

POSTGRADUATE PROGRAMME: COURSE OUTCOME

Name of the Programme: M.Sc. Zoology

Name of the Class	Course Code	Course Title	Course Outcomes	
SEMESTER I				
M.Sc. I	ZOUT 111	Biochemistry and Biochemical Techniques.	CO1	After successfully completing this course, students will be able to: Define basic terms in biochemistry and biochemical techniques.
			CO2	Explain the applications of the various biochemical techniques.
			CO3	Explain the structure and functions of various biomolecules.
			CO4	Explain the importance of tools and techniques in biology.
			CO5	Illustrate the importance of pH, buffer and water in living systems.
			CO6	Illustrate the principle, working and applications of basic techniques used in biology.
			CO7	Draw the structures of various carbohydrates and amino acids.
			CO8	Classify enzymes with examples.
			CO9	CO1: Explain the importance and applications of techniques in biochemistry.
			CO10	CO2: Explain the principle and applications of various chromatographic techniques with examples.
			CO11	CO3: Explain the principle, working, materials used and applications of electrophoresis.
			CO12	CO4: Describe the concept of light, electromagnetic spectrum and its application in absorption spectroscopy
			CO13	CO5: Illustrate the importance of radioactive compounds and radioactivity in biology.
			CO14	CO6: Demonstrate the principle and working of Warburg's apparatus.
			CO15	CO7: Demonstrate the principle,

				working, applications of centrifugation.
			CO16	CO8: Justify the applications of radioactivity compounds in biology.
M.Sc. I	ZOUT 112	Cell Biology and Developmental Biology	CO1	After successfully completing this course, students will be able to: Label the various cell parts
			CO2	Sketch and label various types of cells and cell organelles.
			CO3	Explain carbon as backbone of biomolecules.
			CO4	Explain the ultrastructure and functions of various cell organelles.
			CO5	Explain the concepts of cell signalling.
			CO6	Illustrate the chemistry and organization of cytoskeleton.
			CO7	Illustrate the types, development and causes of tumor.
			CO8	Diagrammatically represent the cell cycle phases and its regulation.
			CO9	Define the terms in developmental biology
			CO10	Explain the significance of model organism for developmental studies.
			CO11	Explain the types of eggs, concept of fertilization and cleavage pattern.
			CO12	Explain the concept of mesoderm induction and pattern formation with examples.
			CO13	Describe neural competence and induction.
			CO14	Explain the concept of growth and differentiation.
			CO15	Illustrate postembryonic development.
			CO16	Compare and contrast spermatogenesis and oogenesis.
M.Sc. I	ZOUT 113	Genetics and English in Scientific Communication	CO1	After successfully completing this course, students will be able to: 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.
			CO5	Explain the principles of Population

				genetics.
			CO6	Illustrate the modified Mendelian laws of inheritance.
			CO7	Justify the inheritance of qualitative and quantitative traits.
			CO8	Solve the problems based on gene frequency.
			CO9	Write the outline of a scientific paper.
			CO10	Write the title, abstract, discussion and citations of a given scientific article.
			CO11	Prepare a scientific presentation using PowerPoint.
			CO12	Explain language as a tool for effective scientific communication.
			CO13	Use the formal elements of specific types of scientific writing.
			CO14	Critically analyze data from research; incorporate it into assigned writing clearly, concisely, and logically; and attribute the source with proper citation.
			CO15	Practice the unique qualities of professional rhetoric and writing style, such as sentence conciseness, clarity, accuracy, honesty, avoiding wordiness or ambiguity, using direct order organization, readability, coherence and transitional devices.
			CO16	Justify the importance of plagiarism check and Proof-read given article.
M.Sc. I	ZODT 114	Freshwater Zoology	CO1	Enlist the diagnostic features of shrimps.
			CO2	Explain the types of aquatic habitats.
			CO3	Discuss the aquatic adaptations of common freshwater forms.
			CO4	Explain the adaptations in freshwater Turtles and Crocodiles.
			CO5	Illustrate the physicochemical properties of water.
			CO6	Demonstrate the effect of pollutants on freshwater bodies
			CO7	Justify the presence of zooplanktons and aquatics forms in freshwater bodies.
M.Sc. I	ZODP 114	Practical Freshwater Zoology	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.
			CO6	Evaluate the bio-indicators of pollution in freshwater.
M.Sc. I	ZOUP 115	Basic Zoology Lab-1	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.
SEMESTER II				
M.Sc. I	ZOUT 121	Molecular Biology and Bioinformatics	CO1	After successfully completing this course, students will be able to: 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 the mobile DNA elements.

