

BSc Botany, Microbiology

Programme Outcomes (POs)

PO 1: Understand, comprehend and appreciate plant diversity, its conservation, sustainable utilization and its application for human welfare and to gain knowledge on primitive and advanced characters based on morphology and molecular characters and appreciate the evolutionary relationship.

PO 2: To inculcate and develop entrepreneurial skills based on quality education in herbal drug research and decision making on aspects of global importance like climate change, SDGs and green technologies.

PO 3: Making aware of the scientific and technological advancements – information and communication, Biotechnology and Molecular Biology for further learning and research in all branches of Botany.

PO 4: Skill development for the collection, preservation and recording of information from simple illustration to molecular database development and prepare them for national and international level competitive examinations.

PO 5: To impart Knowledge and enable understanding of concepts of microbiology and its application in healthcare, pharma, food, agriculture, beverages, nutraceutical industries.

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

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

PO 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.

I SEMESTER BSc. Botany Microbiology

1BOTDSC1-MDT: Microbial Diversity and Technology:

Course Outcomes (COs)

1. Students will appreciate the fascinating biological diversity of microbial world and its significance and get acquainted on taxonomic classification of microbes, historical development and contribution of eminent scientists to the field of microbiology as a scientific discipline.
2. Will give an in-depth knowledge on the principal components, working mechanism, basic principle and applications of microscopy and will be familiar with stains and staining technique in microbiology and be able to differentiate gram-positive and gram-negative bacterial cells.
3. Will understand and gain laboratory skills on the various methods of safe handling and culturing of microorganisms and create awareness on diverse physical and chemical agents used for sterilization and gain knowledge on growth pattern of microbes, its measurement, nutritional types, culturing and storage and their applications in research and industry.
4. Students will be able to comprehend the fundamental functioning of the primitive cells - Viruses, Viroids and Prions, their culturing, diseases caused and control.
5. Will be able to understand the bacterial structure and reproduction with emphasis on Actinomycetes, Cyanobacteria, Mycoplasmas and Phytoplasmas.
6. Students will gain knowledge on fungal structure, classification, reproduction, culturing and diseases.
7. Understand the importance of VAM and Lichens in agriculture and conservation respectively.
8. Will have broad perspective on economic importance of microbes.

MICDSC1- GM : GENERAL MICROBIOLOGY

Course Outcomes (COs)

- 1: The student becomes familiar with the foundation concepts of history of Microbiology.
- 2: The student gains the knowledge of various types of classical microscopy like the brightfield, dark field, fluorescent, phase contrast and advanced microscopy like confocal, atomic force and electron microscopy.
3. Student will be able to perform various staining techniques to identify and differentiate between various cell types and cell structures.
4. To understand the structure and functions of a typical prokaryotic cell and eukaryotic cell.
- 5: To gain knowledge of various (physical and chemical) methods of control of microorganisms and safety measures to be followed while handling microbes.
- 6: To understand and implement disposal and safety measures.

II SEMESTER BSc Botany Microbiology

2BOTDSC2-DNFP: Diversity of Non-Flowering Plants:

Course Outcomes (COs)

1. Understand the diversity and affinities among algae, bryophytes, pteridophytes and gymnosperms.
2. Understand the characteristics and classification of non-flowering plants.
3. To get acquainted with morphology, anatomy, reproduction and life cycles of algae, bryophytes, pteridophytes and gymnosperms and their ecological and evolutionary significance.
4. Obtain laboratory skills to preserve non-flowering plants for morphometric analysis.
5. To explore the ecological importance of non-flowering plants.
6. To understand the applications of algae in various fields like food industries, pharmaceutical industries, cosmetics and others.
7. Understand the affinities and evolutionary significance of plants through geological time scale.
8. Understand and appreciate palaeobotanical records.

2MICDSC2-MBP: MICROBIAL BIOCHEMISTRY AND PHYSIOLOGY

Course Outcomes (COs)

1. The student is able to describe the concept of pH and its biological significance, biological buffer systems and their importance.
2. To understand the concepts of biophysics, principle, construction working of spectrophotometers, centrifuges, chromatography.
3. To know the various physical and chemical growth requirements of bacteria and get equipped with various methods of bacterial growth measurement.
4. To understand, learn and gain skills of isolation, culturing and maintenance of pure culture.
5. Overview of major biomolecules: Classification, structure, functions of carbohydrates, lipids, proteins, amino acids, and nucleic acids.
6. 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.
7. Conceptual knowledge of aerobic and anaerobic respiration and various intermediary mechanisms involved oxidative phosphorylation.

