

## Graduate Attributes in Zoology

**1. Disciplinary knowledge and skills:** Capable of demonstrating (i) comprehensive knowledge and understanding of major concepts, theoretical principles and experimental findings in Zoology and its different subfields (animal diversity, principles of ecology, comparative anatomy and developmental biology of vertebrates, physiology and biochemistry, genetics and evolutionary biology, animal iotechnology, applied Zoology, aquatic biology, immunology, reproductive biology, and insect, vectors and diseases), and other related fields of study, including broader interdisciplinary subfields such as chemistry, physics and mathematics; (ii) ability to use modern instrumentation for advanced genomic and proteomic technology.

**2. Skilled communicator:** Ability to impart complex technical knowledge relating to Zoology in a clear and concise manner in writing and oral skills.

**3. Critical thinker and problem solver:** Ability to have critical thinking and efficient problem solving skills in the basic areas of Zoology (animal diversity, principles of ecology, comparative anatomy and developmental biology of vertebrates, physiology and biochemistry, genetics and evolutionary biology, animal iotechnology, applied Zoology, aquatic biology, immunology, reproductive biology, insect, vectors and diseases etc.).

**4. Sense of inquiry:** Capability for asking relevant/appropriate questions relating to issues and problems in the field of Zoology, and planning, executing and reporting the results of an experiment or investigation.

**5. Team player/worker:** Capable of working effectively in diverse teams in both classroom, laboratory and in industry and field-based situations.

**6. Skilled project manager:** Capable of identifying/mobilizing appropriate resources required for a project, and manage a project to completion, while observing responsible and ethical scientific conduct; and safety and chemical hygiene regulations and practices.

**7. Digitally literate:** Capable of using computers for Bioinformatics and computation and appropriate software for analysis of genomics and proteomics data, and employing modern bioinformatics search tools to locate, retrieve, and evaluate location and biological annotation genes of different species.

**8. Ethical awareness/reasoning:** Capable of conducting their work with honesty and precision thus avoiding unethical behavior such as fabrication, falsification or misrepresentation of data or committing plagiarism, and appreciating environmental and sustainability issues. Research ethics committee expects them to declare any type of conflict of interest that may affect the research. Any plan to withhold information from researchers should be properly explained with justification in the application for ethical approval.

**8. Lifelong learners:** Capable of self-paced and self-directed learning aimed at personal development and for improving knowledge/skill development and reskilling.

## **Programme Learning Outcomes (PO) in B.Sc. (Major) Zoology**

### **A. Knowledge and Understanding**

1. Demonstrate (i) in-depth knowledge and understanding about the fundamental concepts, principles and processes underlying the academic field of Zoology and its different subfields (animal diversity, principles of ecology, comparative anatomy and developmental biology of vertebrates, physiology and biochemistry, genetics and evolutionary biology, animal biotechnology, applied Zoology, aquatic biology, immunology, reproductive biology, and insect, vectors and diseases, apiculture, aquarium fish keeping, medical diagnostics, and sericulture) (ii) procedural knowledge that creates different types of professionals in the field of Zoology and related fields such as, apiculture, aquarium fish keeping, medical diagnostics, and sericulture, etc.(iii) skills related to specialization areas within Zoology as well as within subfields of Zoology, including broader interdisciplinary subfields (Chemistry, Physics and Mathematics).

2: Over the years, Zoologists were able to find many differences within the same breed of an animal species. As a Zoology professional one can study extinct animals by specializing in Paleozoology, on the different types of birds in Ornithology; opt for studying Herpetology and Arachnology, the branches dealing with the study of snakes and spiders, respectively.

3: Appreciate the complexity of life processes, their molecular, cellular and physiological processes, their genetics, evolution and behaviour and their interrelationships with the environment.

4: Study concepts, principles and theories related with animal behaviour and welfare.

5: Understand and interpret data to reach a conclusion.

6: Design and conduct experiments to test a hypothesis.

7: Understand scientific principles underlying animal health, management and welfare.

