

**BACHELOR OF**  
**SCIENCE**  
**(BIOTECHNOLOGY)**

## **COURSE OUTCOMES**

### **SEMESTER -I**

#### **BT101      English**

- CO1: Read creative non-fiction, essays and opinion while analysing the structural, sentence level arrangement of writing and understanding of the basic concepts of grammar.
- CO2: Understand the poetic language and develop writing skill.
- CO3: Understand the phrases, speech and their uses in writing paragraph.
- CO4: Understand the basic concepts of grammar.

#### **BT102      Plant Diversity and Bioprospecting**

- CO1: Understand about the structure, habitat, reproduction and economic importance of algae, fungi, lichens.
- CO2: Understand some plant diseases in reference to their causative agents, symptoms and control measures.
- CO3: To understand life cycles of different algal species.
- CO4: To gain knowledge about diverse plants and their general characters

#### **BT103      Cell Biology**

- CO1: Understand scope of cell biology, distinguishing characters of cell types and cellular organelles.
- CO2: Study about cell cycle, regulation and molecular basis of cancer.
- CO3: Understanding the functions of different cellular organelles.
- CO4: Build concept of biogenesis of different cellular structures

#### **BT104      Biochemistry and Metabolism**

- CO1: Understand complete structure and function of different biomolecules found in living cells.
- CO2: Learn the properties, enzyme catalysis- mechanism of enzyme action.
- CO3: Describe the catabolic reactions of carbohydrates, lipids and amino acids
- CO4: Describe the classification and structural organisation of proteins

#### **BT105      Physical Chemistry**

- CO1: To understand the general characteristics of different states of matter.  
CO2: To impart knowledge to the students about the liquefaction of gases and applications of liquid crystal.  
CO3: To Explain the Collision Theory of Reaction rates and activated complex theory.  
CO4: To explain the detailed application of Brag's equation and Miller indices.

### **BT106 Inorganic Chemistry**

- CO1: To familiarise the concept of atomic structure and properties of periodic table.  
CO2: To develop the knowledge about the chemistry of Ionic structure of various solids.  
CO3: To Predict the shapes and geometry of hybridisation of compounds.  
CO4: To Explain the Crystal Lattices Structure e.g. FCC, BCC, HCP, etc.

### **BT107 Organic Chemistry**

- CO1: To learn the basic methods of structure formation as well as bond formation and improve their concept related to symmetry of compounds.  
CO2: Gain knowledge about nomenclature, reaction mechanism and chemical properties.  
CO3: To differentiate between chiral and achiral molecules.  
CO4: To know the relationship between Enantiomers and their specific rotations.

### **BT108 Lab Course I**

- CO1: Students will gain an understanding of methods of analysis related to chemical analysis goals.  
CO2: To know about the Volumetric Analysis.  
CO3: To determine the Redox titrations of  $\text{Fe}^{2+}$ ,  $\text{C}_2\text{O}_4^{2-}$  ( using  $\text{KMnO}_4$ ,  $\text{K}_2\text{Cr}_2\text{O}_7$  ).  
CO4: To know about the Idiomatic titrations: Determination of  $\text{Cu}^{2+}$  (using standard hypo solution).

### **BT109 Lab Course II**

- CO1: Microscopic observation and identification of algae and fungi.  
CO2: Handling of microscope and observation of cell type and cell division.  
CO3: Gain skill on working principles of pH meter, colorimeter and learn techniques of chromatography by separation of biomolecules.  
CO4: Learn different cellular and microbial staining techniques.

## **SEMESTER-II**

### **BT201      Biostatistics**

CO1: Define the main concepts about biostatistics.

CO2: Able to describe statistical methods and probability distributions relevant for molecular biology data.

CO3: Understand basic concepts of probability and statistics.

CO4: Collect data relating to variable/variables which will be examined and calculate descriptive statistics from these data.

### **BT202      Microbiology**

CO1: Understand microscopic organism, microbial growth and culture.

CO2: Introduction to economic importance of micro-organisms.

CO3: To understand fungal and protozoan diseases with diagnosis and treatment.

CO4: Learn and understand about hospital-acquired and general infections with the prevention techniques and treatments.

### **BT203      Genetics**

CO1: Provide the basics of mendelian genetics, hybridisation and monohybrid cross.

