A: Enzymology**Outcome:**

Students will learn the role of enzyme in human health and their industrial applications. They will acquire the laboratory knowledge for the industrial enzyme products.

BT-VIII B : Nano-biotechnology**Outcome:**

Students will understand the use of Nano-biotechnology in various areas like agriculture, medicine, cosmetics and environment. They will learn the rights of Intellectual properties

M.Sc. II Year Biotechnology**BT -IX: Genetic Engineering**

Learning Outcomes (LO): Students will become aware about rDNA technology, its advantages and disadvantages in addition to tools and techniques. It will help in avoiding spread of misconception about GMO in society.

BT -X: Industrial Biotechnology

Learning Outcomes (LO): On completion of this course, the students shall:

1. Demonstrate the knowledge about the techniques of microbial productions and acquire comprehensive knowledge on quality control and quality assessment.
2. Acquire knowledge in Production and purification of fungal enzymes Amylase Pectinase and other industrial products.
3. Able to work in the section of quality control of Food industry.
4. Shall develop scientific skills to work in Pharmaceutical and Research laboratories.

BT -XI: Plant Biotechnology

Learning Outcomes (LO): On completion of this course, the students shall:

1. Demonstrate the knowledge about the techniques of Plant Tissue Culture and acquire comprehensive knowledge on GM technology for quality characteristics and their role in crop improvement.
2. Acquire knowledge in metabolic engineering and industrial products.
3. Develop skills in molecular markers studies and their use in plant breeding.
4. Shall develop scientific skills to work in Plant tissue culture, Pharmaceutical and Research laboratories.

BT - XIV: Computational Biology & Biostatistics

Learning Outcomes (LO): Students will be able to

- 1 Construct the phylogenetics of different sequences.
- 2 Analyze sequence and structure of bio-macromolecule data
- 3 Edit the three dimensional structure of protein using structural bioinformatics tools
- 4 Explain the properties of genetic materials and storage and processing of genetic information.
- 5 Analyze genomic data.
- 6 Explain biological phenomena based on comparative genomics

BT - XV: Pharmaceutical Biotechnology

Learning Outcomes (LO): Students will be able to

- 1 Explain the strategies and various steps of new drug discovery process.
- 2 Explain the concept of pharmacodynamics and pharmacokinetics
- 3 Apply the knowledge of pharmaceutical manufacturing in the production of biopharmaceuticals like antibiotics, vaccines, proteins and hormones
- 4 Carry out the quality control procedures in the production of various biopharmaceuticals
- 5 Explain the regulatory aspects in the development of pharmaceuticals.

BT - XVI: Environmental Biotechnology

Course Learning Outcomes (CLO): Students will be able to 1. comprehend environmental issues and role of biotechnology in the cleanup of contaminated environments 2. Comprehend fundamentals of biodegradation, biotransformation and bioremediation of organic contaminants and toxic metals 3. apply biotechnological processes in waste water and solid waste management. 4. Comprehend biofuels/bioenergy systems; attributes for biofuel / bioenergy production. 5. demonstrate innovative biotechnological interventions to combat environmental challenges.

BT –XVII (A): Animal Biotechnology

Learning Outcomes (LO): Students will be able to

- 1 Explain the fundamental scientific principles that underlie cell culture
- 2 Acquire knowledge for isolation, maintenance and growth of cells.
- 3 Develop proficiency in establishing and maintaining of cell lines.
- 4 Acquire knowledge in animal cloning and its applications

BT – XVII (B): Food Biotechnology

Learning Outcomes (LO): Students will be able to

- 1 Comprehend the different microorganisms roles involved in food biotechnology with different food items.
- 2 Define and explain different preliminary steps before and after food fermentation.
- 3 Comprehend phenomenon of food degradation and spoilage by microorganisms with change in the properties of food.
- 4 To create awareness about different laws and standards in food biotechnology.

M.Sc. I Year Botany

THEORY PAPER-I: BIOLOGY AND DIVERSITY OF MICROBES

Learning outcomes:

1. Understand the morphology, structure and importance of the various organisms
2. Differentiate between various groups of Fungi, Bacteria, Viruses, and Lichens & Mycorrhiza.
3. Learn the life cycles of individuals belonging to Fungi, Bacteria, Viruses, Lichens & Mycorrhiza.

THEORY PAPER-II: BIOLOGY AND DIVERSITY OF CRYPTOGAMS

Learning outcomes:

1. Understand the morphology, structure and importance of the various organisms
2. Differentiate between various groups of Algae, Bryophyta and Pteridophyta.
3. Learn the life cycles of individuals belonging to Algae, Bryophyta and Pteridophyta.

THEORY PAPER-III: TAXONOMY OF ANGIOSPERMS AND GYMNOSPERMS

Learning outcomes:

1. Understand the morphology, structure and importance of the various organisms.
2. Differentiate between various groups of Gymnosperms, Angiosperms and fossil plants.
3. Learn the characters of taxa belonging to Gymnosperms, Angiosperms and fossil plants.

THEORY PAPER-IV: PLANT ANATOMY & DEVELOPMENTAL BIOLOGY (Elective)

Learning outcomes:

1. Understand the anatomy, embryology and palynology of angiosperms.
2. Learn the applied aspects of palynology, embryology and anatomy.

THEORY PAPER-VI: BIOINSTRUMENTATION AND METHODS IN BIOLOGY

Learning outcomes:

1. Understand the actual working and applications of different laboratory equipments
2. Learn the various techniques used in life sciences and their utility.

THEORY PAPER-VII: CELL BIOLOGY, GENETICS AND PLANT BREEDING

Learning outcomes:

1. Understand the structural organization and functions of cell and cell organelles.
2. Able to understand Gene structure, linkage groups, Genetic inheritance and extra chromosomal inheritance in plants.

3. Understand basic techniques of hybridization.

THEORY PAPER-VIII: PLANT RESOURCE UTILIZATION & BIODIVERSITY CONSERVATION

Learning outcomes:

1. Study of origin, cultivation and economic importances of various plant wealth
2. Learn the importance of biodiversity and motivation of students for its conservation

***THEORY PAPER-IX: PLANT ECOLOGY, ENVIRONMENTAL BIOLOGY AND PHYTOGEOGRAPHY (ELECTIVE)**

Learning outcomes:

1. Able to understand the ecological principles, structure and functions of ecosystem.
2. Learn about the causes of environmental pollution and its control measures.
3. Learn about different phytogeographic regions and their vegetation pattern.