8: Accept the legal restrictions & ethical considerations placed for animal welfare.

9: Understand fundamental aspects of animal science relating to management of animals.

10: Assess problems and identify constraints in management of livestock.

### **B. Subject Specific Intellectual and Practical Skills**

The students will be able to

PO-1. Understand how organisms are classified and full and identified

PO-2. Demonstrate knowledge of basic zoological principles

PO-3. Use appropriate information with a critical understanding

PO-4. Learn basic laboratory and analytical skills

- PO-5. Use effective methods for modifying animal behaviour
- PO-6. Participate in animal management programmes in an effective manner
- PO-7. Work safely and effectively in the field, in laboratories and in animal facilities.
- PO-8. Demonstrate competence in handling and statistical analysis of data gained from practical
- PO-9. Learn communication and IT skills, including the collation and statistical analysis of data, citing & referencing work appropriately, communicating using a range of formats

In course learning outcomes, the student will attain subject knowledge in terms of individual course as well as holistically. There are Core Courses (CC) and Skill Enhancement Courses (SEC). The example related to the courses and their outcomes are given below.

**Course Outcome (CO) : CCF (Major)**  
**Course Code: CC1 Cell Biology**

- CO-1. Students get the knowledge about cell structure and function to understand the life sustaining process.
- CO-2. Students understand the normal and abnormal conditions of cell functioning, get basic knowledge about cancer.
- CO-3. Student get familiar with different tools and techniques in cell biology like microscopy, cell culture, cell fractionation, freeze fracture replication, freeze etching etc.
- CO-4. Students learn the technics of cell measurement, cell staining and study cell viability.

**PO-CO Mapping- CC1-Cell Biology**

|      | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 |
|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| CO 1 | √   | √   | X   | X   | √   | X   | X   | X   | X   |
| CO2  | √   | √   | X   | √   | √   | √   | √   | √   | √   |
| CO3  | √   | √   | X   | √   | √   | √   | √   | √   | √   |
| CO4  | √   | √   | X   | √   | √   | √   | √   | √   | √   |

**Course Outcome (CO) : CCF (Major)**  
**Course Code: SEC-1 Applied Entomology**

- CO-1. Students are introduce with different bugs and their harmful effect and control measure.
- CO-2. Students are demonstrated about different insect vectors and pests through photographs.
- CO-3. Students learn about the morphology of different castes of bees and their social behaviour. Students understand the culture methods of honey bees and introduced with different modern instruments.
- CO-4. Students gain idea about disease of honey bees and control measures.

- CO-5. Students understand about the Apiary products and their uses.
- CO-6. Students come to know about the modern methods introduced to improve bee industry.
- CO-7. Students learn about the types of silk moths, their geographical distribution, life cycle and host plants.
- CO-8. Students become familiar with the process of silk-worm rearing, their disease management and silk production.
- CO-9. Students understand general perception and status of Forensic Entomology, its applications and limitations.
- CO-10. Students learn to collect and preserve economically important insects.
- CO-11. Students learn to prepare project report.

**PO-CO Mapping: CCF (Major) Course: SECI**

|       | PO 1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 |
|-------|------|-----|-----|-----|-----|-----|-----|-----|-----|
| CO 1  | -    | -   | -   | -   | -   | √   | -   | -   | -   |
| CO 2  | -    | √   | -   | -   | -   | -   | -   | -   | -   |
| CO 3  | √    | -   | √   | -   | -   | -   | -   | -   | -   |
| CO 4  | √    | √   | -   | √   | -   | √   | -   | -   | √   |
| CO 5  | √    | -   | -   | -   | -   | √   | -   | -   | √   |
| CO 6  | √    | -   | -   | -   | -   | √   | -   | -   | -   |
| CO 7  | -    | -   | -   | -   | -   | -   | -   | √   | -   |
| CO 8  | √    | -   | -   | -   | -   | -   | -   | -   | -   |
| CO 9  | √    | -   | -   | -   | -   | -   | √   | -   | √   |
| CO 10 | √    | √   | -   | -   | -   | -   | -   | -   | -   |
| CO 11 | √    | -   | -   | -   | -   | √   | -   | -   | -   |

