Bachelor of Science (B.Sc.) Zoology

Programme Outcomes (POs)

At the completion of programme, student will attain:

- **PO1. Disciplinary Knowledge**: Acquire comprehensive knowledge of major concepts, theoretical principles and experimental findings in Zoology, and some of the applied areas of study such as wildlife conservation and management; environmental science; various techniques, instruments, used for analysis of animal forms and functions.
- **PO2. Effective communication and Critical thinking**: Convey the intricate zoological information effectively and efficiently, analyze and solve the problems related to animal sciences without reckoning on assumptions and guesses.
- **PO3. Research & Leadership quality**: Recognize and mobilize relevant resources essential for a research project, and manage the project in a responsible way by following ethical scientific conduct and bio-safety protocols.
- **PO4. Digitally literate and Ethical awareness**: Use computers for computation and data analysis with appropriate software for biostatistics, and employ search tools to locate and retrieve relevant information recognize and avoid unethical behaviour such as fabrication, or misrepresentation of data or commit plagiarism.
- **PO5. Environment and Sustainability**: Understand the environmental and sustainability issues, acquire self-directed learning aimed at personal and social development.

Programme Specific Outcomes (PSOs)

At the completion of programme, student will attain:

- **PSO1.** Students should be able to identify, classify and differentiate diverse chordates and non-chordates based on their morphological, anatomical and systemic organization.
- **PSO2.** They also be able to describe economic, ecological and medical significance of various animal in human life. This will create a curiosity and awareness among them to explore the animal diversity and explore related career options. The procedural knowledge about identifying and classifying animals will provide students professional advantages in teaching, research and taxonomist jobs in various government organizations.

- **PSO3.** Acquired practical skills in molecular biology; biotechnology; microscopy; enzymology and analytical biochemistry and genetics will provide an extra to our students, who wish to undertake higher studies.
- **PSO4.** In-depth knowledge and understanding about comparative anatomy and developmental biology of various biological system; and learning about the organization, functions, strength and weaknesses of various systems will let students critically analyze the way evolution has shaped these traits in the human body.
- **PSO1.** Acquired skills in diagnostic testing, hematology, histopathology, staining procedures etc. used in clinical and research laboratory. Deep understanding of different physiological systems and methods available to measure vital physiological parameters and to comprehend the mechanism behind occurrence of different life-threatening disease via laboratory examination, assessment of basic physiological functions by interpreting physiological charts will help to find their career options.

Semester – I

Major Course 1 (MJC-1)

Course Title – Diversity of Non-Chordates

Course Outcomes (COs)

After completion of the course, students should be able to:

- **CO-1:** Learn about the importance of systematics, taxonomy and structural organization of non-chordates.
- CO-2: Understand & appreciate the diversity of non-chordates living in varied habits and habitats.
- **CO-3:** Understand evolutionary history and relationships of different non-chordates through functional and structural affinities.
- CO-4: Critically analyze the organization, complexity and characteristic features of non-chordates.
- CO-5: Recognize the life functions and the ecological roles of the animals belonging to different phyla.
- **CO-6:** Enhance collaborative learning and communication skills through practical sessions, team-work, group discussions, Assignments and projects.

Semester – I

Minor Course 1 (MIC-1)

Course Title – Diversity of Non-Chordates

Course Outcomes (COs)

After completion of the course, students should be able to:

CO-1: Learn about the importance of systematics, taxonomy and structural organization of non-chordates.

CO-2: Critically analyze the organization, complexity and characteristic features of non-chordates.

CO-3: Recognize the life functions and the ecological roles of the animals belonging to different phyla.

Semester – I

Multidisciplinary Course 1 (MDC-1)

Course Title – Diversity of Non-Chordates

Course Outcomes (COs)

After completion of the course, students should be able to:

CO-1: Learn about the importance of systematics, taxonomy and structural organization of non-chordates.

CO-2: Critically analyze the organization, complexity and characteristic features of non-chordates.

CO-3: Recognize the life functions and the ecological roles of the animals belonging to different phyla.

Semester – II

Major Course 2 (MJC-2)

Course Title – Diversity of Chordates

Course Outcomes (COs)

After completion of the course, students should be able to:

- **CO-1:** Understand different classes of chordates, level of organization and evolutionary relationship between different subphyla and classes, within and outside the phylum.
- CO-2: Study about diversity in animals making students understand about their distinguishing features.
- CO-3: Appreciate similarities and differences in life functions among various groups of animals in Phylum Chordata.
- CO-4: Comprehend the circulatory, nervous and skeletal system of chordates.
- CO-5: Know about the habit and habitat of chordates in marine, freshwater and terrestrial ecosystems.

