

## Course Outcomes

### B.Sc-CHEMISTRY

#### **CHE-101T: Analytical/Physical and Inorganic Chemistry-I.**

- Understand basic laboratory practices, safety, and precautions in the chemistry lab.
- Understand and describe the concepts of chemical analysis, accuracy, and statistical data treatment.
- Understand and explain the principle of titrimetric analysis, limitations of classical elements
- Apply the concepts of determination of hardness of water, Schrodinger wave equation for particles in one dimension and ionization enthalpy.
- Analysis and evaluate the properties of elements of the periodic table.

#### **CHE-101P: Analytical/Physical and Inorganic Chemistry Lab-I.**

- To handle the glassware, prepare the dilute solutions, and perform the experiments with prepared reagents.
- Strengthen the concepts of mole and stoichiometry.
- To determine the analyte through volumetric and gravimetric analysis and understand the chemistry involved in each method of analysis.

#### **CHE-201T: Analytical/Physical and Inorganic Chemistry-II**

- Gain the knowledge on implementing the basic techniques to monitor the properties of liquids and solutions which are valuable methods to control the quality of incoming and final products in many industrial areas.
- Photo means light. Exposure of light on different chemicals produce colour of chemicals and also can carry out chemical conversion. This course discussed the theoretical basics of photochemistry.
- Chemical bonding theory (covalent, ionic, metallic) explains how atoms are held together in these different types of structure. This theoretical chemical bonding knowledge, backed up with experimental evidence, helps scientists to design and engineer new materials with desirable properties for specific uses.
- Students will be acquainted with the knowledge on application of zeolites in the water treatment processes.
- Students will be able to compare the properties of noble gases and design their applications in relevant fields such as metallurgical processes, photography, medical imaging systems, radiotherapy etc.

- Impart technical knowledge about chromatographic techniques and their applications for separation of inorganic and organic compounds.
- Recognize and distinguish between aromatic and anti-aromatic compounds by their structures.
- Illustrate the mechanism involved in SN2 reactions, SN1 reactions, E1 reactions and E2 reactions of alkyl halides.

### **CHE-201P: Analytical/Physical and Inorganic Chemistry Lab-II**

- Students would learn the importance of green methods over conventional methods.
- Students gain the basic knowledge as how to select a solvent for crystallization of organic compounds and get trained as how to purify a compound.
- Students would understand the mechanism behind the reaction and role of catalysts in enhancing reaction rate and yield.

### **CHE-301T ANALYTICAL and ORGANIC CHEMISTRY II [ Theory | regular ]**

- Understand the validation parameters in chemical analysis, principle of chromatography, isomerism in organic compounds, and reactions of intermediates.
- Investigating molecules with two or more chiral centres, construction of calibration graph, column efficiency, and crossover experiments.
- Evaluate the limitations of Beer's law, the mechanism of the cation and anion exchange process, optical activity, and isotopic studies.
- Analyze the solvent extraction method for metal ions, Nernst distribution law, and configuration of molecules and applications of reaction intermediates.
- Describe Beer's law, classification of chromatographic methods, E/Z notations for molecules, and relative stability of reaction intermediates.

### **CHE-301P ANALYTICAL and ORGANIC CHEMISTRY Lab-II [ Practical]**

- To understand the importance of instrumental methods for quantitative applications
- Apply colorimetric methods for accurate determination of metal ions and anions in water samples
- To learn how functional groups in a compound are responsible for its characteristic properties and the importance of qualitative tests in identifying functional groups.

### **CHE-OEC-302 Environmental and Green Chemistry [ Theory | elective ]**

- Understand the key concepts of environmental chemistry, including the structure and evolution of the atmosphere, and the Oxygen, Carbon, and Nitrogen cycles.
- Analyze the causes and effects of environmental pollution, the importance of green chemistry and sustainable technologies.
- Evaluate energy resources, distinguishing between conventional and non-conventional sources, and explore hydrogen as a potential alternative energy solution.

### **CHE-401T: Inorganic and Physical Chemistry-II**

- Predict the nature of the bond formed between different elements
- Identify the possible type of arrangements of ions in ionic compounds
- Write Born - Haber cycle for different ionic compounds
- Relate different energy parameters like, lattice energy, entropy, enthalpy and solvation energy in the dissolution of ionic solids
- Explain covalent nature in ionic compounds
- Write the M.O. energy diagrams for simple molecules
- Differentiate bonding in metals from their compounds
- Learn important laws of thermodynamics and their applications to various thermodynamic systems

### **CHE-401P: Inorganic and Physical Chemistry-II [ Practical ]**

- Understand the chemical reactions involved in the detection of cations and anions.
- Explain basic principles involved in classification of ions into groups in semi-microqualitative analysis of salt mixture
- Carry out the separation of cations into groups and understand the concept of common ion effect. Understand the choice of group reagents used in the analysis.

### **CHE-501T Inorganic chemistry - III & Organic chemistry - III [ Theory | regular ]**

- Understand the geometry and applications of coordination compounds, rearrangement reactions, and nuclear reactions.
- Analyze the classification of alloys and reactions of amines and carbonyl compounds.
- Describe the distinct functions of alloying elements, theories and structure of bonding in coordination compounds, and properties of amines and carbonyl compounds.