**Course Outcome (CO) : CCF (Major))**  
**Course Code: CC-2 Biochemistry**

After successfully completing this course, the students will be able to:

- CO-1: Understand about the importance and scope of biochemistry.
- CO-2: Understand the structure and biological significance of carbohydrates, amino acids, proteins, lipids and nucleic acids.
- CO-3: Understand the structure and function of immunoglobulins.
- CO-4: Understand the concept of enzyme, its mechanism of action and regulation.
- CO-5: Understand the process of metabolism of carbohydrate, protein, lipid and nucleic acids.
- CO-6: Develop the concept of free radicals and antioxidants.

**PO-CO Mapping: CCF (Major) Course: CC-2**

|      | PO-1 | PO-2 | PO-3 | PO-4 | Po-5 | Po-6 | PO-7 | PO-8 | PO-9 |
|------|------|------|------|------|------|------|------|------|------|
| CO-1 | -    | √    | √    | √    | -    | -    | -    | √    | √    |
| CO-2 | -    | √    | √    | √    | -    | -    | √    | √    | √    |
| CO-3 | -    | √    | √    | √    | -    | -    | -    | √    | √    |
| CO-4 | -    | √    | -    | √    | -    | -    | √    | √    | -    |
| CO-5 | -    | √    | √    | √    | -    | -    | √    | √    | √    |
| CO-6 | -    | -    | -    | -    | -    | -    | √    | √    | √    |

**Course Outcome (CO) : CCF (Major)****Course Code: SEC-2 Aquaculture**

CO-1 : Students Learn about different types of cultivable fishes.

CO-2 : Understand different aspects of sustainable Aquaculture systems.

CO-3 : Become familiar with recent advancement of Aquaculture, Aquarium fishery, fish nutrition, capture fishery and fish biotechnology.

CO-4 : Learn about different types of fish diseases and their pathogens.

CO-5 : Learn about different fish breeding technique and pearl culture technique.

|      | PO-1 | PO-2 | PO-3 | PO-4 | Po-5 | Po-6 | PO-7 | PO-8 | PO-9 |
|------|------|------|------|------|------|------|------|------|------|
| CO-1 | √    | -    | -    | -    | -    | -    | -    | -    |      |
| CO-2 | -    | √    | √    | √    | -    | √    | -    | -    | √    |
| CO-3 | -    | √    | √    | √    | -    | √    | -    | √    | √    |
| CO-4 | -    | √    | √    | √    | -    | √    | √    | -    | √    |
| CO-5 | -    | √    | √    | √    | √    | √    | √    | √    | √    |

**Course Outcome (CO) : CCF (IDC) Zoology****Course Code: IDC-1 &2 Animal Biology**

CO-1 : Students understand animal diversity with their taxonomic positions.

CO-2 : Understand basic principles of Genetic and sex determination.

CO-3 : Learn about Biodiversity types, measurement of Biodiversity and its conservation.

CO-4 : Develop concept of vectors and disease cycle.

CO-5 : Learn basic principle of laboratory techniques like Karyotype analysis, Microscopy, Colorimetry and Ultracentrifugation.

|      | PO-1 | PO-2 | PO-3 | PO-4 | Po-5 | Po-6 | PO-7 | PO-8 | PO-9 |
|------|------|------|------|------|------|------|------|------|------|
| CO-1 | √    | -    | -    | √    | -    | -    | -    | -    | -    |
| CO-2 | -    | √    | √    | √    | -    | -    | √    | -    | -    |
| CO-3 | -    | √    | √    | -    | -    | -    | √    | √    | √    |
| CO-4 | -    | -    | -    | -    | √    | -    | √    | -    | -    |
| CO-5 | -    | -    | -    | -    | -    | -    | √    | √    | -    |