

BSc Biotechnology Chemistry (BScBTCHE)

Programme Specific Outcomes (PSO)

1. To create enthusiasm among students with a with broad and balanced knowledge of Analytical chemistry by understanding its key concepts , thereby applying in various fields of life science.
2. To develop range of practical skills to understand and assess risks and work safety measures to be followed in the laboratory, which provides the skill and ability to devise problem solving methodologies in chemical laboratory methods.
3. To provide students with basic concepts, knowledge and skill towards employment or higher education in chemistry or multi-disciplinary areas involving chemistry.
4. To provide students with the ethics and ability to plan and carry out experiments independently and assess the significant outcomes which helps to cater the demands of chemical Industries by well-trained graduates.
5. Students can acquire skills to use modern analytical tools and advanced mechanisms to analyze and solve problems in various areas of life by employing biotechnology.
6. Program helps to understand the fundamental concepts in core (plant, animal, industrial biotechnology, molecular biology, genetic engineering and genetics) and allied (microbiology, immunology and physiology) branches of life sciences, with biotechnological techniques.
7. This program explores biochemical and molecular basis in living cells and employs the technical tools to study the ways they interact and communicate, which helps them to manipulate the living systems for the betterment of mankind.
8. The critical awareness in advances at the forefront of chemical and biological sciences prepare students effectively for professional employment or research in various fields where the thrust area will be the use of core and interdisciplinary subjects.

Semester 1 – Chemistry Course Title:

DSC 1: Analytical, Inorganic and Organic Chemistry (1CHEDSC1-AIOC)

Course Outcomes (CO)

At the end of the course students will learn and able to explain:

1. The concept of chemical analysis, accuracy, precision and statistical data treatment, preparation of solutions of varying concentrations and different dilutions.
2. Quantum numbers and their necessity in explaining the atomic structure, shapes of different orbitals.
3. Historic development of periodic table, periodic properties viz., atomic and ionic radii, ionisation energies, electronegativity.
4. Concept of resonance, hyper conjugation, aromaticity, preparation of alkane, alkene, alkyne and their reactions. The mechanism of nucleophilic and electrophilic reactions, energy profile, diagram, factors affecting the orientation of aromatic substitution reaction.

Semester 1 - Biotechnology Course Title:

DSC 1: Cell Biology and Genetics (1BTDSC1-CBG)

Course Outcomes (CO)

At the end of the course the student should be able to understand

1. The student will understand the concept of structure and function of a cell, role of cellular organelles and their cellular activities
2. A deep understanding of eukaryotic chromosome structure and organization and their involvement in cell division will be provided
3. Clear knowledge of cell cycle and identification of checkpoints involved
4. Knowledge about how genetic information are transferred by a range of mechanisms for generating genetic diversity
5. Will be able to explain the relation between chromosomal inheritance and disorders and the causes for such abnormalities

Semester 2 - Chemistry Course Title:

DSC 2: Analytical, Physical and Organic Chemistry (2CHEDSC2-APOC2)

Course Outcomes (CO)

At the end of the course students will be able to explain:

1. The concept of titrimetric analysis, gravimetric analysis. Regression equation, correlation coefficient.
2. Concept of nucleophilic substitution reaction, aromatic nucleophilic and electrophilic substitution reactions, mechanisms with orienting effect of certain groups in those reactions.
3. Various theories of gases and their significance, concept of viscosity, surface tension, refraction and their significance.
4. The different colligative properties and application of distribution law. Different types of liquid crystals and their applications, concept of unit cell and symmetry elements.

Semester 2 - Biotechnology Course Title:

DSC 2: Microbiological Methods and Techniques (2BTDSC2-MML)

Course Outcomes (CO)

1. Students will be able to understand the theory behind various techniques and apply their knowledge better in the laboratory.
2. They will understand the importance of sterilization and the application of sterilants / disinfectants in medical and industrial domains.
3. Students will learn the different types of media that are used to grow different types of bacteria and also learn to preserve cultures for long-term use. Staining techniques will help them understand the importance of characterizing bacteria based on their cell wall components.
4. Students will appreciate the different shapes of bacteria and their arrangement and also understand the pattern in which bacteria grows.
5. They will understand the mode of action of various drugs and how exactly diagnostic laboratories process samples.
6. They will comprehend how genes get passed on from one microbial organism to the other horizontally.
7. They will understand the basis on which viruses are classified and the life cycle they follow.