- Investigate the structure of ferrocene, mass defect, tautomerism in carbonyl compounds, and mechanism of ester hydrolysis.
- Evaluate Nucleophilic addition reactions, eighteen electron rule, half-life period of a radioisotope, and Action of heat on dicarboxylic acids.

### **CHE-501P Inorganic Chemistry -III [ Practical ]**

- To estimate the various elements through volumetric and gravimetric analysis and understand the chemistry involved in each analysis method.
- To prepare and analyse the inorganic complexes.
- To understand the mechanism behind the reactions and the role of catalysts in enhancing reaction rate and yield.

### **CHE-502T Physical Chemistry - III & Spectroscopy - I [ Theory | regular ]**

- Understand the chemical kinetics, photochemical process, electrochemical reactions and fundamentals of quantum mechanics and molecular spectroscopy.
- Explore the importance of phase diagrams, electrochemical cell reactions, and the electromagnetic spectrum.
- Analyze and interpret common ion effects, principles of photochemistry and Molecular spectroscopy.
- Develop expertise in the fundamental concepts of quantum mechanics, kinetics of chain reaction and molecular, vibrational, rotational, Raman and NMR spectroscopy.
- Evaluate the theory of indicator, electrode potential, significance of quantum yield and identification of molecules using spectroscopy.

### **CHE-502P Organic Chemistry and Physical Chemistry-III [ Practical | regular ]**

- Students will be able to plan and execute single and two-step synthesis of small organic molecules.
- Students would understand the mechanism behind the reaction.
- Students will be able to determine different physical parameters.

### **CHE-601T: INORGANIC CHEMISTRY and ORGANIC CHEMISTRY– IV**

- To develop a solid understanding of the different materials used in industry, including their properties, applications, and manufacturing processes.

- To acquire an understanding of various fertilizer types, their categorization, and the production methods for different fertilizers.
- To understand the various nanostructures and their classification and knowledge of conducting polymers, superconductors, and fullerenes.
- To understand the concepts of nanomaterial, conducting polymers, superconductors, and fullerenes.
- A comprehensive understanding of electro analytical methods about voltammetry, including polarography and cyclic voltammetry, and thermal methods of analysis. 6. To understand the fundamental principles of thermodynamics and apply these concepts effectively to solve practical problems.
- To understand the fundamental principles of instrumental analysis.
- To understand the physical properties, molecular structures, and the practical applications of concepts like pyro electricity, piezoelectricity, ferroelectricity, and various electrical effects.

### **CHE 601-P : INORGANIC CHEMISTRY AND ORGANIC CHEMISTRY PRACTICAL**

- To estimate the analytes through conductometric and potentiometric titration methods.
- To demonstrate skills in pH meter to assess pKa values, pH, the degree of hydrolysis, dissociation constants, and isoelectric points in various compounds

### **CHE-602T : Paper VIII (Organic chemistry - IV & Spectroscopy - II)**

- Recognize and classify heterocyclic compounds based on their ring structures and heteroatoms.
- Understand the principles and strategies involved in the total synthesis of complex natural products.
- A thorough knowledge of the structure, chemistry and functions of biomolecules like carbohydrates, lipids and proteins
- To understand the various polymers, their preparation, structure, properties, and applications.
- A comprehensive understanding of chemotherapy and drug classification and synthesis of specific drugs and the structure and uses of important antibiotics
- The basic characteristics of enzyme and its classification, mechanism enzyme action, enzyme kinetics, enzyme inhibition and co-enzymes
- A comprehensive understanding of the classification of vitamins and their biological significance.
- To introduce students to various spectroscopic techniques, including UV-Vis, IR, NMR, and their applications in organic compound analysis.

### **CHE-602P: Organic Chemistry-IV**

- To develop skills in quantitative analysis of amino acids, ketones, and phenols.
- To learn the importance of qualitative tests in carbohydrates and proteins.
- To expertise in synthesizing a variety of organic compounds.

## **B.Sc Mathematics**

### **MAT-101T: Algebra - I and Calculus - I**

- Learn the row reduced echelon form, rank of a matrix, homogeneous and nonhomogeneous system of linear equations, characteristic equation, Eigen values, Eigen vectors, limit, continuity, differentiability, statements of mean value theorems, relation between Cartesian and polar form,  $\tan\phi$ , polar subtangent, polar subnormal, derivative of an arc length, curvature, radius of curvature, centre of curvature, evolutes and envelopes,  $n^{th}$  derivative of standard functions, Leibnitz rule, partial derivative, asymptotes and singular points.
- To solve systems of linear equations both homogeneous and non-homogeneous, problems on Gauss elimination method, Cayley-Hamilton theorem, evaluate limit of a function, check for continuity, verify differentiability, verification of mean value theorems, evaluate limits using L'Hospitals rule, polar subtangent, angle of intersection of two curves, pedal equation (Cartesian and polar form), derivative of arc length,  $n^{th}$  derivative of product of functions, asymptotes parallel to axis, singular points, finding second order partial derivatives.
- Finding  $A^{-1}$  using row reduced echelon form, Determine the  $p - r$  equations (Cartesian, parametric and polar form), Radius of curvature, Centre of curvature, evolutes, Analyze and trace standard curves like the Astroid, Cissoid, Folium of Descartes, Strophoid, Cardioid, Three-leaved rose, Four-leaved rose, and Cycloid.
- To prove the theorems on limits, continuity, differentiability, mean value theorems, Problems on Taylor's and Maclaurin's expansion evaluation of limit of all indeterminate form using L'Hospitals rule,  $n^{th}$  derivatives of Standard functions, Leibnitz rule and its applications, finding second order partial derivatives.
- To develop and promote research culture in interdisciplinary and multidisciplinary areas through project/seminar/group discussion.