M.Sc. II Year Botany

THEORY PAPER-XI: PLANT PHYSIOLOGY

Learning outcomes:

1. Understanding the mechanism of different water based process in plants.
2. Able to understand role of light, hormone in controlling plant activity
3. Understand important plant process i.e. photosynthesis and respiration.

THEORY PAPER-XII: MOLECULAR BIOLOGY AND BIostatISTICS

1. Detailed understanding about the nucleic acid.
2. Able to understand expression and regulation of different proteins in body
3. Understanding and interpretation of various statistical tools in biological experiments.

***Theory Paper-XIII: PLANT PATHOLOGY-I (PRINCIPLES OF PLANT PATHOLOGY)**

Learning Outcomes:

1. The students will be able to understand the importance of plant pathology and will help to develop interest in Plant Pathology.
2. They will bring the awareness among the farmers for losses caused due to epidemics
3. They will opt plant pathology as a Profession

***Theory Paper-XIV: PLANT PATHOLOGY-II (DISEASES OF CROP PLANTS AND THEIR MANAGEMENT)**

Learning Outcomes:

1. Student will know importance of sign and symptoms for detection of pathogens and disease, integrated methods of disease management, use of biological and chemicals in disease management.
2. Students will know symptoms, etiology, disease cycle and management of major diseases of cereals, pulses, oil seeds and vegetables.

THEORY PAPER-XIII: ANGIOSPERMS-I (SYSTEMATICS OF ANGIOSPERMS-I)

Learning outcomes:

1. Understand the pre and post Darwinian concept of classification
2. Learn the floral and vegetative characters of plants belonging to families
3. Able to identify plants belonging to angiosperms

THEORY PAPER-XIV: ANGIOSPERMS-II (PLANT STRUCTURE AND REPRODUCTIVE BIOLOGY)

Learning outcomes:

1. Understand the organization of Root and Stem Apical Meristem
2. Learn the basic and applied embryological aspects of angiosperms

THEORY PAPER-XIII: Seed Technology-I (PRINCIPLES OF SEED TECHNOLOGY)

Learning outcomes:

1. Student will adopt the skill of purity, viability and vigour testing
2. Student will properly maintain the storage conditions of seeds

THEORY PAPER-XIV: Seed Technology-II (SEED PATHOLOGY)

Learning outcomes:

1. Student will identify seed borne pathogens
2. Student will recommend the control measures for seed borne diseases.

THEORY PAPER- XVI: BIOCHEMISTRY AND PLANT METABOLISM

Learning outcomes:

1. Understanding the biochemistry and metabolism of amino acids, proteins including enzyme kinetics.
2. Able to understand nitrogen, sulphur and phosphorous metabolism in plant.
3. Understand role and importance of carbohydrate and lipids in plants.

THEORY PAPER- XVII: BIOTECHNOLOGY AND GENETIC ENGINEERING

Learning outcomes:

1. Understanding basic principle and process of tissue culture.
2. Large scale industrial application of plant tissue culture.
3. Able to understand the technique and process of cloning.

***THEORY PAPER-XVIII: PLANT PATHOLOGY-III (PHYSIOLOGICAL AND MOLECULAR PLANT PATHOLOGY)**

Learning Outcomes:

1. The students will be realize about physiological and molecular changes brought about in host plants
2. Student will think how to prevent the production of enzymes and toxins of plant pathogens.
3. They will understand how resistant varieties are developed against different pathogens

***THEORY PAPER-XIX: PLANT PATHOLOGY-IV (Diseases of Fruit Plants and their Management)**

Learning outcome

1. Students will know common pathogens, symptoms, etiology, disease cycle and management of major diseases of fruit plants.
2. Students will know common pathogens, symptoms, etiology, disease cycle and management of post harvest diseases of fruit plants.

THEORY PAPER-XVIII: ANGIOSPERMS-III (SYSTEMATICS OF ANGIOSPERMS-II)

Learning outcomes:

1. Understand the interrelationship and general characters of families belonging to orders
2. Learn the various concepts of species
3. Able to understand evolutionary aspects of angiosperms

THEORY PAPER-XIX: ANGIOSPERMS-IV (PHYTOCHEMISTRY AND PHARMACOGNOSY)

Learning outcomes:

1. Understand the concept of drug adulteration
2. Learn the pharmacognostical aspects of common drug plants
3. Understand the knowledge of important medicinal plants

THEORY PAPER-XVIIIIC: Seed Technology-III (Seed Production and Processing)

Learning outcomes:

1. Student will produce hybrid seeds in field crops
2. Student will adopt the skills of seed processing and handling of equipments

THEORY PAPER-XIXC: Seed Technology-IV (Seed Health Testing and Management)

Learning outcomes:

1. Student will acquire skill for identification of seed borne pathogens
2. Students will recommend the control measures of seed borne diseases.

M.Sc. I Year Computer Science

CS-101 Semester : I Computer Architecture and Microprocessor

Course Outcome :

1. Students will acquire skill of Assembly Language programming using 8086 Microprocessor
2. Student will be familiar with Internal Processing of Computers

CS-102 Semester I OOP Concepts using C++

Course Objectives :

1. To aware the students with the concept of Object oriented concepts
2. To master students in advanced programming languages faster which is useful for foundation of software development.

CS-103 Mathematical Foundations for Computer Science

Course Outcome:

At the end of the course student will be able to Understand the notion of mathematical thinking, mathematical proofs and to apply them in problem solving. Ability to understand use of

functions, graphs and their use in programming applications. Apply discrete structures into computing problems, formal specification, artificial intelligence, cryptography, Data Analysis.

CS-104 A Elective Relational Database Management System

Course Outcome:

1. To study the basic concepts of relational databases
2. Learn and practice data modelling using the entity-relationship and developing database designs.
3. Understand the use of Structured Query Language (SQL) and learn SQL syntax for writing queries.
4. Apply normalization techniques to normalize the databases.

CS-104 B Elective Computer Network

Course Outcome:

1. analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies;
2. specify and identify deficiencies in existing protocols, and then go onto formulate new and better protocols;
3. analyze, specify and design the topological and routing strategies for an IP based networking infrastructure
4. Have a working knowledge of datagram and internet socket programming

CS-105 Semester: I Lab-1 : C++ Programming

Course Outcome :

1. Confidence in C++.
2. Students will be skilled to learn fundamentals of advanced internet programming languages

CS-106 Semester: I Lab-2 : ALP using 8086 Microprocessor

Course Outcome :

1. Lab work will skill to apply the fundamentals of assembly level programming of microprocessors.
2. Students will be skilled to learn fundamentals of designing embedded systems

CS-201 Semester: II Design and Analysis of Algorithms

Course Outcome :

1. This course will aware the implementation of various advance algorithms to solve real world problem
2. Students will be skilled to select appropriate design techniques to solve various problems problems.

