

<b>Department of Zoology</b>
Programme Name: M.Sc.

**Programme outcomes**

PO1 - Demonstrate and apply the fundamental knowledge of the basic principles of major fields of Zoology;

PO2- Identify, review research literature, and analyse complex situations of living forms.

PO3- Design processes/strategies that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**Programme specific outcomes**

PSO1- Understand the impact of the natural and anthropogenic activities in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development. Identify a range of invertebrates and vertebrates and justify their conservation.

PSO2- Apply ethical principles and commit to professional ethics and responsibilities and norms of the work/research practice.

PSO3- Perform procedures as per laboratory standards in the areas of Taxonomy, Physiology, Ecology, Cell biology, Genetics, Applied Zoology, Clinical science, tools and techniques of Zoology, Toxicology, Sericulture, Biochemistry, Fish biology, Animal biotechnology, Immunology and research methodology

PSO4- Understand the impact of the natural and anthropogenic activities in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development. Identify a range of invertebrates and vertebrates and justify their conservation.

<b>Course outcomes</b>
First Year: MSc-I

Course: **ZOUT 111 Biochemistry and Biochemical Techniques. (Semester I )**

CO1- Define basic terms in biochemistry and biochemical techniques.

CO2- Explain the structure and functions of various biomolecules.

CO3- Illustrate the importance of pH, buffer and water in living systems..

CO4- Draw the structures of various carbohydrates and amino acids.

CO5- Classify enzymes with examples.

**Biochemical techniques:**

CO1: Explain the principle and applications of various biochemical techniques with examples.

CO2: Describe the concept of light, electromagnetic spectrum and its application in absorption spectroscopy.

CO3: Illustrate the importance of radioactive compounds and radioactivity in biology.

Course: **ZOUT 112 Cell Biology and Developmental Biology (Semester I)**

**Cell Biology:**

CO1: Explain the ultrastructure and functions of various cell organelles.

CO2: Explain carbon as backbone of biomolecules.

CO3: Explain the concepts of cell signalling.

CO4 : Illustrate the chemistry and organization of cytoskeleton.

CO5: Diagrammatically represent the cell cycle phases and its regulation.

**Developmental Biology:**

CO1: Define the terms in developmental biology

CO2: Explain the significance of model organism for developmental studies.

CO3: Explain the types of eggs, concept of gametogenesis, fertilization and cleavage pattern.

CO4: Explain the concept of mesoderm induction and pattern formation with examples

**ZOUT 113 Genetics and English in Scientific Communication.**

**Semester I**

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

**Genetics:**

CO1: Define the basic terminologies in genetics.

CO2: Identify genetic disorders based on Karyotypes and traits.

CO3: Explain the concept of Mendelian genetics, gene, gene regulation and multiple alleles.

CO4: Discuss Linkage and crossing with their types and significance.

**ZODT 114 Freshwater Zoology.**

**Semester I**

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

CO1: Explain the types of aquatic habitats.

CO2: Discuss the aquatic adaptations of common freshwater forms.

CO3: Demonstrate the effect of pollutants on freshwater bodies

CO4: Justify the presence of zooplanktons and aquatic forms in freshwater bodies.

CO5: Illustrate the physicochemical properties of water.

**ZODP 114 Practical Freshwater Zoology. (Semester I)**

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

CO1: Identify commercially important freshwater fish.

CO2: Identify the aquatic adaptations in common freshwater forms.

CO3: Prepare the culture of *Paramecium* and *Daphnia*.

CO4: Estimate the hardness and chloride content in water samples.

CO5: Analyze the Zooplanktons from local freshwater bodies.

### **ZOUP 115 Basic Zoology Lab-1**

#### **Semester I**

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

CO1: Identify the developmental stages of chick embryo, cell structures and phases of cell division

CO2: Identify the grammatical mistakes from the given paragraph and common errors in written and spoken presentations.

CO3: Write a scientific project and research article along with its proof reading.

CO4: Demonstrate the working of different microscopes, colorimetric and spectrophotometric methods, cell fractionation and ligature in *Drosophila* larvae,

CO5: Determine the gene distance and order, genotype and phenotype ratios and allelic frequencies from the given data.

CO6: Estimate sugar and protein by suitable biochemical method, and isolate protein from biological source.

CO7: Prepare acid and base solutions of desired strength, buffers, bacterial Culture, chick embryo culture and *Drosophila* culture.