### **MAT-101P: Algebra - I and Calculus – I Lab-I**

- Learn Free and Open-Source Software (FOSS) tools for computer programming.
- Solve problem on algebra and calculus theory studied in MAT-101T by using FOSS software's.
- Acquire knowledge of applications of algebra and calculus through FOSS

## **MAT-OEC-102: Corporate Mathematics**

- Learn types of equations, quadratic equations, raw data, attributes and variables, classification of data, frequency distribution, cumulative frequency distribution, histogram, requisites of ideal measures of central tendency, empirical relation among mean, median and mode, geometric mean, harmonic mean, linear inequalities, characteristics of standard form of LPP, classification of solutions.
- Learn simple linear equations, solution of simultaneous equations by elimination method, substitution method and rule of cross multiplication method, arithmetic mean, median and mode for ungrouped and grouped data, combined mean, harmonic mean, merits and demerits of measures of central tendency, choice of A.M., G.M., and H.M., range, variance, standard deviation, tabulation, Bar graphs, linear inequalities and their graphs, characteristics of standard form of LPP, solution of system of linear equations – basic feasible, degenerate solutions.
- Learn quadratic equation by factorization method and formula method, harmonic mean, measures of dispersion and types, Range, Variance, Standard deviation (SD) for grouped and ungrouped data, combined SD, coefficient of range, and coefficient of variation, pie charts, line graphs, solution of LPP by graphical method.
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## **MAT-201T: Algebra - II and Calculus – II**

- Recognize the mathematical objects called Groups.
- Link the fundamental concepts of groups and symmetries of geometrical objects.
- Explain the significance of the notions of Cosets, normal subgroups and factor groups.
- Understand the concept of differentiation and fundamental theorems in differentiation and various rules.
- Find the extreme values of functions of two variables.

## **MAT-201P: Algebra -II and Calculus – II Lab-II**

- Learn Free and Open Source Software (FOSS) tools for computer programming
- Solve problem on algebra and calculus by using FOSS software's.
- Acquire knowledge of applications of algebra and calculus through FOSS

## **MAT-OEC-202: Commercial Mathematics**

- Learn concepts of set types of sets and Venn diagrams.
- Learn concepts of Relations and functions
- Learn concept of permutation and combination with application problems.
- Learn concept of probability, definitions of events, occurrences of events.
- Learn some rules of probability and application problems.



- Learn to calculate percentage and ratios in application problems. learn definitions of proportions and properties.
- Apply these concepts in commercial problems.

### **MAT-301T: Ordinary Differential Equations and Real Analysis – I**

- Solve first-order non-linear differential equations and linear differential equations.
- To model problems in nature using Ordinary Differential Equations.
- Formulate differential equations for various mathematical models.
- Apply these techniques to solve and analyze various mathematical models.
- Understand the fundamental properties of the real numbers that lead to define sequence and series, the formal development of real analysis.
- Learn the concept of Convergence and Divergence of a sequence.
- Able to handle and understand limits and their use in sequences, series, differentiation, and integration.
- Apply the ratio, root, alternating series, and limit comparison tests for convergence and absolute convergence of an infinite series.

### **MAT-301P: Ordinary Differential Equations and Real Analysis – I Lab-I**

- Free and Open-Source software (FOSS) tools or computer programming.
- Solving exact differential equations,
- Plotting orthogonal trajectories.
- Finding complementary function and particular integral of linear and homogeneous differential equations.
- Acquire knowledge of applications of real analysis and differential equations.
- Verification of convergence/divergence of different types of series.

### **MAT-OEC- 301: Quantitative Mathematics**

- Understand number system and fundamental operations.
- Understand the concept of linear quadratic and simultaneous equations and their applications in real life problems.
- Understand and solve the problems based on Age.
- Solve Speed and Distance related problems.

### **MAT-401T: Integral Transforms and Partial Differential Equations**

- Solve the partial differential equations of the first order and second order.
- Formulate, classify, and transform partial differential equations into canonical form.
- Solve linear and non-linear partial differential equations using various methods; and apply these methods to solving some physical problems.
- Able to take more courses on wave equation, heat equation, and Laplace equation.
- Solve PDE by Laplace Transforms and Fourier Transforms.



### **MAT-401P: Integral Transforms and Partial Differential Equations Lab-I**

- Learn Free and Open-Source software (FOSS) tools or computer programming.
- Solve problems on Partial Differential Equations and Integral Forms.
- To find Laplace transform of various functions.
- To find the Fourier Transform of periodic functions.
- To solve differential equations by using Integral transform.