CS-202 Semester: II Software Engineering

Course Outcome : After completion of this course students will be able to

1. Learn various methods of software development.
2. Apply various software testing techniques.

CS-203 Semester: II Programming with VB .NET

Course Outcome :

1. Students will be able to develop simple as well as complex applications using .Net framework
2. Students will learn to use web applications for creating GUI based programs.

CS-204 A Elective Semester: II Advanced Operating System

Course Outcome :

1. Students will be able to Analyze the structure of OS and basic architectural components involved in OS design
2. Students will be able to Conceptualize the components involved in designing a contemporary OS

CS-204 B Elective Semester: II Compiler Designing

Course Outcome :

1. To realize the students basics of compiler design and apply for real time applications.
2. Students will get knowledge about compiler generation tools and techniques

M.Sc. II Year Computer Science

CS-301 Advance Database Administration

Course Outcomes:

Students Will be able to explain and evaluate the fundamental theories and requirements that influence the design of modern database systems. Students can analyze the background processes involved in queries and transactions, and explain how these impact on database operation and design

CS-302 Web-Technologies

Course Outcome

Students Will be Students are able to develop a dynamic webpage by the use of PHP and java script. On completion of this course, a student will be able to develop a web application using PHP and java script.

CS-303 Course Title:Data Mining & Data Warehousing

Course Outcome:

Students Will be Understand Data Warehouse fundamentals, Data Mining Principles. Identify appropriate data mining algorithms to solve real world problems

CS-304(A) Course Title:Artificial Intelligence

Course Outcome:

Students will be able to compare AI with human intelligence and traditional information processing and discuss its strengths and limitations as well as its application to complex and human-centered problems.

Students Will be able to apply the basic principles, models, and algorithms of AI to recognize, model, and solve problems in the analysis and design of information systems.

CS-304(B) Course Title: Mobile Application Development

Course Outcome:

Student will be able to write simple GUI applications.

Students will be also able to use built-in widgets and components, work with the database to store data locally.

CS-304(C) Course Title: Research Methodology

Course Outcome:

Students Will be demonstrate knowledge of research processes (reading, evaluating, and developing), Perform literature reviews using print and online databases.

CS-307-B Course Title: Cyber Security

Course Outcome:

Students will understand principles of web security.

Students will understand key terms and concepts in cyber law, intellectual property and cybercrimes, trademarks and domain theft.

CS-308 Course Title: SK-03 Seminar Presentation Activity

Course Outcome:

Help the student increase self-motivation, personal responsibility, and understanding of his or her role in being an informed participant in the educational process.

Create an environment that helps the student establish healthy relationships and support networks.

CS-401 Course Title: Digital Image Processing

Course Outcome:

Students will be Analyze images in the frequency domain using various transforms.

Evaluate the techniques for image enhancement and image restoration and also categorize various compression techniques.

CS-402 Course Title: Linux Administration

Course Outcome:

Students will be able carry the duties of a Unix system administer.

Students will learn to do file processing, process management, IO management, queues management, networking, storage backup, account management, proper system start-up and shutting down, as well as other tasks.

CS-403 Course Title: Major Project development Activity

Course Outcome:

Project based learning will increase their capacity and learning through shared cognition.

Students will have an ability to identify, formulate and implement computing solutions.

Students will be able to design a system, component or process as per needs and

specification.

CS-404-A Course Title:Client Server Technology

Course Outcome:

Gain Exposure on most common used servers.

Understand the concept of client-server development and learn problem solving skills through design scenarios for network environment.

CS-404-B Course Title:Software Testing Tools

Course Outcome:

At the end of the course the students will be able to Design test cases suitable for a software development for different domains. Identify suitable tests to be carried out and prepare test planning based on the document. Document test plans and test cases designed and Use of automatic testing tools.

CS-407-B Course Title:Logical Reasoning and Quantitative Aptitude

Course Outcome:

Understand the basic concepts of QUANTITATIVE ABILITY and LOGICAL REASONING Skills, acquire satisfactory competency in use of VERBAL REASONING and Solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning and Verbal Ability

M.Sc. I Year Herbal Medicine

THEORY PAPER – I: INDIAN SYSTEM OF MEDICINES

Learning outcomes:

1. Understand the different dosage forms, Methods of preparation of different types of medicines.
2. To know the difference between various systems of medicines

THEORY PAPER – II: TAXONOMY AND ANATOMY OF MEDICINAL PLANTS

Learning outcomes:

1. Understand the morphology, characters and importance of the various families of angiosperms.
2. Learn the skill for the Identification of plants
3. Understand the anatomical features of plants

THEORY PAPER – III: BIOCHEMISTRY AND PLANT METABOLISM

Learning outcomes:

1. Understand the mechanism of biosynthesis of different metabolites of plants.
2. Learn about the importance of nitrogen, amino acids, proteins and enzymes.

***THEORY PAPER – IV: CULTIVATION, PROPERTIES AND UTILIZATION OF MEDICINAL PLANTS**

Learning outcomes:

1. Understand the nutritional requirement of medicinal plant cultivation.
2. Learn the pharmacognostic properties of medicinal plants to avoid adulteration.

THEORY PAPER – VI: INSTRUMENTATION MODERN ANALYTICAL TECHNIQUES

Learning outcomes:

1. Understand the actual working and applications of different laboratory equipments
2. Learn the various techniques used in life sciences and their utility.

THEORY PAPER – VII: MICROBIOLOGY AND PATHOLOGY OF HUMAN DISEASES

Learning outcomes:

1. Understand the techniques of culturing and handling microorganism
2. Learn the herbal remedies of human diseases.

THEORY PAPER- VIII: MOLECULAR BIOLOGY AND GENETIC ENGINEERING

Learning outcomes:

1. Understand the structural organization and functions of cell and cell organelles.
2. Able to understand Gene structure, expression and manipulation with the help of various tools of genetic engineering.

***THEORY PAPER – IX: FUNDAMENTALS OF PHARMACOGNOSY (Elective)**

Learning outcomes:

1. Understand the detail pharmacognostic study of different drug plants.
2. Able to understand the importance of nutraceuticals in healthcare benefits.