CO8: Prepare temporary slide of various cells to demonstrate the cell morphology and cell division, giant chromosome and pedigree analysis chart.

CO9: Calculate % retention and % elution of amino acids on given ion exchanger.

### **ZOUT 121: Molecular Biology and Bioinformatics.**

#### **Semester II**

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

CO1: Explain the DNA structure & types, topology, Physical properties; chromatin structure and organization.

CO2: Discuss genome organization, DNA and Protein sequencing with their application in evolutionary studies.

CO3: Explain mechanism of DNA damage and repair.

CO4: Illustrate the process of DNA replication, transcription, translation and their regulations.

- CO5: Illustrate the database tools with their significance.  
CO6: Schematically represent the processes of central dogma.  
CO7: Justify the post translational and post transcriptional modifications.

## **ZOUT 122 Endocrinology and Parasitology.**

### **Semester II**

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

#### **Endocrinology:**

- CO1: Discuss the roles of Pituitary gland and pineal body.  
CO2: Explain hormonal regulation of biomolecules and mineral metabolism.  
CO3: Explain the hormonal regulation of metabolism.  
CO4: Describe the role of osmoregulatory and gastrointestinal hormones.  
CO5: Illustrate the mechanism of hormone action and role of hormone receptors.  
CO6: Justify the significance of biological clocks and rhythms.

#### **Parasitology:**

- CO1: Define the terminologies of parasitology.  
CO2: Explain the concepts of animal association with examples.  
CO3: Describe the role of parasites in public health and hygiene.  
CO4: Explain the morphology and life cycle of common parasites.  
CO5: Explain the pathogenicity and control measures of common parasites.

## **ZOUT 123 Comparative Animal Physiology & Environmental Biology.**

### **Semester II**

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

#### **Comparative Animal Physiology:**

- CO1: Explain the physiology of processes like digestion, respiration, muscle contraction and excretion.  
CO2: Describe the mechanism of thermoregulation in both poikilotherms and homeotherms.  
CO3: Explain the mechanism of chemical communication in vertebrates.  
CO4: Comment on the structure and functions of various sense organs.  
CO5: Illustrate the concept of osmotic regulation in various animals with suitable examples.

#### **Environmental Biology:**

- CO1: Identify various types of natural resources, human impact on these resources, and common resource management practices.  
CO2: Explain the structure and impact of biogeochemical cycles, ecosystems and energy transformation across trophic levels.  
CO3: Discuss environmental hazards and risks and the socio-economic implications.

CO7: Illustrate the wildlife management practices and their significance.

### **ZODT 124: Ichthyology**

#### **Semester II**

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

CO1: Identify the common fishes in India.

CO2: Explain the general characters and evolution of fishes.

CO3: Explain the fish morphology and anatomical modifications.

### **ZOUP 125 Basic Zoology Lab-2**

#### **Semester II.**

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

CO1: Identify the various parasites and parasitic stages of common parasites, nitrogenous wasteproducs of animals, feshwater planktons and slides of endocrine glands.

CO2: Explain the principle and significance of gonadectomy, thyrodectomyand pancreactomy.

CO3: Demonstrate the role of eye stalk and insulin in sugar level in crab.

CO4: Demonstrate the retro cerebral complex in cockroach.

CO5: Demonstrate the RBCs of common vertebrates and effect of various osmolarities.

CO6: Demonstrate the effect of body size, oxygen consumption and Insulin on aquatic animal.

CO7: Determine the bleeding and clotting time, heartbeat of crab, species richness in selected area, physico- chemical properties of soil and water.

CO8:Perform Sterilization of lab equipment, prepare microbial culture, Isolate Bacterial, liver DNA and RNA from given sample, quantify and resolve them using electrophoretic procedures, analyse protein sample by PAGE and SDS PAGE and construct phylogenetic tree using tools in bioinformatics.

## **M.Sc.- I ZOOLOGY (2013 pattern)**

ZY 301T Entomology I and ZY 401 T Entomology II

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

CO1: have core knowledge of entomology

CO2: demonstrate an understanding of insect identification, structure, and function

CO3: understand the evolutionary and ecological relationships of insects with other life forms and the impact of insects relative to human health and well being and animal and plant health

CO4: understand the principles and methods of managing beneficial and pest insect populations

ZY 302T & P Environmental biology

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

CO1: Master core concepts and methods from ecological and physical sciences and their application in environmental problem solving.