			CO4	Explain mechanism of DNA damage and repair.
			CO5	Illustrate the process of DNA replication, transcription, translation and their regulations.
			CO6	Illustrate the database tools with their significance.
			CO7	Schematically represent the processes of central dogma.
			CO8	Justify the post translational and post transcriptional modifications.
M.Sc. I	ZOUT 122	Endocrinology and Parasitology	CO1	After successfully completing this course, students will be able to: Discuss the roles of Pituitary gland and pineal body.
			CO2	Explain hormonal regulation of biomolecules and mineral metabolism.
			CO3	Describe the role of osmoregulatory and gastrointestinal hormones.
			CO4	Explain the role of hormones in moulting, change in body colour of crustaceans; yolk synthesis in amphibians; insect development.
			CO5	Explain the hormonal regulation of metabolism.
			CO6	Illustrate the mechanism of hormone action and role of hormone receptors.
			CO7	Justify hormones as coordination molecules.
			CO8	Justify the significance of biological clocks and rhythms.
			CO9	Define the terminologies of parasitology.
			CO10	Explain the concepts of animal association with examples.
			CO11	Describe the role of parasites in public health and hygiene.
			CO12	Explain the morphology and life cycle of common parasites.
			CO13	Explain the pathogenicity and control measures of common parasites.
			CO14	Illustrate the process of parasitic infections to human.
			CO15	Justify the importance of control strategies against parasitic infections.
			CO16	Justify the significance of vectors and disease transmission.
M.Sc. I	ZOUT	Comparative	CO1	After successfully completing this

	123	Animal Physiology & Environmental Biology.		course, students will be able to: 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.
			CO6	Compare the physiology of regulatory mechanisms in various groups of animals.
			CO7	Justify the survival strategies of organism in varied climatic conditions.
			CO8	Justify the evolution of various life processes in living forms.
			CO9	List the endangered, endemic and extinct animal species of India.
			CO10	Identify various types of natural resources, human impact on these resources, and common resource management practices.
			CO11	Explain the structure and impact of biogeochemical cycles, ecosystems and energy transformation across trophic levels.
			CO12	Describe concepts in population ecology and their significance.
			CO13	Discuss environmental hazards and risks and the socio-economic implications.
			CO14	Illustrate the impact of climate and anthropogenic factors on biodiversity with reference to India.
			CO15	Illustrate the wildlife management practices and their significance.
			CO16	Analyze the impact of lifestyle on the environment and animal life.
M.Sc. I	ZODT 124	Metabolic Pathways.	CO1	After successfully completing this course, students will be able to: Define basic terminologies of metabolic pathways.
			CO2	Explain the laws of thermodynamics,

				concept of free energy and ATP as currency molecule.
			CO3	Describe the Concepts and regulation of metabolism.
			CO4	Discuss the oxidation of fatty acids and its significance.
			CO5	Illustrate the electron transport chain and oxidative phosphorylation.
			CO6	Illustrate the reactions, energetics and regulation of glycolysis, glycogen biosynthesis, TCA cycle, Purine and Pyrimidine metabolism
			CO7	Write the general reactions of various metabolic pathways.
			CO8	Justify the role of enzymes in metabolism
M.Sc. I	ZODP 124	Practical in Metabolic Pathways	CO1	Identify the common diseases/conditions caused due to errors in metabolism.
			CO2	Explain the principle of Colorimetry and Spectrophotometry.
			CO3	Use the basic equipment in biochemistry lab.
			CO4	Illustrate the enzyme activity from suitable material.
			CO5	Demonstrate the effect of various physical and chemical factors on enzyme activity
			CO6	Demonstrate the absorption studies of biomolecules.
			CO7	Estimate the concentration of cholesterol, uric acid, amino acids and starch.
			CO8	Separate biomolecules by chromatographic methods.
M.Sc. I	ZOUP 125	Basic Zoology Lab-2	CO1	Identify the various parasites and parasitic stages of common parasites, nitrogenous wasteproducts of animals, freshwater planktons and slides of endocrine glands.
			CO2	Explain the principle and significance of gonadectomy, thyroidectomy and pancreatomy.
			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 animals.
			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.

