

## BSc Microbiology, Zoology

### **Programme Outcomes (PO)**

1. Students gain knowledge and skill in the fundamentals of animal sciences and analyse interactions among the various animals of different phyla, their distribution
2. Apply the knowledge of cell structure, metabolism, genetics, and gene expressions to understand the complex evolutionary processes and behaviour of animals
3. Correlates the physiological processes of animals and their relationship of organ systems
4. Apply the knowledge and understanding of economic zoological aspects to one's own life and work
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 – Course Title: **1MICDSC1- GM: General Microbiology**

Course Outcomes (CO)

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.

Semester 1 Course Title: **1ZOODSC1-CGID: Cytology, Genetics, and Infectious Diseases**

Course Outcomes (CO)

1. The structure and function of the cell organelles.
2. The chromatin structure and its location.
3. The basic principle of life, how a cell divides leading to the growth of an organism and reproduces to form a new organism.
4. How a cell communicates with its neighbouring cells.
5. The principles of inheritance, Mendel's laws and the deviations.
6. How environment plays an important role by interacting with genetic factors.
7. Detect chromosomal aberrations in humans and study of pedigree analysis.

Semester 2 Course Title: **2MICDSC2-MBP: Microbial Biochemistry and Physiology**

Course Outcomes (CO)

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, aminoacids, 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.

Semester 2 Course Title: **2ZOODSC2-BP: Biochemistry and Physiology**

Course Outcomes (CO)

1. To develop a deep understanding of structure of biomolecules like proteins, lipids, and carbohydrates.
2. How simple molecules together form complex macromolecules.
3. To understand the thermodynamics of enzyme catalysed reactions.
4. Mechanisms of energy production at cellular and molecular levels.
5. To understand various functional components of an organism.
6. To explore the complex network of these functional components.
7. To comprehend the regulatory mechanisms for maintenance of function in the body.

Semester 3 Course Title: **3MICDSC3-MD: Microbial Diversity**

Course Outcomes (CO)

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.

Semester 3 Course Title: **3ZOODSC3-MBBTB: Molecular Biology Bioinstrumentation & Techniques in Biology**

Course Outcomes (CO)

1. 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.
2. 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.
3. Acquiring knowledge on instrumentation and techniques in biology.

Semester 4 Course Title: **4MICDSC4-MEM: Microbial Enzymology and Metabolism**

Course Outcomes (CO)

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 amino acids 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.

Semester 4 Course Title: **4ZOODSC4-GTICB: Gene Technology, Immunology and Computational Biology**

Course Outcomes (CO)

1. Acquaint knowledge on versatile tools and techniques employed in genetic engineering and recombinant DNA technology.
2. An understanding on application of genetic engineering techniques in basic and applied experimental biology.
3. To acquire a fundamental working knowledge of the basic principles of immunology.
4. To understand how these principles, apply to the process of immune function.
5. 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.

Semester 5 paper 5 Course Title: **5 MICDSC5 - MGMB: Microbial Genetics and Molecular Biology**

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. 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.

Semester 5 paper 6 Course Title: **5 MICDSC6 - IMM: Immunology and Medical Microbiology**

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 5 paper 5 Course Title: **5ZOODSC5 – DNCEZ: Diversity of Non – Chordates and Economic Zoology**

Course Outcomes (CO)

1. Demonstrate the comprehensive identification abilities of non-chordates.
2. Understand and explain evolutionary relationship amongst non-chordate groups.
3. Encourage and equip them for entrepreneurship.
4. Enable students to take up research in Biological Science.

Semester 5 paper 6 Course Title: **5ZOODSC6 – DCCA: Diversity of Chordates and Comparative Anatomy**

Course Outcomes (CO)

1. Demonstrate comprehensive identification abilities for chordates diversity.
2. Understand the structural and functional diversity of chordates.
3. Develop the ability to work collaborative team-based projects.
4. Study the evolutionary relationship amongst chordate groups.
5. Enable students to take up research in biological Science.

Semester 6 paper 7 Course Title: **6 MICDSC7 - BFDM: Biostatistics, Food and Dairy Microbiology**

Course Outcomes (CO)

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.

Semester 6 paper 8 Course Title: **6 MICDSC8 - IMB: Industrial Microbiology and Bioinformatics**

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.



Semester 6 paper 7 Course Title: **6ZOODSC7 – EDB: Evolutionary and Developmental Biology**

Course Outcomes (CO)

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

Semester 6 paper 8 Course Title: **6ZOODSC8 – EBWMC: Environmental Biology, Wildlife Management & Conservation**

Course Outcomes (CO)

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