CO2: Understand the chromosome, genetic mutations, linkage and chromosome mapping.

CO3: To explain the arrangement of Genes and their interaction.

CO4: To understand extra nuclear inheritance, linkage & crossing over.

### **BT204      Animal Diversity & Economic Zoology**

CO1: To understand general characters, adaptations and life history of selective protozoa, porifera, coelentrata, annelda, arthropoda, mollusca and echinodermata.

CO2: To study affinities of hemichordata.

CO3: To understand life cycles of different algal species.

CO4: To gain knowledge about diverse plants and their general characters

### **BT205 Physical Chemistry**

- CO1: To study rate, factor and order of reaction and different theories related to it.
- CO2: To study electrolytic conduction, factors affecting and applications of Kohlrausch's law and transport number.
- CO3: To Study the concept of transition state theory & bimolecular reaction.
- CO4: To describe the Ostwald's Dilution Law, Debye Huckel – Onsager's equation.

### **BT206 Organic Chemistry**

- CO1: Construct the conceptual ideas of basic rules of aromaticity.
- CO2: Understanding of reactivity and stereochemistry of various compounds.
- CO3: To explain the concept of Markownikoff's rule, hydroboration–oxidation, oxymercuration reduction, ozonolysis.
- CO4: To study about the hydration, hydroxylation and oxidation with  $\text{KMnO}_4$ .

### **BT207 Inorganic Chemistry**

- CO1: To understand the qualitative idea of various types of bonds.
- CO2: Concepts of classifications of s & p-block elements.
- CO3: To explain the bonding in main group compounds & p blocks elements.
- CO4: To discuss about various types of Vander Waals Forces

### **BT208 Seminar and term paper writing**

- CO1: Analyse interpreted and present methodology.
- CO2: Discuss results from primary literature in their discipline.
- CO3: Gain knowledge of meta-analysis.
- CO4: Build writing skill of research articles.

### **BT209 Lab Course I**

- CO1: Students will gain an understanding of methods of analysis related to chemical analysis goals.
- CO2: To know the surface tension of a given liquid by drop number method.
- CO3: To determine the viscosity of a given liquid.

CO4: To learn about the specific refractivity of a given liquid.

**BT210      Lab Course II**

CO1: Differentiate between prokaryotic cell types.

CO2: Study of permanent and temporary mount of mitosis and meiosis.

CO3: Microscopic observation and identification of various non-cordates.

CO4: Learn different Staining techniques.

**SEMESTER-III**

**BT301      Medical Microbiology**

CO1: To develop and understanding of human micro flora.

CO2: To understand gram positive and gram-negative bacterial diseases along with fungal and protozoan diseases.

CO3: Basic understanding of pathology of different disease causing agent.

CO4: Develop understanding about the coherent actions of enzymes and cofactors used to channelize the mechanism.

**BT302      Bio Analytical Tools**

CO1: Basic understanding of principle of instruments.

CO2: Understand concepts and handling of tools required for separation of different biomolecules.

CO3: Basic understanding of principles of Biophysics.

CO4: Understand different separation techniques.

**BT303      Plant Physiology**

CO1: Learn about histological organisation of plants.

CO2: Study growth phases of plants and role of hormones in different plants.

CO3: Understand the basic metabolism of the plant including carbon and nitrogen metabolism.

CO4: Learn and understand about mineral nutrition in plants.

**BT304      Plant Diversity**

- CO1: Learn about the general characters, classification, stellar evolution in Pteridophytes, heterosporous and origin of seed habits.
- CO2: Study the methods of fossilisation and fossil plants.
- CO3: Understand Gymnosperms with respect to distinguishing characters, comparison with Angiosperms, economic importance and classification.
- CO4: Understand the life cycles of Pinus, Cycas and geological time scale.

### **BT305      Physical Chemistry**

- CO1: To study the thermodynamics terms, properties, process and mathematical relations.
- CO2: To study Nernst distribution law, Le-chatelier principle, Clausius-Clapeyron equation and their applications.
- CO3: To study about Thermodynamic derivation of law of chemical equilibrium.
- CO4: To become familiar about Modification of distribution law when solute undergoes dissociation, association and chemical combination.