Semester – II

Minor Course 2 (MIC-2)

Course Title – Diversity of Chordates

Course Outcomes (COs)

After completion of the course, students should be able to:

- **CO-1:** To understand the General Characteristic and Classification of Hemichordate, Urochordata and Cephalochordate, the Larval forms of Protochordate and Retrogressive Metamorphosis in Urochordata.
- CO-2: To acquire knowledge about the General Characters and Classification of Agnathia, Pisces and Amphibia.
- **CO-3:** To Understand the General Characteristics and Classification of Reptilia, Aves and Mammals, Biting Mechanism in Snakes, Flight Adaptations in Birds and migration in Birds.

Semester – II

Multidisciplinary Course 2 (MDC-2)

Course Title – Diversity of Chordates

Course Outcomes (COs)

After completion of the course, students should be able to:

- **CO-1:** To understand the General Characteristic and Classification of Hemichordate, Urochordata and Cephalochordate, the Larval forms of Protochordate and Retrogressive Metamorphosis in Urochordata.
- CO-2: To acquire knowledge about the General Characters and Classification of Agnathia, Pisces and Amphibia.
- **CO-3:** To Understand the General Characteristics and Classification of Reptilia, Aves and Mammals, Biting Mechanism in Snakes, Flight Adaptations in Birds and migration in Birds.

Semester – III

Major Course 3 (MJC-3)

Course Title – Comparative Anatomy

Course Outcomes (COs)

Upon completion of the course, students should be able to:

- **CO-1:** Explain comparative account of the different vertebrate systems.
- CO-2: Understand the pattern of vertebrate evolution, organization and functions of various systems.
- **CO-3:** Learn the comparative account of integument, skeletal components, their functions and modifications in different vertebrates.
- **CO-4:** Understand the evolution of heart, modification in aortic arches, Structure of respiratory organs used in aquatic, terrestrial and aerial vertebrates; and digestive system and its anatomical specializations with respect to different diets and feeding habits.
- CO-5: Learn the evolution of brain, sense organs and excretory organs to a complex, highly evolved form in mammals;
- **CO-6:** Learn to analyze and critically evaluate the structure and functions of vertebrate systems, which helps them to discern the developmental, functional and evolutionary history of vertebrate species.

Semester – III

Major Course 4 (MJC-4)

Course Title – Physiology

Course Outcomes (COs)

Upon completion of the course, students should be able to:

CO-1: Know the principles of normal biological function in human body.

CO-2: Outline basic human physiology and correlate with histological structures.

- **CO-3:** Comprehend and analyze problem-based questions on physiological aspects.
- **CO-4:** Recognize and explain how all physiological systems work in unison to maintain homeostasis in the body; and to feedback loops to control the same.
- **CO-5:** Learn an integrative approach to understand the interactions of various organ systems resulting in the complex overall functioning of the body.

Semester – III

Minor Course 3 (MIC-3)

Course Title – Physiology

Course Outcomes (COs)

Upon completion of the course, students should be able to:

- CO-1: Know the principles of normal biological function in human body.
- **CO-2:** Outline basic human physiology and correlate with histological structures.
- CO-3: Comprehend and analyze problem-based questions on physiological aspects.

- **CO-4:** Recognize and explain how all physiological systems work in unison to maintain homeostasis in the body; and to feedback loops to control the same.
- **CO-5:** Learn an integrative approach to understand the interactions of various organ systems resulting in the complex overall functioning of the body.

Semester – III

Multidisciplinary Course 3 (MDC-3)

Course Title – Physiology

Course Outcomes (COs)

Upon completion of the course, students should be able to:

- **CO-1:** Know the principles of normal biological function in human body.
- **CO-2:** Outline basic human physiology and correlate with histological structures.
- CO-3: Comprehend and analyze problem-based questions on physiological aspects.
- **CO-4:** Recognize and explain how all physiological systems work in unison to maintain homeostasis in the body; and to feedback loops to control the same.
- **CO-5:** Learn an integrative approach to understand the interactions of various organ systems resulting in the complex overall functioning of the body.

Semester – IV

Major Course 5 (MJC-5)

Course Title – Cell Biology

Course Outcomes (COs)

Upon completion of the course, students should be able to:

- **CO-1:** Understand fundamental principles of cell biology.
- CO-2: Explain structure and functions of cell organelles involved in diverse cellular processes.
- CO-3: Appreciate how cells grow, divide, survive, die and regulate these important processes.
- **CO-4:** Comprehend the process of cell signaling and its role in cellular functions.
- **CO-5:** Have an insight of how defects in functioning of cell organelles and regulation of cellular processes can develop into diseases.
- CO-6: Learn the advances made in the field of cell biology and their applications.