M.Sc. II Year Herbal Medicine

THEORY PAPER-XI: NATURAL PLANT PRODUCTS

Learning Outcome:

1. Learn the methods of isolation and preliminary screening of phytochemicals.
2. Understand the knowledge of various biological enzymes

THEORY PAPER- XII: MEDICINAL PLANT BIOTECHNOLOGY

Learning Outcome:

1. Learn the Crop quality improving methods.
2. Understand the knowledge of basic and applied aspects of tissue culture
- 3 Outcome: Students will gain the knowledge about various strategies of plant tissue culture and students will gain knowledge about various secondary metabolites produced by plant tissue culture.

THEORY PAPER- XIII: HERBAL DRUG TECHNOLOGY

Learning Outcome:

1. Learn the making and uses of herbal medicines for common ailments
2. Understand the knowledge of Quality Control and Quality Assurance of Herbal ingredient

***THEORY PAPER- XIV: HERBAL COSMETICS (ELECTIVE)**

Learning Outcome:

1. Students will design the hair and skin care products
2. Student will establish a small scale industry of herbal cosmetics

THEORY PAPER- XVI: INDUSTRIAL PHARMACOGNOSY

Learning Outcome:

1. The student shall be able to Know the requirements for setting up the herbal/natural drug industry.
2. Student will understand the guidelines for quality of herbal/natural medicines and regulatory issues
3. Interest will develop to establish Herbal product industry

THEORY PAPER- XVII: HERBAL DRUG DEVELOPMENT

Learning Outcome:

1. Student will know the techniques for processing of herbs
2. Student will understand the methods of isolation and estimation of phytochemicals.
3. Student will prepare herbal formulations.

THEORY PAPER- XVIII: DRUG STANDARDIZATION AND VALIDATION

Learning Outcome:

1. Learn the good agricultural practices of herbal drug processing
2. Understand the knowledge of drug validation

***THEORY PAPER- XIX: REGULATORY AFFAIRS AND IPR (ELECTIVE)**

Learning Outcome:

1. Learn the clear information about the patent laws, intellectual property rights
2. Understand the knowledge of drug regulation in India and abroad.

M.Sc. I Year Microbiology

Paper Name: MICROBIAL PHYSIOLOGY

M.Sc. II Year Microbiology

Paper Name: MOLECULAR IMMUNOLOGY

Specific Course Outcome:

Student will be able to explain and categorize different types of lymphoid organs as primary and secondary lymphoid organs, immunogen and immunoglobulin, Organization and Expression of Immunoglobulin genes, and Major, Minor Histocompatibility Complexes and Clinical immunology.

Practical Paper Name: MOLECULAR IMMUNOLOGY

Specific Course Outcome:

Acquire skills to perform practical by Comparing various parameters according to different immunological techniques.

Paper Name: RECOMBINANT DNA TECHNOLOGY

Specific Course Outcome:

Student will be able to understand and explain the recombinant DNA technology, explain steps and tools in genetic engineering and apply recombinant DNA technology in medicine agriculture and veterinary sciences.

Practical Paper Name: RECOMBINANT DNA TECHNOLOGY

Specific Course Outcome:

Acquire skills to perform practicals of isolation, restriction digestion, ligation, amplification, gene mapping and gene cloning required for recombinant DNA technology.

Paper Name: MICROBIAL DIVERSITY AND EXTREMOPHILES

Specific Course Outcome:

Student will be able to understand and explain the microbial diversity present in different extreme environmental conditions in terms of their distribution, abundance, classification, structure and applications of their products.

Practical Paper Name: MICROBIAL DIVERSITY AND EXTREMOPHILES

Specific Course Outcome:

Students are enabled to isolate thermophiles, halophiles by studying different parameters. Isolation

of thermophiles from hot water spring (Study at least one thermostable enzyme).

1. Studies on halophiles isolated from high salt habitat. (Study its pigmentation and salt tolerance phenomenon).
2. Studies on alkalophiles and its enzymes (any one) isolated from extreme alkaline environment.
3. Biogenic methane production using different wastes.
4. Isolation of *Thiobacillus ferrooxidans* and *Thiobacillus thiooxidans* culture from metal sulfides, rock coal and acid mine water.

Paper Name: BIOSTATISTICS, COMPUTER APPLICATIONS AND RESEARCH METHODOLOGY

Specific Course Outcome:

Student will be able to understand explain and apply the biostatistics, computer and research methodology during his further studies.

Practical Paper Name: BIOSTATISTICS, COMPUTER APPLICATIONS AND RESEARCH METHODOLOGY

Specific Course Outcome:

Students develop skill to apply statistical knowledge and to correlate statistically extracted value by performing knowledge based practical. Also acquires skill to represent data by using the computer knowledge of MS Word, Excel and power point presentation.

Paper Name: FERMENTATION TECHNOLOGY

Specific Course Outcome:

Student able to understand and develop skill of the different microbial fermentation processes, production of fermentation products, therapeutic compound. Bioplastic production, biofertilizer production. Get aware of procedure of IPR, Trademark, copyright.

Practical Paper Name: FERMENTATION TECHNOLOGY

Specific Course Outcome:

Students develops skill of production and estimation of acid production glutamic acid, rifamycin production, thuricides, laboratory scale production of biofertilizer. Also acquires skills of microbial production of dextran and hydrogen gas.

1. Production and characterization of citric acid using *A. niger*.
2. Microbial production of glutamic acid.
3. Production of rifamycin using *Nocardia* strain.
4. Comparison of ethanol production using various organic wastes/raw materials. (Free cells / immobilized cells).
5. Production and extraction of thuricides.

6. Laboratory scale production of biofertilizers. (Nitrogen fixer/ Phosphate solubilizers/ Siderophore producers).
7. Microbial production of dextran by *Leuconostoc mesenteroids*.
8. Microbial production of hydrogen gas by algae.

Paper Name: MEDICAL AND PHARMACEUTICAL MICROBIOLOGY

Specific Course Outcome:

Student able to understand and develop skill for construct antibiotic, microbiological assay drug resistance. Explain the mechanism and action of antibiotic antimicrobial agent. apply safety in microbiology. students will gain the knowledge and can work in hospital, pharmacy and industry

Practical Paper Name: MEDICAL AND PHARMACEUTICAL MICROBIOLOGY

Specific Course Outcome:

Students develops skill of production and bioassay of penicillin, estimation of griseofulvin, production of therapeutic enzymes, determination of MIC and LD, sterility testing, and determination of antimicrobial activity of chemical compounds.