### **MAT-501T: Advanced Algebra and Complex Analysis**

- Explain the concepts and use equations, formulae and mathematical expressions and relationships in a variety of contexts
- Apply the knowledge in solving problems
- Ability to solve problems and evaluate them.

### **MAT-501P: Advanced Algebra and Complex Analysis Lab**

- Learn Free and Open-Source Software (FOSS) tools for computer programming.
- Solve problem on Advanced Algebra and Complex Analysis studied in MAT-501T by using FOSS software's.
- Acquire knowledge of applications of Advanced Algebra and Complex.

### **MAT-502T: Advanced Vector Calculus**

- Explain the concepts and use equations, formulae and mathematical expressions and relationships in a variety of contexts
- Apply the knowledge in solving problems
- Ability to solve problems and evaluate them.
- Analyze and demonstrate mathematical skill

### **MAT-502P: Advanced Vector Calculus Lab**

- Learn Free and Open-Source Software (FOSS) tools for computer programming.
- Solve problems related to Vector Calculus, Improper integrals and Calculus of variations using FOSS software.

### **MAT-601T: Linear Algebra, Beta and Gamma Functions and Calculus of Variation**

- Explain the concepts and use equations, formulae and mathematical expressions and relationships in a variety of contexts
- Apply the knowledge in solving problems
- Ability to solve problems and evaluate them.
- Analyze and demonstrate mathematical skill

### **MAT-601P: Linear Algebra, Beta and Gamma Functions and Calculus of Variation Lab**

- Learn Free and Open-Source Software (FOSS) tools for computer programming.

- Solve problem on Linear Algebra studied in MAT-601T by using FOSS software's.
- Acquire knowledge of applications of Linear Algebra through.

### **MAT-602T: Numerical Analysis**

- Explain the concepts and use equations, formulae and mathematical expressions and relationships in a variety of contexts
- Apply the knowledge in solving problems
- Ability to solve problems and evaluate them.
- Analyze and demonstrate mathematical skill

### **MAT-602P: Numerical Analysis Lab**

- Learn Free and Open-Source Software (FOSS) tools for computer programming.
- Solve problem on numerical Analysis studied in MAT-602T by using FOSS software's.
- Acquire knowledge of applications of Numerical Analysis through FOSS.

## **B.Sc Zoology**

### **Cytology, Genetics and Infectious Diseases**

- Basic Biomolecules helps the students to understand various physiological process taking place in the living system
- A sound knowledge of physiology of life process like, Digestion, respiration, circulation, nervous control enables them to understand the importance of these system for survival.
- Concepts of endocrinology enables students to understand the pathophysiology and clinical manifestation of endocrine glands.
- Students will be able to analyze a ECG in relation to physiological events and various disease states, including conduction abnormalities, probability of tachycardia and describes clinical significance.
- Understanding of molecular basis of catalysis by enzymes and the underlying basis of their specificity and clinical importance of enzyme inhibitors.

### **Course Title: Parasitology**

- They will be able to interpret various ways of parasitic infection and disease caused by them. Illustrate the complexities of the parasite-host relationship and appraise the impact of parasitic diseases on human societies. Analyze laboratory methods used to detect and identify parasites.

### **Molecular Biology, Bioinstrumentation & Techniques in Biology**

- After successful accomplishment of the course, the learners will be able to acquire better understanding and comprehensive knowledge regarding most of the essential aspects of Molecular Biology subject which in turn will provide a fantastic opportunity to develop professional skill related to the field of molecular biology.

- The course will mainly focus on the study of principal molecular events of cell incorporating DNA Replication, Transcription and Translation in prokaryotic as well as eukaryotic organisms.
- Acquiring knowledge on instrumentation and techniques in biology.

### **Animal Behaviour**

- Examine and critically to evaluate the emergence of ideas that have shaped how we observe and collect data on animal behaviour.
- Understand the main historical ideas that underpin animal behaviour theory
- Critically review hypotheses to explain animal behaviour
- Understand different methods for collecting data on animal behaviour
- Have advanced their written and oral presentation skills

### **Gene Technology Immunology and Computational Biology**

- Acquaint knowledge on versatile tools and techniques employed in genetic engineering and recombinant DNA technology.
- An understanding on application of genetic engineering techniques in basic and applied experimental biology.
- To acquire a fundamental working knowledge of the basic principles of immunology.
- To understand how these principles, apply to the process of immune function.
- Use, and interpret results of, the principal methods of statistical inference and design; helps to communicate the results of statistical analyses accurately and effectively; helps in usage of appropriate tool of statistical software.

### **Non-Chordates and Economic Zoology**

- Group animals on the basis of their morphological characteristics/ structures.
- Demonstrate comprehensive identification abilities of Non-Chordate diversity.
- Explain structural and functional diversity of Non-Chordates
- Develop understanding on the diversity of life with regard to protists, non-chordates and chordates.
- Examine the diversity and evolutionary history of a taxon through the construction of a basic phylogenetic/ cladistics tree.

### **Chordates and Comparative Anatomy**

- To demonstrate comprehensive identification abilities of chordate diversity
- Able to explain structural and functional diversity of chordate diversity
- To understand evolutionary relationship amongst chordates
- To take up research in biological sciences.
- To realize that very similar physiological mechanisms are used in very diverse organisms.

