BSc Chemistry Microbiology (BScMICCHE)

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. To impart Knowledge and enable understanding of concepts of microbiology and its application in healthcare, pharma, food, agriculture, beverages, nutraceutical industries.

6. Understanding biochemical and physiological aspects of microbes and developing broader perspective to identify innovative solutions for present and future challenges posed by microbes.

7. Demonstrate the ability to identify ethical issues related to recombinant DNA technology, GMOs, intellectual property rights, biosafety and biohazards.

8. Demonstrate the ability to identify key questions in microbiological research, optimize research methods, and analyze outcomes by adopting scientific methods, thereby improving the employability.

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 - Microbiology Course Title:

DSC 1: General Microbiology (1MICDSC1-GM)

Course Outcomes (CO)

1. To become familiar with the foundation concepts of history of Microbiology

2. To gain the knowledge of microscopy and staining concepts

3. To understand the structure and functions of a typical prokaryotic cell and eukaryotic cell.

4. To gain knowledge of various (physical and chemical) methods of control of microorganisms and safety measures to be followed while handling microbes

5. To understand and implement disposal and safety measures

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 - Microbiology Course Title:

DSC 2: Microbial Biochemistry And Physiology (2MICDSC2-MBP)

Course Outcomes (CO)

1. The student is able to describe the concept of pH and its biological significance, biological buffer systems and their importance. To understand the concepts of biophysics, principle, construction working of spectrophotometers,centrifuges, chromatography.

2. To know the various physical and chemical growth requirements of bacteria and get equipped with various methods of bacterial growth measurement.

3. To understand, learn and gain skills of isolation, culturing and maintenance of pure culture.

4. Overview of major biomolecules: Classification, structure, functions of carbohydrates, lipids,proteins, aminoacids, and nucleic acids.

5. The student develops understanding of the laws of thermodynamics, concepts of entropy, enthalpy and free energy changes and their application to biological systems and various biochemical studies and reactions. Conceptual knowledge of aerobic and anaerobic respiration and various intermediary mechanisms involved oxidative phosphorylation.

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 - Microbiology Course Title:

DSC 3: Microbial Diversity (3MICDSC3-MD)

Course Outcomes (CO)

1. To learn and understand the microbial diversity in the living world.

2. To demonstrate an understanding of diversity of prokaryotic microorganisms namely bacteria, archea , Actinomycetes, Chlamydiae, Spirochaetes ,rickettsia and cyanobacteria and their classifications, culturing, reproduction and significance.

3. To demonstrate an understanding of diversity of eukaryotic microorganisms namely Algae, Fungi, protozoans General characters; Classification- Economic importance, culturing, reproduction and significance.

4. To demonstrate an understanding of diversity of viruses namely plant viruses, animal viruses, microbial viruses and sub viral particles. General characters; Classification- Economic importance and type study.

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 - Microbiology Course Title:

DSC 4: Microbial Enzymology And Metabolism (4MICDSC4-MEM)

Course Outcomes (CO)

1. Discuss the biosynthesis and the degradation pathways involved in the physiology of microbes.
2. To demonstrate understanding of metabolism of carbohydrates via various fermentation Pathways
3. To demonstrate understanding of metabolism, both biosynthesis and degradation of aminoacids, nucleotides and lipids via various fermentation pathways
4. Conceptual knowledge of properties, structure, functions of enzymes, classification of enzyme and catalytic mechanisms.
5. To develop the understanding of enzyme kinetics and enzyme regulation and application of enzymes in large scale industrial processes.

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 - Microbiology Course Title:

DSC 5: Paper 5 - Microbial Genetics and Molecular Biology (5 MICDSC5-MGMB)

Course Outcomes (CO)

1. Understand the importance of the master molecule "nucleic acid", get knowledge of DNA and RNA structures, genome organization of prokaryotes, gene structure and function.
2. Understand about mechanism of prokaryotic DNA replication and machinery of DNA replication.
3. Acquire knowledge regarding Central Dogma of gene expression and all steps of the central dogma in detail like, transcription, translation, replication and reverse transcription. Knoabout regulation of gene expression
4. Understand about various RNAs, Ribosome, genetic code and their role in protein synthesis
5. Understand how mutations and repair of genetic material influence evolutionary process. And will get information regarding chemical and physical mutagenic agents, types of mutations and DNA repair
6. Are able to describe different types of plasmids, and other cloning vectors and understand the consequences of recombination
7. Develop, understand and apply tools and techniques involved in Genetic engineering.
8. Understand the basic steps involved in gene cloning and its applications

Semester 5 - Microbiology Course Title:

DSC 6: Paper 6 - Immunology and medical microbiology (5 MICDSC6-IMM)

Course Outcomes (CO)

1. Understanding the cellular and molecular basis of immune responsiveness and the role of the immune system in both maintaining health and contributing to disease.
2. Conceptualize the understanding of host defense mechanism.
3. Understanding of Antigens & Antibody
4. The salient features of antigen antibody reaction & its use in diagnostics and various other studies.
5. Explain the importance of normal flora of human body
6. Understand importance of human diseases, its pathogenesis, transmission and epidemiology.
7. Explain interventions employed to prevent infectious diseases including infection control measure and vaccines
8. Assess treatment strategies including the appropriate use of antimicrobial agents and common mechanisms of antimicrobial action and resistance.

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 - Microbiology Course Title:

DSC 7: Paper 7 - Biostatistics, Food and Dairy Microbiology (6MICDSC7-BFDM)

Course Outcomes (CO)

1. Understand the significance and activities of microorganisms in food and role of intrinsic andextrinsic factors on growth and survival of microorganisms in food and dairy.
2. Know the spoilage mechanisms in foods and dairy and thus identify methods to control deterioration and spoilage
3. Skills to detect and describe the characteristics of important pathogens and spoilage microorganisms in foods and dairy.
4. Identify methods to control microorganisms in food and dairy and thus know the principles involving various techniques of food preservation
5. Acquire knowledge of food safety regulations and discuss the rationale for the use of standard methods and procedures for the microbiological analysis of food and dairy products.
6. Comprehension on importance and application of tabulation and classification of data
7. Knowledge of various statistical methods of data analysis.
8. Demonstrate skills in interpreting and communicating the results of statistical analysis.

Semester 6 - Microbiology Course Title:

DSC 8: Paper 8 – Industrial Microbiology and Bioinformatics (6MICDSC8 - IMB)

Course Outcomes (CO)

1. Awareness about the industrial aspect of the field of Microbiology, and also learn about growth pattern of microbes in different industrial systems.
2. Learning the techniques of discovering (new) useful microorganisms by various isolation, screening and strain improvement methods and store them reliably for later use.
3. Understanding various upstream processes like media formulation, sterilization, process control and selection of the appropriate fermentation process.
4. Understanding functional and fabrication aspects of various bioreactor designs.
5. Gain knowledge about microbial production of various industrial products such as alcohols, Vitamins, enzymes, organic acids, Antibiotics, biofertilizers, biopesticides, vaccines, biofuel etc.
6. Develop an understanding of downstream processes like detection and assay of the product, methods of recovery of the product and purification of the production.
7. Ascertain the contents and properties of the most important bioinformatics databases, perform text- and sequence-based searches, and analyze and discuss the results in light of genomics and proteomics knowledge.