1. Spectrophotometric/ Microbiological methods for the determination of Griseofulvin.
2. Microbial production and Bioassay of Penicillin.
3. Bioassay of Chloramphenicol/Streptomycin by plate assay method or turbidometric assay methods.
4. Screening, Production and assay of therapeutic enzymes: Glucose Oxidase/Asperginase/beta lactamase.
5. Treatment of bacterial cells with cetrimide, phenol, and detection of Leaky substances such as amino acids, nucleic acids as cytoplasmic membrane damaging substances.
6. Determination of MIC and LD50 of Ampicillin / Streptomycin.
7. Sterility testing by using *B. sterothermophilus* / *B. subtilis*.
8. Testing for microbial contamination. Microbial loads from syrups, suspensions, creams, and other preparations, Determination of D-value and Z-value for heat sterilization in pharmaceuticals.
9. Determination of antimicrobial activity of chemical compounds (like phenol, resorcinol and formaldehydes) Comparison with standard products.

Paper Name: ENVIRONMENTAL MICROBIOLOGY

Specific Course Outcome:

Student able to understand and recognise characteristic of environment and ecosystem, characteristics of waste water, solid waste and its treatment by various methods such as aerobic and anaerobic treatment. Also explains biodeterioration, biotransformation & recovery of Metals & Metalloids and impact of these factors on environment.

Practical Paper Name: ENVIRONMENTAL MICROBIOLOGY

Specific Course Outcome:

Students develops skill and handling of physical analysis of sewage, measurement of BOD/COD, recovery of toxic metal ions from industrial effluent, study of municipal solid waste management, and

microbial dye decolouration.

1. Physical analysis of sewage/industrial effluent by measuring total solids, total dissolved solids and total suspended solids.
2. Determination of indices of pollution by measuring BOD/COD of different effluents.
3. Bacterial reduction of nitrate from ground waters
4. Isolation and purification of degradative plasmid of microbes growing in polluted environments.
5. Recovery of toxic metal ions of an industrial effluent by immobilized cells.
6. Utilization of microbial consortium for the treatment of solid waste [Municipal Solid Waste].
7. Biotransformation of toxic chromium (+ 6) into non-toxic (+ 3) by *Pseudomonas* species.
8. Tests for the microbial degradation products of aromatic hydrocarbons /aromatic compounds
9. Reduction of distillery spent wash (or any other industrial effluent) BOD by bacterial cultures.
10. Microbial dye decolourization/adsorption.

Paper Name: MICROBIAL BIOINFORMATICS, GENOMICS AND PROTEOMICS

Specific Course Outcome:

Students are able to predict the significance of the biological phenomenon on the basis of available data set. Student develops skill to apply the knowledge of bioinformatic for the analysis of microbial genome and proteins.

Practical Paper Name: MICROBIAL BIOINFORMATICS, GENOMICS AND PROTEOMICS

Specific Course Outcome:

Students develops skill of handling data bases for nucleic acid and protein sequences, structure detection by RASMOL software, gene and protein sequence analysis using BLAST algorithm

1. Studies of public domain databases for nucleic acid and protein sequences.
2. Determination of protein structure (PDB) by using RASMOL software
3. Genome sequence analysis by using BLAST algorithm
4. Protein sequence analysis by using BLAST algorithm
5. To prepare Phylogenetic tree and Cladogram using CLUSTAL-W

M.Sc. I Year Zoology

Paper I: Invertebrates: Structure and Function

Expected Outcomes:

1. Classify animals from different groups based on their features.
2. Explain the similarity and differences in structure and function of organs in different groups of animals.
3. Understanding about importance of integument and skeletal systems.
4. Compare the functional morphology different groups of invertebrates.

Paper II: Biosystematics, Taxonomy and Evolution

Expected Outcomes:

1. Classify animals from different groups based on their features.
2. Describe different taxa and elaborate on their anatomical and morphological features.
3. Identify and describe homologies between different groups of animals.
4. Identify and access taxonomic information in different online databases.
5. Describe evolutionary relationship between different taxa.
6. Explain about evolutionary distance between different taxa.
7. Infer phylogenetic information and prepare phylogenetic trees.

Paper III: Economic Zoology and Animal Behavior

Expected Outcomes:

1. Identify animal pathogenic diseases in humans and suggest remedial measures.
2. Evaluate and describe the economic impact of animals on human society.
3. Describe different culture methods relevant to aquaculture.
4. Identify and describe economically important fish and other animals.
5. Identify and explain different types of behavior patterns in animals.
6. Describe the importance of different behaviors in animal husbandry.

Paper IV(Elective): Quantitative Biology and Bio-Informatics

Outcomes:

- 1) Describe different methods of data handling using computers.
- 2) Feed and tabulate raw data using computer.
- 3) Explain and perform data representation using digital methods.
- 4) Access and download relevant information from different online databases of biological information.
- 5) Perform basic operations of gene sequence retrieval and compare them using different software.
- 6) Perform basic operations of protein structure retrieval and comparison using different software.

Paper IV (Elective): Conservation Biology

Expected Outcomes:

1. Ability to describe biodiversity and its role in ecosystem health.
2. Ability to understand and analyze ecological factors affecting biodiversity.
3. Knowledge about different biodiversity hotspots of India and their unique characteristics.
4. An understanding of methods and tools used for wildlife conservation in India.
5. An understanding of and ability to interpret the Laws governing natural biodiversity in India.
6. Ability to disseminate knowledge about biodiversity in India and the significance of its conservation.

Paper VI: Animal Ecology, Toxicology and Environmental Pollution

Expected Outcomes:

1. Describe the role of different gases in greenhouse effect.
2. Identify and suggest remedial measures to deal with different types of pollution.
3. Identify and describe adaptations of animals to different ecosystems.

4. Suggest and develop conservation and management strategies for a particular ecological problem.

Paper VII: Gamete Biology and Animal Development

Expected Outcomes:

1. Understand and describe the different developmental processes.
2. Describe different techniques and methods used in experimental embryology.
3. Elaborate on metamorphosis and regeneration in various and relate these processes to abnormalities in animals.
4. Identify and evaluate application of different ART techniques to different infertility conditions.
5. Describe different types of infertility in humans.

Paper VIII: Biochemistry and Immunology

Expected Outcomes:

1. Describe the structure and working of different components of vertebrate immune system.
2. Elaborate about the innate and adaptive immune responses in vertebrates.
3. Describe the different immunological disorders found in man.
4. Explain the different techniques in immunology
5. Elaborate about structure and application of antibodies in clinical therapy and biological research.