- To Get a flavor of research by working on project besides improving their writing skills. It will further enable the students to think and interpret individually.

### **Evolutionary & Developmental Biology**

- Understand that by biological evolution we mean that many of the organisms that inhabit the earth today are different from those that inhabited it in the past.
- Understand that natural selection is one of several processes that can bring about evolution, although it can also promote stability rather than change.
- Understand how the single cell formed at fertilization forms an embryo and then a full adult organism.
- Integrate genetics, molecular biology, biochemistry, cell biology, anatomy and physiology during embryonic development.
- Understand a variety of interacting processes, which generate an organism's heterogeneous shapes, size, and structural features.
- Understand how a cell behaves in response to an autonomous determinant or an external signal, and the scientific reasoning exhibited in experimental life science.

### **Environmental Biology, Wildlife Management & Conservation**

- Develop an understanding of how animals interact with each other and their natural environment.
- Develop the ability to use the fundamental principles of wildlife ecology to solve local, regional and national conservation and management issues.
- Develop the ability to work collaborative team-based projects.
- Gain an appreciation for the modern scope of scientific inquiry in the field of wildlife conservation management.
- Develop an ability to analyze, present and interpret wildlife conservation management information.

## **B.Sc Botany**

### **MICROBIAL DIVERSITY AND TECHNOLOGY**

- Understand the fascinating diversity, evolution, and significance of microorganisms.
- Comprehend the systematic position, structure, physiology and life cycles of microbes and their impact on humans and environment.
- Gain laboratory skills such as microscopy, microbial cultures, staining, identification, preservation of microbes for their applications in research and industry.

## **PLANTS AND HUMAN WELFARE**

- To make the students familiar with economic importance of diverse plants that offer resources to human life
- To make the students known about the plants used as food, medicinal value and also plant source of different economic value
- To generate interest among students on plant importance in day today life, conservation, ecosystem and sustainability.

## **DIVERSITY OF NON- FLOWERING PLANTS**

- Understand the diversity and affinities among Algae, Bryophytes, Pteridophytes and Gymnosperms.
- Understand the morphology, anatomy, reproduction and life cycle across Algae, Bryophytes,
- Knowledge on Pteridophytes and Gymnosperms, and their ecological and evolutionary significance.
- Obtain laboratory skills/explore non-flowering plants for their commercial applications.
- Explore Phytoplankton and flora in nearby water body as a part of best practise.

## **PLANT PROPAGATION, NURSERY MANAGEMENT AND GARDENING**

- To gain knowledge on gardening, cultivation, multiplication, raising of seedling of garden plants.
- To get knowledge on new and modern techniques of cultivation
- To develop interest in nature and plant life

## **PLANT ANATOMY AND DEVELOPMENTAL BIOLOGY**

- Observation of variations that exist in internal structure of various parts of a plant and as well as among different plant groups in support for the evolutionary concept.
- Skill development for the proper description of internal structure using botanical terms, their identification and further classification.
- Induction of the enthusiasm on internal structure of locally available plants.
- Understanding various levels of organization in a plant body with an outlook in the relationship between the structure and function through comparative studies.
- Observation and classification of the floral variations from the premises of college and house.
- Understanding the various reproductive methods sub-stages in the life cycle of plants
- Observation and classification of the embryological variations in angiosperms
- Enthusiasm to understand evolution based on the variations in reproduction among plants.

## **LANDSCAPING AND GARDENING**

- Apply the basic principles and components of gardening
- Conceptualize flower arrangements and bio-aesthetic planning.
- Design various types of gardens according to the culture and art of bonsai
- Distinguish between formal, informal and free style gardens
- Establish and maintain special types of gardens for outdoor and indoor land scaping

## **ECOLOGY AND CONSERVATION BIOLOGY**

- Demonstrate broad and coherent knowledge in the principles and concepts associated with the ecology.
- Understanding of physical and chemical factors that influence organisms, their physiology, and ecosystem function.
- Analysing the methods of conservation and its significance.
- Understanding the geography and its influence on the diversity of plants.
- Examining the impact of pollution on plants.

## **FLORICULTURE**

- Develop conceptual understanding of gardening from historical perspective.
- Analyze various nursery management practices with routine garden operations.
- Distinguish among the various Ornamental plants and their cultivation.
- Evaluate garden designs of different countries.
- Appraise the landscaping of public and commercial places for floriculture.
- Diagnoses the various diseases and uses of pests for ornamental plants.

## **PLANT MORPHOLOGY AND TAXONOMY**

- Understanding the main features in Angiosperm evolution.
- Ability to identify, classify and describe a plant in scientific terms, thereby, Identification of plants using dichotomous keys. Skill development in identification and classification of flowering plants.
- Interpret the rules of ICN in botanical nomenclature.
- Classify Plant Systematic and recognize the importance of herbarium and Virtual Herbarium, evaluate the Important herbaria and botanical gardens.
- Recognition of locally available angiosperm families and plants and economically important plants. Appreciation of human activities in conservation of useful plants from the past to the present.