CO2: Understand the nature of environmental problems and ways of addressing them, including interactions across local to global scales.

CO3: Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.

CO4: Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

#### **ZY304T & P** Insect physiology and biochemistry

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

CO1: achieve an understanding of the biochemical and physiological processes governing insect metabolism, growth, and form

CO2: understand the evolutionary and ecological significance of insects

CO3: have a broad background in the biological sciences

#### **ZY305T & P** Research methodology

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

CO1: understand some basic concepts of research and its methodologies

CO2: identify appropriate research topics

CO3: select and define appropriate research problem and parameters

CO4: prepare a project proposal (to undertake a project)

CO5: organize and conduct research (advanced project) in a more appropriate manner

CO6: write a research report and thesis

CO7: write a research proposal (grants)

#### **ZY306T& P** Parasitology

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

CO1: demonstrate detailed knowledge and understanding of the biology, life cycles, pathogenesis, diagnosis of parasitic infections in humans and their relevance for human health and strategies for control;

CO2: demonstrate detailed knowledge and understanding of the biology and strategies for control of the vectors and intermediate hosts of human parasites;

CO3: carry out practical laboratory identification of the various parasite stages both free and in tissues and diagnose infections;

CO5: demonstrate specialised skills acquired through taking Modules on: advanced diagnostic, molecular, immunological, genetic, chemotherapeutic, ecological and/or control aspects of the subject;

### **ZY307T & P Fundamentals of Systematics**

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

CO1: Describe general taxonomic rules on animal classification

CO2: understand the patterns and processes of evolution above the species level

CO3: appreciate the differences between the three methods of phylogenetic analysis: evolutionary systematics, phenetics, cladistics.

### **ZY 308T& P Insect Ecology**

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

CO1: Have a broad-based knowledge of the principles of ecology at four levels of integration [populations, communities, ecosystems, and landscapes],

CO2: have an understanding of the linkages between the levels of integration,

CO3: have an understanding of the relationship between principles of insect ecology and the scientific and applied branches of entomology,

CO4: have a functional vocabulary of ecological terms and concepts,

CO5: have a fundamental background in ecology adequate for more advanced study of basic and applied principles of ecology.

### **ZY 402 T &P Economic Zoology**

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

CO1: describe fresh water, marine and estuarine fisheries

CO2: To explain Hatchery design and management

CO3: To describe the techniques in Induced breeding

#### **ZY 403T & P Biodiversity Assessment**

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

CO1: Understand Biodiversity and conservation, explore natural landscapes, species and ecosystems and acquires theories and practical methods in preserving environments and organisms.

CO2: increase awareness about Biodiversity and Conservation and understanding of how human life depends on preserving animal species and natural ecosystems.

CO3: Demonstrate knowledge and understanding of theories in the field of Biodiversity and Systematics, in the broad sense as well as at a more detailed level in a limited part of the field.

CO4: Demonstrate deeper insight into current research practice and methodologies in the field of biodiversity and systematics.

CO5: Demonstrate ability to critically and systematically integrate knowledge and perspectives and to analyse, assess and deal with complex biological problems, issues and situations in particular within the field of Biodiversity and Systematics.

#### **ZY404T & P Histology and histochemistry**

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

CO1: Acquire a basic background in histology and to understand the properties of cells and their interactions with one another as components of tissues and organs.

CO2: To understand how structure and function correlate at the microscopic level. •

CO3: Describe the method of tissue preparation for histological examination.

CO4: Outline the principles of histochemistry and immunohistochemistry.

CO5: Describe the function of the different types of microscopy utilized in histology.

#### **ZY405T & P Pollution Biology**

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

CO1: list the major sources of pollutants (air, water, soil, noise)

CO2: describe the effects of pollutants due to organic materials, plant nutrients and toxic, physical and biological pollutants;



ZY406T & P Apiculture

CO1: Understand bee biology and behaviour: Types of Bees, Life cycle

CO2: Handle beekeeping systems and beekeeping equipments: Bee Keeping Systems/Hives, Installation of Hives, Tools

CO3: Beehive Management: Colony Management etc

CO4: Manage insects, diseases and nuisances in beehive:

CO5: Harvest, process and market the produce: Honey and other byproducts, Method of Harvesting, time of harvesting, tools and equipments required, Processing of products, marketing etc

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