Major Course 6 (MJC-6)

Course Title – Endocrinology

Course Outcomes (COs)

After completion of the course the students will be able to:

- CO-1: Understand endocrine system and the basic properties of hormones.
- **CO-2:** Appreciate the importance of endocrine system and the crucial role it plays along with the nervous system in maintenance of homeostasis.
- CO-3: Gain insight into the molecular mechanism of hormone action and its regulation.
- CO-4: Know the regulation of physiological process by the endocrine system and its implication in diseases.
- **CO-5:** Gain knowledge about the prevalent endocrine disorders and critically analyze their own and their family's health issues.

Major Course 7 (MJC-7)

Course Title – Ecology

Course Outcomes (COs)

Upon completion of the course, students should be able to:

- **CO-1:** Demonstrate an understanding of key concepts in ecology with emphasis on historical perspective, role of physical factors and concept of limiting factors.
- CO-2: Comprehend the population characteristics, dynamics, growth models and interactions.
- **CO-3:** Understand the community characteristics, ecosystem development and climax theories.
- CO-4: Know about the types of ecosystems, food chains, food webs, energy models and ecological efficiencies.
- CO-5: Apply the basic principles of ecology in wildlife conservation and management.
- **CO-6:** Inculcate scientific quantitative skills, evaluate experimental design, read graphs, and analyze and use information available in scientific literature.

Semester – IV

Minor Course 4 (MiC-4)

Course Title – Ecology

Course Outcomes (COs)

Upon completion of the course, students should be able to:

- **CO-1:** Demonstrate an understanding of key concepts in ecology with emphasis on historical perspective, role of physical factors and concept of limiting factors.
- CO-2: Comprehend the population characteristics, dynamics, growth models and interactions.

CO-3: Understand the community characteristics, ecosystem development and climax theories.

- CO-4: Know about the types of ecosystems, food chains, food webs, energy models, and ecological efficiencies.
- **CO-5:** Apply the basic principles of ecology in wildlife conservation and management.
- **CO-6:** Inculcate scientific quantitative skills, evaluate experimental design, read graphs, and analyze and use information available in scientific literature.

Semester – V

Major Course 8 (MJC-8)

Course Title – Biochemistry

Course Outcomes (COs)

After the completion of the course, students should be able to:

- **CO-1:** To understand the structure. Classification and importance of Carbohydrates and Proteins.
- **CO-2:** To understand the structure and significance of physiologically important Lipids.
- **CO-3:** To understand the basic structure and types of DNA and RNA, Base pairing, denaturation and renaturation of DNA.
- CO-4: To understand the type of Enzymes, Mechanism of Enzyme Action and Enzyme Kinetics.
- **CO-5:** Have an insight of how defects in functioning of cell organelles and regulation of cellular processes can develop into diseases.

Major Course 9 (MJC-9)

Course Title – Genetics

Course Outcomes (COs)

After the completion of the course, students should be able to:

CO-1: To explain and discuss the genetic variation through linkage and crossing over.

- **CO-2:** To describe sex-linked, sex-limited and sex-influenced inheritance.
- **CO-3:** To understand the Concept behind genetic disorder, gene mutations and molecular basis of mutations and to explain the criteria for extra-chromosomal inheritance.
- **CO-4:** To describe the molecular mechanisms of recombination in bacteria and to explain and distinguish the concept of transposable genetic elements in prokaryotes and eukaryotes. To Solve genetic based problems.

Semester – V

Minor Course 5 (MIC-5)

Course Title – Cell Biology

Semester – V

Minor Course 6 (MIC-6)

Course Title – Genetics

Course Outcomes (COs)

After the completion of the course, students should be able to:

CO-1: To understand variation, linkage and crossing over.

CO-2: To understand sex linked inheritance.

CO-3: To understand genetic disorders and mutations.

CO-4: To understand extra chromosomal inheritance.

Semester – VI

Major Course 10 (MJC-10)

Course Title – Developmental Biology

Course Outcomes (COs)

After the completion of the course, students should be able to:

CO-1: To describe the mechanism of gametogenesis, fertilization and blocks to polyspermy.

CO-2: To explain early embryonic development in frog and chick.

- CO-3: To understand the concepts of late embryonic development in model organisms.
- **CO-4:** To describe post embryonic development such as metamorphosis and regeneration with suitable examples and apply important experiments and project work.

Major Course 11 (MJC-11)

Course Title – Evolution

Course Outcomes (COs)

After the completion of the course, students should be able to:

CO-1: To understand the basis of origin of life such as: chemogenic, RNA world, biogeny and evolution of eukaryotes.