III SEMESTER BSc Botany Microbiology

3BOTDSC3-PADB: Plant Anatomy and Developmental Biology:

Course Outcomes (COs)

1. To understand, identify and compare anatomy of different plant tissues.
2. Skill development for the proper description and illustration of internal structure using technical terms and further classification.
3. Provide an understanding on differentiation of plant parts and compare their primary and secondary structure.
4. Observation and classification of the floral variations from the premises of college and surroundings.
5. Equip the students with the knowledge of basic structure and organization of plant parts and help students to understand plant development and appreciate the process.
6. Understand the reproductive processes in the life cycle of plants.
7. Students will be able to understand the growth, development and embryological variations in angiosperms.
8. Elicit enthusiasm to understand evolution based on variations in reproduction among plants.

3MICDSC3-MD : MICROBIAL DIVERSITY

Course Outcomes (COs)

1. To learn and understand the microbial diversity in the living world.
2. The student will be able to explain Biosystematics and the major classification systems of numerical and chemotaxonomy.
3. Student will be able to Study the measures of microbial diversity; Conservation and economic values of microbial diversity.
4. To display an understanding of diversity of prokaryotic microorganisms namely Bacteria, Archea , Actinomycetes, Chlamydiae, Spirochaetes ,Rickettsia and Cyanobacteria and their classifications, culturing, reproduction and significance
5. To demonstrate an understanding of diversity of eukaryotic microorganisms namely Algae, Fungi, Protozoans and study of their General characters; Classification- Economic importance, culturing, reproduction and significance.
6. To demonstrate an understanding of diversity of viruses namely plant viruses, animal viruses, microbial viruses and sub viral particles and study of their General characters; Classification- Economic importance and type study.

IV SEMESTER BSc Botany Microbiology

4BOTDSC4-ECB: ECOLOGY AND CONSERVATION BIOLOGY

Course Outcomes (COs)

1. Gain knowledge on the fundamental concepts in ecology, environmental science and phytogeography.
2. To appreciate the history, scope, importance of ecology and improve knowledge on the various ecological factors and ecological adaptations in plants.
3. To understand various concepts of ecosystems and communities along with ecological relationships between organisms and their environment.
4. To utilize various tools and techniques to study various physical and physiological parameters of ecosystems.
5. To acquaint the students with geographical phenomena and principles of phytogeography.
6. The student will appreciate and acquire detailed understanding on the phytogeographical regions of India. This knowledge is critical in understanding the vegetation, its management and biodiversity conservation of phytogeographical zones.
7. Students will be able to identify the sources of pollution, pros and cons of urbanization with respect to pollution and provide remedies to mitigate and rectify the same.
8. To appreciate biodiversity, importance and its conservation. Students will judiciously understand the various threats to biodiversity and methods to conserve them in the best possible ways.

4MICDSC4-MEM: MICROBIAL ENZYMOLOGY AND METABOLISM

Course outcomes:

1. The student will be able to discuss the biosynthesis and the degradation pathways involved in the physiology of microbes.
2. To demonstrate understanding of metabolism of carbohydrates via various aerobic and anaerobic fermentation pathways.
3. To demonstrate understanding of metabolism of aminoacids with special significance to Nitrogen Metabolism including introduction to biological nitrogen fixation Ammonia assimilation Assimilatory nitrate reduction, dissimilatory nitrate reduction, denitrification.
4. To explain both biosynthesis and degradation of purine and pyrimidine .
5. To elucidate the various fermentation pathways of biosynthesis and oxidation of lipids.
6. To display conceptual knowledge of properties, structure, functions of enzymes, classification of enzyme and catalytic mechanisms.
7. To develop the understanding of enzyme kinetics and enzyme regulation and application of enzymes in large scale industrial processes.