## **GENERAL MICROBIOLOGY**

- Students will acquire basic knowledge about microorganisms, technical terminologies of microscopy, staining, culture media and sterilization with a fundamental understanding of prokaryotic and eukaryotic cell organization

- Understand the concepts related to branches of microbiology, gain insight into microbial origin of life through their fossilization process, microscopy types, media design and preparation, types of staining; sterilization and culture preservation and to differentiate prokaryotic and eukaryotic systems through distinguishable staining properties.
- Capable of analyzing the historical contributions, scope of microbiology, significance, and application of microscopy, staining and sterilization and understand to differentiate prokaryotic and eukaryotic cells
- Inculcate the perceptions on major discoveries in microbiology, advanced microscopy, and microbe control methods; they shall also be able to categorize microbes on structural, cellular, and morphological differences, compare and categorize organisms with prokaryotic and eukaryotic features
- Students can evaluate the differences in microscopy, staining and sterilization methods with a thorough understanding of prokaryotic and eukaryotic cell characteristics

## **MICROBIAL BIOCHEMISTRY AND PHYSIOLOGY**

- Students will attain basic knowledge about major elements of life, necessity of biomolecules, requirements of microbial nutrition with an necessary understanding of microbial respiration and photosynthesis
- Able to understand the atomic and chemical bonds, classification levels of biomolecules, growth parameters of microbes and fundamentals of microbial metabolic processes
- Capable of analysing the properties and significance of water and other biomolecules, growth enumeration patterns and mechanisms of microbial respiration and photosynthesis
- Incorporate in-depth knowledge to differentiate biomolecules; help to apply the different metabolic situations and pathways in microbes
- Students can evaluate the differences solution preparation, biomolecular differences, diverse nutrition levels and understand the physiology of microbes

## **Microbial Diversity**

- Acquire knowledge about microbes and their diversity
- Study the characteristics, classification and economic importance of Prokaryotic and Eukaryotic microorganisms.
- Gain knowledge about viruses and their diversity

## **Microbial Entrepreneurship**

- Demonstrate entrepreneurial skills
- Acquire knowledge on Industrial Entrepreneurship
- Acquire knowledge on Healthcare Entrepreneurship



## **Microbial Enzymology and Metabolism**

- Differentiating concepts of chemoheterotrophic metabolism and Chemolithotrophic metabolism.
- Describing the enzyme kinetics, enzyme activity and regulation.
- Differentiating concepts of aerobic and anaerobic respiration and how these are manifested in the form of different metabolic pathways in microorganisms

## **Human Microbiome**

- Articulate a deeper understanding on biological complexities of human microbiome.
- Understand broader goals of biological anthropology.
- Compare and contrast the micro biome of different human body sites and impact human health promotion

## **MICROBIAL GENETICS AND MOLECULAR BIOLOGY**

- Understand concepts involved in replication, transcription, translation, regulation of gene expression in bacteria and Eukaryotes.
- Differentiate the process of replication, transcription, translation, regulation of gene expression in bacteria and Eukaryotes.
- Compare and contrast housekeeping, constitutive, inducible and repressible genes

## **GENETIC ENGINEERING**

- Outline regulatory mechanisms in bacteria to control cellular processes
- Understand the fundamental molecular principles of genetic engineering
- Understand the applications of genetic engineering
- Comprehend the principle and application of analytical techniques and understand the genetic switch in bacteriophages.

## **IMMUNOLOGY AND MEDICAL MICROBIOLOGY**

- To gain a preliminary understanding about various immune mechanisms.
- To familiarize with Immunological techniques and sero diagnosis of infectious diseases
- To understand pathogenic bacterial infections, symptoms, diagnosis and treatment process.
- To understand pathogenic viral infections, symptoms, diagnosis and To understand pathogenic protozoan infections, symptoms, diagnosis and treatment process treatment process

## **FOOD, DAIRY AND INDUSTRIAL MICROBIOLOGY**

- To understand the association of microbes in food and the quality testing of food
- To understand the preservation and food safety protocols

- To understand the methods of spoilage of food and the diseases associated with it
- To learn the properties of milk and the types of preservation of milk.
- To learn the types of fermented food and dairy products and its significance
- Learn the overview of scope and importance of industrially important microbes
- Acquaint with different types of fermentation processes and equipments
- Evaluate the factors influencing the enhancement of cell and product formation during fermentation

## **B Sc Computer science**

### **PROBLEM SOLVING TECHNIQUES**

- Knowledge of algorithms, technologies, notations. Writing algorithms and flowcharts for different types of problems.
- Learning basics of C language, Operators, loops, arrays and pointers.
- Advanced array operations like reversing the elements, histograms, partitioning etc.
- Learn about functions, reusability, types. Understand structures and Unions. Also learn about strings and string operations.

### **CSC-101P: C PROGRAMMING PRACTICALS**

- Realizing the capacity and power of C language in solving problems.
- Making use of C structures and constructs to solve the problems.

### **CSC-201T - DATA STRUCTURES**

- Introduction, types, complexity, Mathematical functions, searching and sorting techniques.
- Linked lists – construction, manipulations and applications.
- Stacks and Queues – types, construction, manipulations and applications.
- Trees, Graphs and Hashing - construction, manipulations and applications.