Paper IX: (Elective) Tools and Techniques for Biology

Expected Outcomes:

1. Identify and describe the different equipment and tools used in a biology laboratory.
2. Correctly operate different laboratory instruments.
3. Correctly operate different types of microscopes.
4. Prepare tissue for section cutting and correctly operate a microtome.
5. Choose and perform correct staining technique for any given tissue sections.
6. Describe cellular separation techniques.
7. Properly handle and maintain glassware.
8. Properly operate laboratory equipment.

Paper IX (Elective): Pathobiology & Medical Zoology

Expected Outcomes:

1. Explain about the different pathogens causing disease in man.
2. Describe the different parasites causing disease and disability in man and animals.
3. Ability to elaborate about the life cycle and biology of disease carrying vectors; suggest preventive and control measures for the said diseases.
4. An understanding of the relationship between changes in physiology of host and progress of pathogenesis in human beings and animals.

M.Sc. II Year Zoology

Title of the Paper: VERTEBRATES- STRUCTURE AND FUNCTION

Outcomes

1. Able to explain the broad classification of vertebrates based on features.
2. Describe relation between organ systems in different vertebrate groups.
3. Explain the significance of integument and skeletal systems of vertebrates.
4. Compare the structural and functional morphology of vertebrates.

Laboratory Course- XI- VERTEBRATES: STRUCTURE AND FUNCTION

Outcomes

1. Describe in detail the structure, affinities and adaptive features of vertebrates.
2. Able to dissect/demonstrate important organ systems in vertebrates.
3. Explain about structure of bony parts of different vertebrates.

Title of the Paper: MOLECULAR CELL BIOLOGY

Outcomes

1. Elaborate about contemporary developments in the field of molecular biology.
2. Explain the differences between prokaryotes and eukaryotes.
3. Describe the processes of cell communication and carcinogenesis.
4. Learn about latest in gene and genome structure, functions and organization.

Laboratory Course: XII- MOLECULAR CELL BIOLOGY

Outcomes

1. Perform extraction of DNA and RNA.
2. Perform micro-preparation of cell division stages and chromosomes.
3. Detect different types of biomolecules in sample.
4. Perform separation of biomolecules using different techniques.

Paper XIII-A: Applied Parasitology- I TITLE OF THE PAPER: MICROBES AND ARTHROPODS OF MEDICAL IMPORTANCE

Expected Outcomes:

1. Students are able to identify Microbes and Arthropods of medical importance.
2. Students can describe basics of microbes and arthropods of public health importance.
3. Students will be able to understand and apply the principles of controlling diseases caused by microbes and arthropods.
4. Students will be able to elucidate the Vector-Host-Pathogen relationship.
5. Students will be able to understand the basic components of the immune system and its role to protect the host against pathogens.

Applied Parasitology- I Lab Course XIII-A: MICROBES AND ARTHROPODS OF MEDICAL IMPORTANCE

Outcomes

1. Identify, classify and describe microbes and Arthropods of medical importance.
2. Explain about vector □ host □ pathogen relationships in arthropod □ borne diseases.
3. Elaborate about arthropod vectors and their control measures.
4. Appreciate the principles of controlling microbial and arthropod caused diseases.

Fishery Science- I Title of the Paper: Fish Morphology, Anatomy and Physiology- I

Outcomes

1. Explain the inter-relation between different groups of fish.
2. Be able to identify and broadly classify fish.
3. Appreciate the relation between environment and feeding and digestion in fish.
4. Describe the respiratory mechanisms in different groups of fish.
5. Explain the significance of biological rhythms in fish growth and reproduction.

Fishery Science- I Laboratory Course- XIII-B: Fish Morphology, Anatomy and Physiology- I

Outcomes

1. Describe morphology of fish from different groups.
2. Explain the structure of different types of scales in fish.
3. Identify and describe skeletal components of fish.
4. To learn about different feeding habits of fish based on their gut content.
5. To expose and study internal anatomy of fish of different groups.

Theory Paper- XIII-C Title of the Paper: INSECT STRUCTURE & FUNCTION

Outcomes

1. To describe the anatomy & morphology of head and mouth parts of insects.
2. To explain the structure of thorax & appendages and their functions in insects.
3. To represent the structure and functions of digestive, circulatory and excretory systems.
4. To elaborate about structure & working of respiratory, nervous & reproductive systems.

ENTOMOLOGY- I Laboratory Course XIII-C: INSECT STRUCTURE & FUNCTION

Outcomes

1. Describe the various anatomical and morphological structures of insects.
2. Demonstrate dissecting skills required in study of entomology.
3. Prepare permanent slides of insect organs.

Animal Physiology- I Title of the Paper: GENERAL PHYSIOLOGY- I

Outcomes

- 1) To describe the different mechanisms of homeostasis in animals.
- 2) To elaborate about and relate the structure and functions of neurons.
- 3) To explain respiratory functions under conditions of high altitude and under water.
- 4) To explain the relation between physiology of body with physical exercise and Yoga.

Animal Physiology- II Laboratory Course XIII-D: GENERAL PHYSIOLOGY- I

Outcomes

1. Correlate respiration with external environmental factors in animals.
2. Describe structure of neuro-endocrine function in animals.
3. Explain the different haematological parameters of animals.

Paper XIV-A: Applied Parasitology- II Title of the Paper: PROTOZOANS OF MEDICAL IMPORTANCE

Expected Outcomes:

1. Students are able to identify Protozoans of medical importance.
2. Describe basics of Protozoans of public health importance.

3. Able to understand and apply the principles of controlling Protozoan diseases.
4. Explain about Host-Parasite relationship.

Applied Parasitology- II Lab Course XIV-A: PROTOZOANS OF MEDICAL IMPORTANCE

Outcomes

1. Describe protozoans of medical importance.
2. Perform micropreparation, microscopy and photo-micrography of protozoans.
3. Identify pathogenic protozoans.
4. Isolate of pathogenic protozoans.

Fishery Science- II Title of the Paper: Fish Morphology, Anatomy and Physiology- II

Outcomes

1. Ability to describe the structure and functions of the nervous & reproductive systems.
2. Elaborate the migration patterns, growth & age determination methods of fish species.
3. Describe the specialized organs like swim bladder, electric & acoustic organs in fish.
4. Explain the working of endocrine and venom glands in fish.

Fishery Science- II Laboratory Course XIV-B: Fishery Science- II

Outcomes

1. Perform determination of fecundity, age and biometric constants in fish.
2. Describe anatomy of internal organs of fish.
3. Explain about migratory fish and specialized organs in fish.
4. Identify different endocrine gland micropreparations based on their histology.