### **BT306      Organic Chemistry**

- CO1: To familiarise with the mechanism of organic reaction and different factors which affect the reaction rate.
- CO2: To know the different types of concerted reactions in organic chemistry and orbital correlation approaches.
- CO3: To Apply the knowledge of electromagnetic radiation, UV spectroscopy to detect the structure of compound.
- CO4: To calculate the  $\lambda_{max}$  of Diene and unsaturated carbonyl compounds.

### **BT307      Inorganic Chemistry**

- CO1: To understanding the general characteristics of d and f block elements.
- CO2: The knowledge of different theories to explain the bonding in co-ordination.
- CO3: To understand the concept Werner's coordination theory, effective atomic number concept and valence bond theory.
- CO4: To differentiate between Aqueous and non-aqueous solvents.

### **BT308      Lab Course I**

- CO1: To develop skills required for qualitative analysis of organic compounds using basic understanding of relative reactivity of functional group.

- CO2: To describe different methods for separation of mixtures.  
CO3: To recognise the different type of procedures for separation of compounds.  
CO4: To determine the solubility of benzoic acid at various temperatures.

**BT309      Lab Course II**

- CO1: Study of the Photosynthetic pigments, antibiotic sensitivity of bacteria.  
CO2: Handling of instruments and separation of different analytes using their specific features.  
CO3: Understand different purification and separation techniques.  
CO4: Learn different Staining techniques.

**SEMESTER-IV**

**BT401      Animal Diversity -II**

- CO1: Understand higher life forms and their adaptation to their niche.  
CO2: Understand their food behaviour, flight adaptation and survival in adverse conditions.  
CO3: Understand anatomy of different mammalian organs.  
CO4: Gain knowledge of classification of different animals.

**BT402      Molecular Biology**

- CO1: To get knowledge about the structure, type and replication mechanism of the DNA.  
CO2: To learn transcription and RNA processing.  
CO3: To understand translation process and regulation of gene expression.  
CO4: Develop understanding about the coherent actions of enzymes and cofactors used to channelize the mechanism.

**BT403      Animal Developmental Biology**

- CO1: Provide the basics of the developmental biology and list of the sequence of early events in animal developments.  
CO2: Provide the information about early embryonic development and differentiation.  
CO3: To learn the fundamental concept of embryogenesis.  
CO4: To learn the fundamental concept of Organogenesis.

**BT404      Mammalian Physiology**

- CO1: To understand the physiology at cellular and systemic levels.



- CO2: Understand blood flow, gaseous transport, and mechanism of working nerve and metabolic activities in mammalian body.
- CO3: Develop understanding for the fundamental concepts of physiology of digestion.
- CO4: To understand renal and muscle physiology.

#### **BT405      Physical Chemistry**

- CO1: To study of basic of chemicals cells, concepts and various mathematical relations.
- CO2: Detailed study of thermodynamics with stress on third law of thermodynamics, entropy and Gibbs free energy with equations.
- CO3: To understand the various concept of electrode potentials, Eo- cell , Nernst equation.
- CO4: To understand the concept of Carnot cycle, Joule Thomson's law.

#### **BT406      Organic Chemistry**

- CO1: To predicts the outcomes and mechanism of some simple organic reactions, using a basic understanding of the relative reactivity of functional group.
- CO2: To characterise absorptions of various functional groups and interpretation of IR spectra of simple organic compounds.
- CO3: To predict the Hooke's law, selection rules, intensity and position of IR bands.
- CO4: To understand the Wittig reaction. Mannich reaction. Oxidation of aldehydes, Baeyer–Villiger oxidation of ketones, Cannizzaro reaction.

#### **BT407      Inorganic Chemistry**

- CO1: To correlate the optical and magnetic properties of lanthanides and actinides.
- CO2: To impart thorough knowledge of systematic and qualitative analysis of mixture containing acid and basic radicals.
- CO3: To study about the Comparison of properties of Lanthanides and Actinides and with transition elements.
- CO4: To study about the analysis of various groups of basic radicals, Theory of precipitation.

#### **BT408      Seminar and Term Paper Writing**

- CO1: Students can develop the skill to write and present their summer training.
- CO2: Gain knowledge of articles, paper and review.
- CO3: To understand meta- analysis.
- CO4: Build writing skill of research articles.