### **CSC-201P DATA STRUCTURES LAB PROGRAMS**

- Ability to construct and manipulate different data structures.
- Ability to relate data structures to real life problems.

### **CSC-301T OBJECT ORIENTED PROGRAMMING USING JAVA**

- Basics of OOP concepts.
- Knowledge of inheritance, polymorphism, overloading
- Knowledge of Packages and Exception Handling
- Applet programming & Event handling.

### **CSC-301P JAVA PROGRAMMING LAB**

- Ability to learn the concept of Object Oriented Programming
- Ability to apply OOPS concepts to real life problems
- Ability to learn Graphics, Event handling & Applet programming.

### **CSC-401T OPERATING SYSTEMS**

- Computer architecture, kernel, system calls
- Knowledge of Synchronized processes and process scheduling
- Memory management & file system
- Distributed Systems & protection.

### **CSC-401P UNIX LAB**

- Ability to learn the concept of Shell Programming
- Ability to understand & apply Operating System concepts.

### **CSC-501T Database Management Systems**

- Understanding Database Management System, Database concepts, architecture, classification of DBMS.
- Gain knowledge on Data modelling using ER model, data model, Record storage and primary file organization, Hashing techniques.
- Relational Data Model and Relational Algebra, Examples of Relational Algebra queries, Relational Database Language, Data types, DDL and DML queries, Nested Queries, Applications of various types of SQL queries and their implementation
- Functional Dependencies, Transitive Dependency and Normalization for Relational Database, Understand Transaction Processing Concepts, Concurrency Control techniques, Distributed Databases and Client Server Architecture and ACID properties.

### **CSC-501P DATABASE MANAGEMENT SYSTEM LAB**

- Design of queries for creation of database, tables with primary key and foreign key constraints, data manipulation operations like insertion, deletion, modification, creation of views and displaying of records
- Creation of multiple tables in database, establishing relationship between them and designing complex queries, nested queries, Entity Relationship diagram for case studies of Bank Database and College Database.

### **CSC-502T ARTIFICIAL INTELLIGENCE**

- Gain knowledge on fundamentals of Artificial Intelligence (AI) and expert systems, and knowledge representation.
- Application of basic principles of AI in solutions that require problem solving, knowledge representation.
- Gain knowledge on Symbolic reasoning under uncertainty, Overview of Expert

- System.
- Gain knowledge on Planning systems, AI in parallel and distributed applications, perceptions and fuzzy logic systems.
- Gain programming skills in Prolog and LISP.

### **CSC-502P ARTIFICIAL INTELLIGENCE LAB**

- Ability to learn the concept of Python Programming
- Ability to understand & apply AI Python concepts.

### **CSC-601T COMPUTER NETWORKS**

- Ability to understand Data communication concepts, Computer Networks, protocols, standard model of communication (OSI and TCP/IP) and Physical and data link layer.
- Ability to understand the concept of data link control and MAC, polling, reservation and token passing.
- Ability to understand the concept of network layer and its protocol, routing concepts and to have knowledge on next generation IP address.
- To have knowledge on transport layer and its protocol, UDP, TCP and application layer protocols like Domain Name System; Telnet, E-mail, FTP, WWW and HTTP.

### **CS-C16P COMPUTER NETWORKS LAB**

- **PROJECT WORK**
- Ability to do literature survey, select suitable problem, understand system requirements, and prepare the Software Requirement Specification document for minor project.
- Ability to design the system – form design, database design, report design.
- Implementation of the system using latest trends in technologies.
- Verification and validation of Software developed, using Software Testing methods.
- Documentation of the whole process and generation of project report.

## **B.Sc Biochemistry**

### **Course Title: CHEMICAL FOUNDATION OF BIOCHEMISTRY -1**

#### **Course code: BC 101**

- Understand the basic fundamentals of Biochemistry, as a discipline and milestone discoveries in life science.
- Understand and apply the concepts of stoichiometry, atomic structure, chemical bonds, redox reactions and electrochemistry
- Evaluate the theories of bond formation and chemical properties of biological elements and compounds.
- Gain knowledge of the fundamental properties of elements and analyze their role in the formation of biomolecules and in chemical reactions within living organisms.

- Relate and analyse the scope of fundamental chemistry in biological systems

## **VOLUMETRIC ANALYSIS – PRACTICALS-1**

**Course code: BC 102**

- Acquire skills in learning safety and precautionary measures, calibration and basic calculations of working in a biochemistry laboratory.
- Develop proficiency in preparation of standard solutions, indicators, reagents and handling of glassware for conducting volumetric analysis experiments.
- Understand the use of volumetric analysis in biological research and industrial applications.

## **OPEN ELECTIVE**

### **BIOCHEMISTRY IN HEALTH AND DISEASE**

**Course code: BC-OEC 1**

- Gain an elementary knowledge of human health and related terminologies used in health and diseased conditions.
- Understand various disease conditions, causes, treatment and their prevention.
- Acquire knowledge on health promotion including insights into mental health and differentiate between communicable and non-communicable diseases.

## **CHEMICAL FOUNDATION OF BIOCHEMISTRY -2**

**Course code: BC 201**

- These topics will enable students to understand the fundamentals of chemical processes in biological systems
- Students will gain the knowledge of role of stereochemistry in biological system
- To understand the preparation and application of organometallic compounds.
- Appreciation of the roles of metals, non-metals, transition metals and coordination compounds in biological systems.
- Understand the Chemical toxicity and free radical scavenger mechanism.