Theory Paper- XIV-C Title of the Paper: INSECT TAXONOMY, INSECT DEVELOPMENT AND ECOLOGY

Outcomes

1. Ability to collect & process insect specimens.
2. Explain the detailed classification of insects.
3. Describe types of development and its stages in insects.
4. Elaborate about the ecology and social organization of insects.

Entomology- II Laboratory Course XIV-C: Insect Taxonomy, Insect Development and Ecology

Outcomes

1. Perform collection, curation and preservation of insect specimens.
2. Explain the systematics and taxonomy of insects.
3. Culture insects of economic and academic importance in the laboratory.
4. Identify and describe insect pests on plants.

Animal Physiology-II Title of the Paper: GENERAL PHYSIOLOGY- II

Outcomes

1. Ability to distinguish between prokaryotes and eukaryotes.
2. Trace relation between different aspects of metabolism.
3. Knowledge of different types of enzymes, their properties, functions and interactions.

4. An appreciation of energy pathways, intermediaries and dynamics in cells.

Animal Physiology-II Laboratory Course XIV-D: GENERAL PHYSIOLOGY- II

Outcomes

1. Elaborate about responses of animals to different types of stress.
2. Identify and describe eukaryotic cells organelles using a microscope.
3. Estimate organic biomolecules from animal tissues and body fluids.
4. Perform toxicity testing for chemicals in animals.

Theory Paper- I Title of the Paper: GENETICS AND GENETIC ENGINEERING

Outcomes

1. Explain the principles of Mendelian inheritance.
2. Describe gene and chromosomal inheritance and their disorders.
3. Elaborate about different tools and techniques used in recombinant DNA technology.
4. Discern the different tools used in cloning and gene transfer technology.

Laboratory Course XVI- GENETICS AND GENETIC ENGINEERING

Outcomes

1. Preparing and analyzing pedigree charts and karyograms from provided data.
2. Describe Mendelian and polygenic inheritance.
3. Elaborate about sex chromatin, meiotic, mitotic and polytene chromosomes.
4. Visualize and estimation of DNA/RNA using appropriate techniques.

Theory Paper- XVII Title of the Paper: MAMMALIAN ENDOCRINOLOGY

Outcomes

1. Appreciate the nature, functions and classification of hormones.
2. Describe general structure and functions of endocrine glands in mammals.
3. Trace the relation between pituitary and other endocrine glands.
4. Elaborate about endocrine role of adrenal, pancreatic and pineal tissue in humans.
5. Explain about functions of gastro-intestinal and reproductive hormones in humans.
6. Elaborate about the different endocrine disorders in humans.

Laboratory Course XVII: MAMMALIAN ENDOCRINOLOGY

Outcomes

1. Pinpoint anatomical location and surgical removal of endocrine glands in vertebrates.
2. To learn skills of micro-preparation of endocrine glands of vertebrates.
3. To study functional role of hormones in physiology of animals.
4. To study hormonal control of reproductive system in mammals.

Paper XVIII-A: Applied Parasitology- I Title of the Paper: Trematodes And Cestodes

Expected Outcomes:

1. Students will understand morphology, life cycle and pathogenesis of Trematode and Cestode infections.
2. Students will be able to identify clinical signs and suggest preventive measure in parasitic infections.
3. Students will understand structure and working of immunity system and appreciate its

role in resistance to parasitic infections.

4. Students will have the knowledge of endemic and national parasitic problems.

Applied Parasitology- I Lab Course XVIII-A: Trematodes and Cestodes

Outcomes

1. Familiarity with laboratory techniques of micro-preparation and microscopy.
2. Knowledge of morphologic criteria to differentiate Trematode and Cestode parasites.
3. Diagnosis of helminth parasites by studying morphology and pathogenesis.

Theory Paper- XVIII-B Title of the Paper: Fisheries and Fish Culture- I

Outcomes

1. Knowledge of capture and culture fishery practices of India and methods adopted.
2. Suggest design and management procedures for a fish farm.
3. Carry out artificial fish breeding and weed control in a fish farm.
4. Identify various fish diseases and suggest treatments.
5. Elaborate about different fish preservation methods.
6. Evaluate suitability of different fish for making by-products.

Laboratory Course XVIII-B: Fisheries and Fish Culture- I

Outcomes

1. Able to identify and describe the Indian Major Carps and Exotic Carps.
2. Drafting the layout of a fish farm.
3. Perform different soil tests used in farm management.
4. Describe the different fish parasites and suggest their control measures.
5. Discuss different fish by-products and their processing methods.
6. Elaborate on method of preparation of different fish feed formulations.

Theory Paper- XVIII-C Title of the Paper: ECONOMIC ENTOMOLOGY

Outcomes

1. Describe the principle and practices in sericulture and lac culture.
2. Explain and demonstrate techniques used in apiculture and butterfly farming.
3. Elaborate application of entomology in forensic science and medicine.
4. Identify and initiate control measures against household insect pests.

Laboratory Course XVIII-C: ECONOMIC ENTOMOLOGY

Outcomes

1. Knowledge of economically important insects.
2. Ability to culture honey bees and lac insects.
3. Appreciation of insects of forensic importance and domestic insect pests.

Theory Paper- XVIII-D Title of the Paper: Mammalian Physiology- I

Outcomes

1. An understanding of digestive system structure, functions & its disorders.
2. Knowledge of respiratory system function and its pathological conditions.
3. Ability to describe circulatory system, its components, functions & diseases.
4. Appreciation of excretory system structure, functions & related disorders & their tests.

Animal Physiology- I Laboratory Course XVIII-D: Mammalian Physiology- I Outcomes

1. Perform analysis of animal tissue and body fluids like saliva, blood and urine.
2. Explain the relation between body fluid composition and health status of animals.
3. Elaborate about relation between environmental factors on body functions and health.

Paper XIX-A: Applied Parasitology- II Title of the Paper: Animal Nematodes and Plant Nematodes

Expected Outcomes:

1. A good understanding of parasitology in general and Nematodes in particular.
2. Knowledge of plant nematology, especially of disease caused by parasitic nematods.
3. Understanding of structural and functional organization of nematodes.
4. Knowledge of pathogenesis of plant and animal nematode parasites.
5. An understanding of methods of nematode disease prevention.
6. Knowledge of life history and ecology of larval and adult nematodes.