#### **BT409      Lab Course I**

- CO1: To develop skills required for qualitative analysis of organic compounds.

- CO2: Basic understanding of relative reactivity of functional group.
- CO3: To know the of melting point or boiling point and preparation of at least one pure solid derivative) of the following simple mono and bifunctional organic compounds: Naphthalene & benzyl chloride.
- CO4: To demonstrate the knowledge of detection of extra elements.

#### **BT410      Lab Course II**

- CO1: Students are able to understand how physiological parameters are measured in mammals.
- CO2: Learn the identification of the developmental stages of chick and frog's embryo using permanent mount.
- CO3: Students are able to understand various molecular techniques like genomic DNA extraction, SDS PAGE etc.
- CO4: To learn different Pathological Techniques.

### **SEMESTER-V**

#### **BT501      Bioinformatics**

- CO1: To understand about Protein and Genome Databases.
- CO2: To provide the introduction of bioinformatics and different types of data and information about sequence homology.
- CO3: Define the properties of phylogenetic trees, different methods of tree construction, alignment of the sequences.
- CO4: To understand about the Data Retrieval tools and its utilisation.

#### **BT502      Recombinant DNA Technology**

- CO1: To understand the steps involved in recombinant DNA technology.
- CO2: To learn the techniques involved in production of transgenic plants and animals and their pros and cons.
- CO3: To get insight in applications or recombinant DNA technology in agriculture, production of therapeutic proteins.
- CO4: To understand the applications of genetic engineering techniques and proficiency in designing protocols involving genetic manipulation.

#### **BT503      Immunology**

- CO1: To understand the structure, mechanism of immune cells and regulation of the antibodies.  
CO2: To understand about various vaccines and immune techniques to identify the diseases.  
CO3: To understand about production and separation of various downstream processing.  
CO4: To know about economically important strains of microbes.

#### **BT504      Genomic and Proteomics**

- CO1: To understand genome, proteome and transcriptome.  
CO2: To learn about structure and sequencing of DNA and protein.  
CO3: To learn about structure and sequencing of DNA and protein.  
CO4: To learn about structure and sequencing of DNA and protein.

#### **BT505      Physical Chemistry**

- CO1: To understand postulates of quantum mechanics, energy of 1-D box.  
CO2: To understand dipole moment, magnetic permeability & susceptibility.  
CO3: To acquaint knowledge on rotational, vibrational and Raman spectra.  
CO4: To study about the Black-body radiation, Plank's radiation law, photoelectric effect & heat capacity of solids.

#### **BT506      Organic Chemistry**

- CO1: To study different technique and principle involved in NMR spectroscopy.  
CO2: To study types of reactions and applications of carbohydrates and organometallic compounds.  
CO3: To Discuss about the PMR spectra of the molecules: ethyl bromide, n propyl bromide, isopropyl bromide, ethanol.  
CO4: To study about the Structures of ribose and deoxy ribose.

#### **BT507      Inorganic Chemistry**

- CO1: To understand metal- ligand bonding, explain magnetic properties, interpret electronic spectra of transition metal complexes.  
CO2: To understand the crystal field splitting in octahedral, tetrahedral and square planar complexes. factors affecting the crystal-field parameters.  
CO3: To discuss about the factors affecting the crystal-field parameters.  
CO4: To understand the methods of determining magnetic susceptibility, spin-only formula. L-S coupling.

#### **BT508      Lab Course I**

- CO1: To impart students a thorough knowledge of systematic qualitative analysis.
- CO2: To learn students about the mixture containing of two acid and two base radicals with interfering radicals by semi-micro method.
- CO3: To discuss about the strength of the given acid solution (mono and dibasic acid) conductometrically.
- CO4: To describe different methods for separation of mixtures.

**BT509      Lab Course II**

- CO1: To understand using various BLAST analysis and database study.
- CO2: To perform various DNA isolation techniques.
- CO3: To learn about various agglutination assays, immuno-diffusion tests and separation methods.

**SEMESTER-VI**

**BT601      I.P.R. Entrepreneurship Bio Ethics and Bio Safety**

- CO1: Learn about entrepreneurship and how to step up biotech industry.
- CO2: Learn about laboratories sterilisation and handling condition.
- CO3: Understand Indian patent law.
- CO4: Learn about different molecular ethical issues.