**Course Title: QUALITATIVE AND QUANTITATIVE ANALYSIS – PRACTICALS – 2**

**Course code : BC202**

- The Course Objective is to provide experimental practice of quantitative and qualitative analysis. Also it provides training in physical chemistry laboratory

techniques. Upon successful completion, students should develop skills in handling instruments and understand its application in research work.

## **OPEN ELECTIVE**

### **Course Title : NUTRITION AND DIETETICS**

#### **Course code: BC-OEC2**

- The student will gain knowledge about energy requirements and the Recommended Dietary Allowances.
- The student will understand the functions and role of macronutrients, their requirements and the effect of deficiency and excess & impact of various functional foods on our health
- The student will be able to apply basic nutrition knowledge in making foods choices and obtaining an adequate diet and gain competence in connecting the role of various nutrients in maintaining health and learn to enhance traditional recipes.

## **COURSE TITLE BIO-ORGANIC CHEMISTRY**

### **COURSE CODE: BC301**

- These topics will enable students to understand the fundamentals of organic chemistry pertinent to their importance in understanding biochemical reactions.

## **OPEN ELECTIVE**

### **COURSE TITLE : BIOCHEMICAL TECHNIQUES**

#### **COURSE CODE: BC-OEC 3**

- Develop competence in handling various chromatographic, electrophoretic and isotope techniques and apply them in isolating and characterizing different biological molecules

## **COURSE TITLE HORMONES - BIOCHEMISTRY AND FUNCTION**

### **COURSE CODE: BC-OEC 4**

- Understand the function of hormones and their regulation.
- Know how hormonal systems act in an integrated manner to regulate overall body functions.
- Understand how failure of these normal physiologic functions and integrations are associated with some endocrine disorders.

## **COURSE TITLE ANALYTICAL BIOCHEMISTRY**

### **COURSE CODE: BC401**

- Understanding the concept of biological sample preparation
- Appreciate chemistry and application of analytical instruments.
- Get acquainted with Care & Maintenance of Equipment & Chemicals.
- Clinically relevant biochemical analysis for deeper understanding of all biochemical components i.e., Proteins, Electrolytes, Hormones etc.
- Basic knowledge of clinical and forensic analytical methods and their principles.

## **OPEN ELECTIVE**

### **COURSE TITLE- BIOCHEMICAL TOXICOLOGY**

#### **COURSE CODE- BC-OEC 5**

- Categorize the classes of toxicants/drugs and know specific examples
- State the routes of exposure to toxins/drugs;
- Explain the processes of absorption, metabolism and elimination of toxins/drugs
- Explain environmental and physiological factors that affect toxicant metabolism

### **COURSE TITLE PLANT BIOCHEMISTRY**

#### **COURSE CODE- BC-OEC 6**

- Understand the plant cell, photosynthesis, transporters and important primary metabolites.
- Illustrate plant growth regulators, plant's responses to various biotic and abiotic stresses.
- Explain about plant secondary metabolites and their functional importance.

### **COURSE TITLE Biochemistry of Macromolecules and Human Physiology**

#### **COURSE CODE- BIC501T**

- The course provides fundamental insights on the types of macromolecules; and unique structural features, chemical properties and biological importance of each.
- Describe cell structure and functions, how cells form and divide, and how they differentiate and specialize.
- Students will be able to describe the cyclical events of cell division and types of cell divisions.
- Student's knowledge with regard to the process of cell death and cell aging will enhance to its core.



- Physiology involves the study of how living systems function, from the molecular and cellular level to the system level, and emphasizes an integrative approach to studying the biological functions of the human body.

## **COURSE TITLE MOLECULAR BIOLOGY**

### **COURSE CODE- BIC 502T**

- The course provides fundamental insights on the types of nucleic acids and unique structural features, chemical properties and biological importance of each. These topics will enable students to the molecular mechanisms via which genetic information is stored, expressed and transmitted among generations.

### **Enzymology**


#### **COURSE CODE- DSC BIC – 601T**


These topics will enable students to describe structure, functions and the mechanism of action of enzymes. Learning kinetics of enzyme catalyzed reactions and enzyme inhibitions and regulatory process, Enzyme activity, Enzyme Units, Specific activity

### **Metabolism and Immunology**

#### **COURSE CODE- DSC BIC – 602T**

- Understand the concepts of metabolism, characteristics of metabolic pathways and strategies used to study these pathways.
- Gain a detailed knowledge of various catabolic and anabolic pathways and its regulation
- Systematically learn the breakdown and synthesis of amino acids and nucleotides in humans and recognize its relevance with respect to nutrition and human diseases
- Acknowledge the role of inhibitors of nucleotide metabolism which are potentially being used as chemotherapeutic drugs
- Comprehend how the amino acid and nucleotide metabolism are integrated with carbohydrate and lipid metabolism
- Defines the concept of immunology, concepts of antigen and antibody
- Explain immune system cells, Discuss active immunity and passive immunity
- Explain the cellular immune mechanism

  
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