SEMESTER III

M.Sc. II	ZOUT231	Animal Physiology- I	CO1	After successfully completing this course, students will be able to: Explain the membrane physiology and its dynamics.
			CO2	Explain the concept of nutrition and digestion.
			CO3	Explain the structure, contraction and types of contraction of muscle.
			CO4	Illustrate bioluminescence and animal electricity with examples and its significance
			CO5	Correlate the organisms Internal and external environments with homeostasis and biological Clocks.
			CO6	Diagrammatically represent the mechanism of respiration, gas exchange and transport
M.Sc. II	ZOUT 232	Fundamentals of Systematics and Economic Zoology	CO1	After successfully completing this course, students will be able to: Explain principles, methods of biological classification and diversity in kingdom Animalia.
			CO2	Explain the importance of taxonomic keys and taxonomic characters.
			CO3	Explain the principles of zoological classification and nomenclature
			CO4	Discuss the various taxonomic procedures and molecular phylogenetics & phylogeography.

			CO5	Illustrate the methodologies used in systematics.
			CO6	Illustrate the lac culture, apiculture, prawn culture, vermiculture, Poultry, dairy industry and Piggery.
			CO7	Explain the role of insects of economic importance.
			CO8	Explain parasitic roundworms of animal and plants.
			CO9	Signify the role of parasitic and soil protozoan in human welfare.
			CO10	Justify the use of animals in pharmaceutical research.
			CO11	Explain coral reef and its significance.
M.Sc. II	ZOUT 233	Research Methodology and Insect Physiology and Biochemistry	CO1	After successfully completing this course, students will be able to: Demonstrate knowledge of research processes (reading, evaluating, and developing)
			CO2	Perform literature reviews using print and online databases.
			CO3	Select and define appropriate research problem and parameters to prepare a project proposal.
			CO4	Identify, explain, compare, and prepare the key elements of a research proposal/report.
			CO5	Compare and contrast quantitative and qualitative research paradigms
			CO6	Use sampling methods, measurement scales and instruments, and appropriate uses of each.
			CO7	Justify the rationale for research ethics,
			CO8	Explain the structure, Chemistry of integument and sclerotization.
			CO9	Describe the process of digestion and metabolism
			CO10	Explain the characteristics of haemolymph and types of haemocytes.
			CO11	Illustrate the structure, physiology and biochemistry of flight muscle.
			CO12	Demonstrate the process of excretion, detoxification and water balance
			CO13	Justify the role of insect hormones in physiological processes.
M.Sc. II	ZODT 234	Immunology	CO1	After successfully completing this course, students will be able to:

				List the primary and secondary immune organs.
			CO2	Explain the concepts of immunity, self-nonsel immune response, autoimmune disease.
			CO3	Explain the theories of antibody synthesis and generation of antibody diversity.
			CO4	Explain the principle and application of the common techniques used in Immunology
			CO5	Illustrate the events and dynamics of inflammation
			CO6	Compare the MHC molecules and diseases associated with HLA.
			CO7	Differentiate between active and passive immunization
			CO8	Compare the three pathways of complement fixation pathway.
M.Sc. II	ZODP 234	Zoology Practical Paper-3 (Immunology)	CO1	Identify the pattern of identity of antigen- antibody reaction.
			CO2	Identify the microscopic structure of the lymphoid organs.
			CO3	Demonstrate immunoelectrophoresis technique.
			CO4	Demonstrate the double diffusion techniques.
			CO5	Detect the human blood groups by antigen -antibody reactions
			CO6	Prepare the human blood smear to identify various blood cells.
M.Sc. II	ZOUP 235	Special Lab I Module-I: Animal Physiology-I	CO1	Demonstrate the effect of body size and salinity on oxygen consumption in given animals.
			CO2	Demonstrate the effect of starvation on liver and muscle glycogen in given animal.
			CO3	Demonstrate the effect of exercise on breathing, pulse rate and blood lactate level.
			CO4	Demonstrate the effect of pH, temperature and inhibitors on salivary amylase.
			CO5	Map the taste buds on human tongue
M.Sc. II	ZOUP 235	Special Lab I Module-II: Fundamentals of	CO1	Identify museum specimen/pictures of minor phyla, Invertebrates, Protochordates and Vertebrates.