Semester 3 - Chemistry Course Title:

DSC 3: Analytical and Organic Chemistry – II (3CHEDSC3-AOC3)

Course Outcomes (CO)

At the end of the course students will be able to explain:

1. Understand the importance of fundamental laws, validation parameters in chemical analysis by spectrophotometric, nephelometric and turbidometric methods.
2. Understand the various chromatographic techniques in chemical analysis and the importance of ion-exchange chromatography for domestic and industrial applications.
3. The generation of reaction intermediates and predicting the probable mechanism for a chemical reaction.
4. The importance of stereochemistry in predicting the configuration and property of organic molecules.

Semester 3 - Biotechnology Course Title:

DSC 3: Biomolecules (3BTDSC3-B)

Course Outcomes (CO)

1. Students will be provided with the fundamental knowledge about bioenergetics of biochemical Processes
2. Understand in detail the structure and physico chemical properties of carbohydrates ranging from monosaccharide to polysaccharides. Also the building blocks of proteins and to understand how they interact to form proteins along with types of lipids and their role in biological systems
3. They will get a deeper insight in to the fundamentals of enzyme structure and function and Kinetics
4. To recognize and understand each of the vitamins, hormones and nucleic acids and their Significance
5. Exhibit a knowledge base of the different instruments that are commonly used in the field of biochemistry and to understand their practical applications

Semester 4 - Chemistry Course Title:

DSC 4: Inorganic and Physical Chemistry-II (4CHEDSC4-IPC)

Course Outcomes (CO)

At the end of the course students will be able to explain:

1. The different types of ionic compounds, Born-Haber cycle and different energy parameters.
2. Covalent nature of ionic compounds, molecular orbital energy diagram, differentiating the bonding in metals.
3. Important laws of thermodynamics and their applications, concept of adsorption process and its application in waster water purification.
4. Understand the kinetics of various chemical reactions, usefulness of conductance, ionic mobility measurements and transport number.

Semester 4 - Biotechnology Course Title:

DSC 4: Molecular Biology (4BTDSC4-MOB)

Course Outcomes (CO)

1. Students are exposed to the history of molecular biology through several experiments that made a breakthrough in science.
2. They will understand how DNA replicates and the differences between prokaryotic and eukaryotic DNA replication.
3. They will understand the fundamental concept of transcription and how genes are coded both in prokaryotes and eukaryotes.
4. They will understand the link between replication, transcription and translation and will also be able to comprehend the various modifications brought out in the protein once produced.

Semester 5 - Chemistry Course Title:

DSC 5: Paper 5 - Physical Chemistry (5CHEDSC5-PC)

Course Outcomes (CO)

At the end of the course students will be able to explain:

1. Understanding the application partial molar quantities, concept of chemical potential of ideal mixtures, change in thermodynamic functions in mixing of ideal gases.
2. Understanding theories/thermodynamics of dilute solutions.
3. Understanding phases, components, Gibb's phase rule and its applications construction of phase diagram of different systems, the application of phase diagram.
4. Relate Nernst equation to redox reactions, Faraday's law of electrolysis, applications of EMF measurements.

Semester 5 - Chemistry Course Title:

DSC 6: Paper 6 - Analytical Chemistry (5CHEDSC6-AC)

Course Outcomes (CO)

At the end of the course students will be able to explain:

1. Develop a strong knowledge on spectroscopy, qualitative and quantitative aspects of thermal and electro analysis.
2. Learn principles and applications of modern chemical instrumentation, experimental design and data analysis.
3. Understand the basics of separation of mixture by column chromatography.
4. Analyzing the appropriate type of chromatography for specific type of compounds.