**BT602      Animal Biotechnology**

- CO1: To understand principles of animal culture, media preparation.
- CO2: To learn the gene transfer technologies for animals, animal cell lines and significance of transgenic with reference to animal models.
- CO3: To explain invitro fertilisation and embryo transfer technology.
- CO4: To understand the basic principles and techniques in genetic manipulation and problems both technical and ethical in animal cloning.

**BT603      Bioprocess Technology**

- CO1: To understand basic principles underlying design of fermenters, fermentation process and downstream processing.
- CO2: To learn about the production and separation of various industrially important strains from their products.
- CO3: To understand about production and separation of various downstream processing.
- CO4: To know about economically important strains of microbes.

#### **BT604 Plant Biotechnology and Environmental Biotechnology**

- CO1: To understand the embryo culture, hybridisation and process of embryogenesis, endosperm culture and organogenesis.
- CO2: To understand about the methods of the treatment of the municipal waste and industries effluents.
- CO3: To describe meristem culture and clonal propagation of plants on a commercial scale.
- CO4: To explain the microbial degradation of pesticides, Bioremediation & Bio fertilisers.

#### **BT605 Physical Chemistry**

- CO1: To understand laws of photochemistry.
- CO2: To understand concept of potential energy of molecular orbital's.
- CO3: To express concentration of solution and gain knowledge regarding phase, degree of freedom and phase rule.
- CO4: To study about the concept of qualitative description of selection rules and Franck- Condon principle.

#### **BT 606 Organic Chemistry**

- CO1: To study types, reactions and physical properties of heterocyclic compounds and organo Sulphur compounds.
- CO2: To study organic synthesis via enolates and synthetic polymers.
- CO3: To study about the Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution.
- CO4: To discuss about the Comparison of basicity of pyridine, piperidine and pyrrole.

#### **BT607 Inorganic Chemistry**

- CO1: To have a basic idea of organometallic compound.
- CO2: To understand two disciplines of science (biology and chemistry) linkages.
- CO3: To develop understanding for silicones and phosphagens.
- CO4: To discuss about the concept of Hard and Soft Acids & Bases. Symbiosis, electro negativity.

#### **BT608 Project Report and Presentation**

- CO1: To provide broad based training in technical skills in methods of biotechnology and ability to

think and solve problems in the field of biotechnology.

CO2: To provide broad based training in technical skills in methods.

CO3: Gain knowledge of different experimental methods.

CO4: Build concept of fundamental research and bioethics.

### **BT609      Lab Course I**

CO1: To impart students a thorough knowledge of systematic qualitative analysis.

CO2: Analysing mixture containing two acid and two base radicals with interfering radicals by semi-micro method.

CO3: To determine the molecular weight of a non-volatile solute by Rast method.

CO4: To standardise the given acid solution (mono and dibasic acid) pH metrically.

### **BT610      Lab Course II**

CO1: Learn about layout of settings of biotech industry.

CO2: To learn various gene cloning techniques problems associated.

CO3: To develop understanding of preparation of the nutrient medium and their sterilisation procedures also the growth of bacteria, their isolation and analysis of the products.

CO4: Learn about layout of starting biotech industry.

## **PROGRAMME OUTCOME**

PO1: Develop the basic concepts, skills and handling of cell, biomolecules and everything related to life and life forms.

PO2: Enables the students to understand the classification and naming system in biological world.

PO3: Nomenclature, structure, reactivity and mechanism of chemical compounds.

PO4: Students enable to handle the apparatus and chemicals properly and efficiently.

PO5: Demonstrate, solve and understanding of major concepts in all disciplines of chemistry.

PO6: Understand the law of thermodynamics and their applications.

PO7: Understand the Qualitative analysis of different compounds.

## **PROGRAMME SPECIFIC OUTCOME**

PSO1: To develop skills in the proper handling of tools and instruments in biochemical and analyti-

cal process.

PSO2: To develop the ability to apply the principle of life - central dogma.

PSO3: To understand different life-forms and type study of organisms.

PSO4: Understand the basic concepts of cell, cellular and metabolic processes.

PSO5: Students gain knowledge about chemical reactions and importance of chemical compounds in our daily life.

PSO6: Students enable to learn about technology of dyeing of natural fibres.