Applied Parasitology- II

Lab Course XIX-A: Animal Nematodes and Plant Nematodes

Outcomes

1. Identify different stages of nematodes in body fluids, tissue and stools of animals.
2. Demonstrate skills of collection, preservation, processing and identification of nematodes.
3. Elucidate the importance of nematodes in spread of plant diseases.
4. Describe methods of analysis of population dynamics data of nematodes.
5. Perform histochemical, histopathological and biochemical analysis of nematodes.
6. Recognize safety procedures relevant to parasitic diseases.

Theory Paper- XIX-B Title of the Paper: Fisheries and Fish Culture- II

Outcomes

1. Describe the fishery resources of India.
2. Knowledge about culturable organisms and different culture methods.
3. Identify and assess the anthropogenic threats to fishery industry.
4. Knowledge of marine capture and culture fishery of India and legislative framework to regulate it.

Laboratory Course XIX-B: Fisheries and Fish Culture- II

Outcomes

1. Identify and describe different types of cages used in aquaculture.
2. Describe the different economically important fish and shell fish.
3. Explain the structure and operation of different craft and gear used in fishery activity.
4. Perform water analysis tests used in fish farm management.

Theory Paper- XIX-C Title of the Paper: AGRICULTURE ENTOMOLOGY & PEST MANAGEMENT

Outcomes

1. Describe morphology and life stages of insect pests of agricultural crops.
2. Identify agricultural insect pests and suggest control measures.
3. Knowledge about different types of pesticides used in agriculture.
4. Identify agents and chemicals used in integrated pest management.

Laboratory Course XIX-C: AGRICULTURE ENTOMOLOGY & PEST MANAGEMENT

Outcomes

1. Identify and describe insect pests and damage caused by them.
2. Explain the different techniques of pest quantification.
3. Describe and suggest strategies for integrated pest management.
4. Identify and describe equipment used in agricultural pest management.

Theory Paper- XIX-D Title of the Paper: Mammalian Physiology- II

Outcomes

1. To describe and elaborate about nervous system components and their functions.
2. To outline reproductive system structure, functions, related conditions and remedies.
3. To delineate muscle structure, functioning mechanism, and disorders
4. To represent about the sensory system, their working, and disorders.

Animal Physiology- II Laboratory Course XIX-D: Mammalian Physiology- II

Outcomes

1. Perform experiments to demonstrate structure and function of muscles.
2. Separate and estimate carbohydrates and proteins from tissues.
3. Demonstrate localization of carbohydrates, proteins and lipids in tissues.

M.Sc. I Year Physics

PHY 101 – Mathematical Methods in Physics (Core-1)

Learning Outcomes: *After completion of this course students are capable of using the learned mathematical techniques to solve problems in physics such as the use and applications of matrices, the differential equations, the special functions, Fourier series and integral transform and complex functions. Students can apply these learned techniques not only to physics related problems but can extend the use and their applications to Engineering Science and Technology, Biotechnology, Biophysics etc.*

PHY 102 – Classical Mechanics (Core-2)

Learning Outcomes: *After completion of the course the students shall be able to apply Newton's laws of motion to solve complicated problems involving multiple bodies and use the concepts of classical mechanics to the classical rigid bodies. The knowledge acquired through this course will enable the students to lay the foundation of application of the classical dynamics, space dynamics and also for modern physics.*

PHY 103 – Atomic and Molecular Physics (Core-3)

Learning outcomes: *Upon successful completion of these modules, students will be able to understand*

and explain the following;

- 1. The atomic spectra of one valance electron atoms.*
- 2. what is meant by LS and JJ coupling in case of two valance electron atoms and the origin of spinorbit interaction*
- 3. Use appropriate quantum numbers for labeling of energy levels/terms symbols.*
- 4. The change in behavior of atoms in external applied electric and magnetic field.*
- 5. Diatomic molecules, the origin of electronic, vibrational and rotational energy levels, calculate energy levels,*
- 6. Analyze rotational, vibrational, electronic and Raman spectra of molecules*
- 7. To undertake simple calculations of bond lengths, rotational constant, dissociation energy, and relative level populations*

PHYCT 104 – Electronic Devices and Applications (Core-4)

Learning Outcome: *After completion of this course, students will be able to explain the working principles and application of various electronic devices used in various electronic gadgets of domestic uses. They will also understand the construction, working and operational characteristics of semiconductor devices and their applications in advanced electronics industries. The students will also understand the utility and functioning of the microprocessors, the heart of the advanced computing machines.*

PHY 201 – Quantum Mechanics (Core-7)

Learning outcome: *Upon successful completion of these modules, students will be able to understand that quantum mechanics is basic of many branches of Physics and will be able to apply quantum theory to other applied areas like nuclear physics, atomic and molecular physics, solid state physics, laser physics etc. The students will be able to relate the ideas and concepts from physics to chemistry, materials science and engineering. Students will be able to use quantum theory to model natural and physical phenomena in materials science, chemistry and nanotechnology. Students will be able to understand and explain the differences between classical and quantum mechanics. They will be able to understand the idea of wave function and to solve Schrodinger equation for simple potentials.*

PHY 202 – Statistical Mechanics (Core-8)

Learning Outcome: *The main outcome after learning the course is that students can apply and extend concepts learned in this course to theoretical physics. Students will be well acquainted with the particle nature on the basis of distribution laws and their uses in order to illustrate propertis of most exotic systems like white dwarf stars, superfluid materials, etc.*

PHY 203 – Numerical Techniques in Physics (Core-9)

Learning Outcomes: *After completion of the course students shall be able to employ the studied numerical techniques to solve problems in physics related to the applications like data handling and fitting, finding solutions and root of equations, solving the differential and integral equations, simultaneous equations and partial differential equations. They shall also be well versed with writing their programmes using C-language of computer programming. Students can*

apply these learned techniques not only to physics related problems but can extend the use and their applications to Engineering science and technology, Biotechnology, Biophysics etc.

PHY 204 – Condensed Matter Physics (Core-10)

Learning Outcome: *After completing the course students will have knowledge of different types of solids and an understanding of how their microscopic structure affects their mechanical, thermal and electrical properties*

M.Sc. II Year Physics

PHY 301 – Electrodynamics

Learning Outcome: *Upon successful completion of this course students will be able to apply the knowledge of Maxwell's equations to a variety of problems including various types of charge distributions including time-dependent processes, tackle the problems related to the propagation and scattering of EM waves in a variety of media, understand how to design EM sources of different powers, and will also be able to have a good understanding of the relativistic electrodynamics.*

PHY 302 – Nuclear and Particle Physics

Learning Outcome: *After the completion of the subject the students are able to know its Scientific and technological applications in addition with social, economic and environmental implications.*