- **CO-2:** To obtain the various evolutionary concepts and heritable variation and to understand concept of species, isolating mechanisms, modes of speciation and adaptive radiation.
- **CO-3:** To explain and different types of fossils, geological time scale, climatic conditions, hominid characteristics, primate phylogeny and evolution of horse and man.
- **CO-4:** To understand Hardy-Weinberg principle of genetic equilibrium and its destabilizing forces such as Natural selection, Mutation, Migration and genetic drift.

Major Course 12 (MJC-12)

Course Title - Animal Behaviour

Course Outcomes (COs)

After the completion of the course, students should be able to:

- **CO-1:** To understand various pattern of animal behavior's such as stereotyped, instinct, learnt, associative behaviour along with operant conditioning and habituation imprinting and to explain the concept of social and sexual behaviour.
- **CO-2:** To provide the concept of biological rhythm, photoperiod and regulation of seasonal reproduction of vertebrates and role of melatonin.
- **CO-3:** To understand the relevance of biological clock in terms of chrono pharmacology, chrono medicine and chronotherapy.
- **CO-4:** To develop the skill in this course by performing practical works such as studying nest and nesting habitat of birds and social insects and other significant experiments.

Semester – VI

Minor Course 7 (MIC-7)

Course Title – Evolution Minor Course 8 (MJC-8)

Course Title – Developmental Biology

Course Outcomes (COs)

After the completion of the course, students should be able to:

- **CO-1:** To describe the mechanism of gametogenesis, fertilization.
- **CO-2:** To explain early embryonic development in frog and chick.
- **CO-3:** To understand the concepts of late embryonic development in model organisms.
- **CO-4:** To describe post embryonic development such as metamorphosis and regeneration with suitable examples and apply important experiments and project work.

Semester – VII

Major Course 13 (MJC-13)

Course Title - Molecular Biology

Course Outcomes (COs)

After the completion of the course, students should be able to:

- **CO-1:** To understand Central dogma of molecular biology. Explain and distinguish mechanism of replication, transcription and translation in prokaryotes and eukaryotes.
- CO-2: To understand and explain the post transcriptional modifications in eukaryotes.
- CO-3: To explain and differentiate the mechanism of gene expression and regulation in prokaryotes and eukaryotes.
- **CO-4:** To describe the concept of regulatory RNAs, Ribo-switches and RNA interference and to enhance skill in molecular biology through relevant experiments.

Major Course 14 (MJC-14)

Course Title – Research Methodology

Common Syllabus of MJC-14 for all the subjects of the Faculty of Sciences has been separately prepared.

Major Course 15 (MJC-15)

Course Title - Immunology and Microbiology

Course Outcomes (COs)

After the completion of the course, students should be able to:

- CO-1: To explain cells and organs of the immune system, innate and adaptive immunity.
- CO-2: To describe autoimmunity with reference to rheumatoid arthritis and tolerance and AIDS.
- **CO-3:** To understand antigens and its type, structure and functions of immunoglobulin's, antigen-antibody interactions and immunoassays (such as ELISA and RIA).

- **CO-4:** To explain structure and functions major histocompatibility complex, know the concept of hypersensitivity and vaccines.
- CO-5: To understand the microbial basis of diseases.

Semester – VII

Minor Course 09 (MIC-09)

Course Title – Animal Behaviour

Course Outcomes (COs)

After the completion of the course, students should be able to:

- **CO-1:** To understand various pattern of animal behaviours such as stereotyped, instinct, learnt, associative behavior along with operant conditioning and habituation imprinting and to explain the concept of social and sexual behaviour.
- **CO-2:** To provide the concept of biological rhythm, photoperiod and regulation of seasonal reproduction of vertebrates and role of melatonin.
- **CO-3:** To understand the relevance of biological clock in terms of chronopharmacology, chronomedicine and chronotherapy.
- **CO-4:** To develop the skill in this course by performing practical works such as studying nest and nesting habitat of birds and social insects and other significant experiments.

Minor Course 10 (MIC-10)

Course Title – Endocrinology

Course Outcomes (COs)

After the completion of the course, students should be able to:

- **CO-1:** Understand endocrine system and the basic properties of hormones.
- **CO-2:** Appreciate the importance of endocrine system and the crucial role it plays along with the nervous system in maintenance of homeostasis.
- **CO-3:** Know the of hormone action and its regulation.
- CO-4: Know the regulation of physiological process by the endocrine system and its implication in diseases.

Semester – VIII

Major Course 16 (MJC-16)

Course Title – Instrumentation and Biometry

Course Outcomes (COs)

After the completion of the course, students should be able to:

- CO-1: To understand the principals and working of various instruments used in biological experimentation.
- **CO-2:** Gain insight of relationship between mathematics and biology.
- CO-3: To present their data in statistically reliable form.
- **CO-4:** To test their hypothesis using different models.
- CO-5: To correlate their data with different factors.