V SEMESTER BSc Botany Microbiology

Paper V: 5BOTDSC5: Plant Taxonomy and Resource Botany

Course Outcomes (COs)

1. To recognise and understand the concepts involved in plant taxonomy and main features in Angiosperm evolution
2. 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.
3. Interpret the rules of ICN in botanical nomenclature.
4. Classify Plant Systematic and recognize the importance of herbarium and Virtual Herbarium, Evaluate the Important herbaria and botanical gardens
5. 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.
6. Analyse and evaluate the application of Phytochemistry, cytotaxonomy and computer application in taxonomy
7. To study and understand the morphological, embryological and palynological in relation to taxonomy.
8. To access the importance of herbal extracts in cosmeceuticals and nutraceuticals
9. To understand and evaluate the use of herbs as excipients – plant sweeteners, natural colourants, binders, flavours and perfumes
10. To understand the utility of herbs as source of pesticides and its beneficiaries

5 MICDSC5 - MGMB: MICROBIAL GENETICS AND MOLECULAR BIOLOGY

Course Outcomes (COs)

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. Know about 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

V SEMESTER BSc Botany Microbiology

Paper VI: 5BOTDSC6: Cell Biology and Genetics

Course Outcomes (COs)

1. To Identify the basic principles and current trends in classical genetics and cell biology
2. To obtain in-depth knowledge of the cell as a basic unit of life, cell organelles and biomolecules
3. Understanding of Cell metabolism, chemical composition, physiochemical and functional organization of organelles.
4. To understand the process of mitosis and meiosis and importance of chromosomes in the process of cell division
5. Recognize the role of cyclins and protein kinases in regulating the cell cycle as well as the importance of cell cycle checkpoints.
6. Able to describe the mechanism and importance of programmed cell death
7. Ability to identify, calculate and describe crossing over, allelic generations and frequencies of recombination.
8. Understand the various types of gene interactions and their effects on the phenotype
9. To gain knowledge on chromosomal aberrations and its role in evolution.
10. Develop theoretical background on molecular genetics to provide a strong support for the student for future research and employability

5 MICDSC6 - IMM: IMMUNOLOGY AND MEDICAL MICROBIOLOGY

Course Outcomes (COs)

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.

VI SEMESTER BSc Botany Microbiology

Paper VII: 6BOTDSC7: Plant Physiology and Biochemistry

Course Outcomes (COs)

1. To understand the importance of water and the mechanism of transport.
2. To gain conceptual clarity of various physiological processes in plants and understand the interconnections of the processes thereby gaining idea about the importance of plants in the dynamicity of nature
3. Preliminary understanding and appreciation of the basic functions and metabolic process taking place in plant body such as respiration, photosynthesis, nitrogen fixation etc., which are important for life
4. To gain knowledge on the role, functions and importance of mineral nutrients in plant metabolism and crop yield.
5. To understand biosynthesis, breakdown and energetics of biomolecules in plants
6. Understand and evaluate the role of plant hormones in plant development and about secondary metabolites.
7. To understand and analyse the importance of Sensory Photobiology, Plant movements and Programmed cell death
8. To analyse and appreciate the types of stresses and their effect on plants
9. To understand the structure, biosynthesis and role of secondary metabolites (phytochemicals) in plants and as defence molecules
10. Evaluate the importance of secondary metabolites for humans

6 MICDSC7 - BFDM: BIostatistics, Food and Dairy Microbiology

Course Outcomes (COs)

1. Understand the significance and activities of microorganisms in food and role of intrinsic and extrinsic 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.

VI SEMESTER BSc Botany Microbiology

Paper VIII: 6BOTDSC8: Plant Biotechnology and Molecular Biology

Course Outcomes (COs)

1. Understand and acquire skill in plant tissue culture, plant molecular biology and transgenic plants
2. Understand and acquire skills in basic laboratory organization, culture media, various culturing methods and germplasm conservation.
3. Gain knowledge about the enzymes that are frequently used in genetic engineering and about different types of vectors that can be used for gene cloning
4. Understand the basic procedure for cloning and the different types of DNA - library.
5. Understand and get acquainted with the applications of transgenic plants in different fields
6. Understand the mechanism and concept of life process at molecular level through central dogma concept
7. Understand the concept of Gene, epigenetics and genome organization and also acquire the emerging technology skills in plant genetic engineering, genomics and proteomics
8. Understand various concepts related to molecular biology including DNA and RNA structure, DNA replication, transcription and translation
9. Gain knowledge on the mechanism of DNA replication repair mechanisms
10. Understand the basics of Bioinformatics and its application

6 MICDSC8 - IMB: INDUSTRIAL MICROBIOLOGY AND BIOINFORMATICS

Course Outcomes (COs)

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.