Semester 5 - Biotechnology Course Title:

DSC 5: Paper 5 - Genetic Engineering (5BTDSC5-GE)

1. Students will be introduced to the concepts of genetic engineering.
2. The different tools that are used in genetic engineering experiments will be taught in detail to the students.
3. The various vectors used in genetic engineering techniques, the advantages and disadvantages of each vector their construct will be understood by the students.
4. Students will be introduced to the various methods used for gene cloning.
5. The various techniques involved in genetic engineering and their importance and relevance to the present times will be understood by the students.
6. Students will learn to apply their knowledge by studying various domain specific examples.

Semester 5 - Biotechnology Course Title:

DSC 6: Paper 6 - Plant Biotechnology (5BTDSC6-PB)

Course Outcomes (CO)

1. Students are introduced to the various terminologies and concepts of Plant Tissue Culture. The framework and design of a plant tissue culture lab is explained in detail that will help them apply their knowledge in the future if they become entrepreneurs.
2. The importance of sterilization is dealt with in great detail to prevent any contamination in the laboratory.
3. Students will get introduced to the different types of media and the ways to prepare them. They will appreciate the various types of cultures obtained in a PTC laboratory.
4. Students will be able to comprehend how an explant is grown in the lab and acclimatized to the outside environment.
5. The importance of protoplast cultures will be appreciated by the students and the various techniques used for the same will be studied.
6. The numerous variations obtained while growing cultures in the lab will be studied in detail.
7. Students will learn the applications of cell suspension cultures
8. Applications of plant biotechnology with respect to the different crops will be learnt in much detail.

Semester 6 - Chemistry Course Title:

DSC 7: Paper 7 - Organic Chemistry and Spectroscopy (6CHEDSC7-OCS)

Course Outcomes (CO)

At the end of the course students will be able to explain:

1. Learn the conformation analysis of organic compounds.
2. Predict the stereochemistry of chiral compounds.
3. Understanding the synthesis, structure and applications of carbohydrates and lipids.
4. Understanding the basics of microwave, IR, Raman, electronic and ESR spectroscopic techniques.
5. Interpretation of organic compounds by UV, IR and NMR analysis.

Semester 6 - Chemistry Course Title:

DSC 8: Paper 8 - Inorganic Chemistry (6CHEDSC8-IC)

Course Outcomes (CO)

At the end of the course students will be able to explain:

1. Understand the theories of co-ordination chemistry and its applications
2. Predict the stability of organometallic compounds by eighteen electron rule and its applications.
3. Understanding the importance of commercially used organometallic compounds.
4. Learn the VSEPR and MO theories of main group elements, and important compounds of s- and p- block elements.

Semester 6 - Biotechnology Course Title:

DSC 7: Paper 7 - Immunology and Medical Biotechnology (6BTDSC7-IMB)

Course Outcomes (CO)

1. Helps to demonstrate the basic knowledge of immunological processes
2. Provide students with the basic knowledge about the functioning of the *immune system*, inflammation, immune response against infectious agents
3. Elucidate the genetic basis for immunological diversity and the generation of adaptive immune responses
4. Understand and explain the basis of immunological mechanisms involved in recognition and rejection of cells and tissues
5. Understand and explain the basis of immunological tolerance, autoimmunity and immunodeficiencies
6. Become aware of the potentials of stem cells and the associated ethical issues
7. Lets the students know about the benefits of the therapeutic products
8. Know the tools available for disease diagnosis and get introduced to the nanotechnology in therapy

Semester 6 - Biotechnology Course Title:

DSC 8: Paper 8 - Bioprocessing Technology (6BTDSC8-BT)

Course Outcomes (CO)

1. Understand the basics of fermentation process and also able to describe the fermentor through analyzing the materials and methods for the working of a fermentor.
2. Students gain knowledge in deep about process and product optimization, also be able to produce, analyse and interpret data from fermentation.
3. Students are able to learn the steps and operations involved in microbial primary metabolites production.