		Systematics and Economic Zoology	CO2	Identify animals with the help of taxonomic keys.
			CO3	Collect and preserve animal samples using common methods.
			CO4	Write scientific report of field/ institutional visit.
			CO5	Compare the methods of collection and curation of insects.
			CO6	Identify the poultry breeds.
			CO7	Identify edible freshwater fish from nearby area.
			CO8	Demonstrate the apiculture equipment.
			CO9	Demonstrate the methods of prawn culture.
			CO10	Compare various fishing tools, crafts and gears.
M.Sc. II	ZOUN 235		Special Lab I Module-III: Research Methodology and Insect Physiology and Biochemistry	CO1
		CO2		Suggest a suitable title for a research article.
		CO3		Write the abstract, key words, result, discussion, conclusion and citations of references.
		CO4		Write a research project to seek funding.
		CO5		Conduct a scientific survey.
		CO6		Perform protein purification experiment.
		CO7		Demonstrate the heart and haemocytes of cockroach.
		CO8		Demonstrate the effect of starvation on glycogen in insects.
		CO9		Demonstrate the effect of temperature on water loss in cockroach.
		CO10		Detect the amino acids in insect haemolymph by chromatographic method.
		CO11		Determine the oxygen consumption in dragon fly nymph.
		CO12		Perform the assay of amylase activity in midgut of insect.
SEMESTER IV				
M.Sc. II	ZOUT 241	Animal Physiology- II	CO1	After successfully completing this course, students will be able to: Explain the composition of blood, types of blood cells, vascular dynamics and clotting.

			CO2	Illustrate the anatomy and physiology of heart and cardiac cycle
			CO3	Describe the excretory system, nitrogenous wastes and renal regulation
			CO4	Illustrate the osmoregulatory mechanism in invertebrates and vertebrates
			CO5	Discuss the neuronal physiology and various potentials.
			CO6	Justify the location and structure of eye, ear and taste buds to their functions.
			CO7	Justify energy utilization in physiological and metabolic activities.
M.Sc. II	ZOUT 242	Mammalian Reproductive Physiology and Aquaculture	CO1	After successfully completing this course, students will be able to: Explain the male and female reproductive systems and sexual dimorphic characteristics
			CO2	Explain the sexual cycles with examples
			CO3	Illustrate the reproductive dysfunctions.
			CO4	Diagrammatically represent the hormonal regulation of reproductive processes like pregnancy, lactation and parturition.
			CO5	Prepare the flow chart to demonstrate the hormonal coordination of reproductive processes.
			CO6	Justify the artificial control of reproduction.
			CO7	Identify the fish diseases and the causative organisms
			CO8	Mention the various composite fish culture with significance of each type.
			CO9	Describe the methods of freshwater prawn culture and its management.
			CO10	Explain the methods of pearl culture and pearl harvesting.
			CO11	Illustrate the preparation and management of fish culture ponds.
			CO12	Demonstrate the methods of packaging and transport of fish and brood fish.
			CO13	Illustrate techniques of fish harvesting, preservation & processing.
			CO14	Compare the techniques used in fishery development.
M.Sc. II	ZODT 243	Pest Control	CO1	After successfully completing this course, students will be able to: Explain the Pest, nature of damage

				caused by pests and pest control.
			CO2	Explain medical, veterinary, Household and stored grain pests.
			CO3	Explain the Principles and methods of pest control including Biological control measures.
			CO4	Explain the Integrated pest management (IPM)
			CO5	Explain the Non- insect pest and their control: Rat, Bandicoots, Crabs, Snails, Slugs, Birds and Squirrels.
			CO6	Explain the principle and working of pesticide appliances.
M.Sc. II	ZODT 244	Apiculture	CO1	After successfully completing this course, students will be able to: Explain the basic concepts of apiculture like systematics, colony organization, polymorphism, morphology and foraging.
			CO2	CO2: Explain the tools and management of apiary.
			CO3	CO3: Explain the importance of institutions pertinent to apiculture.
			CO4	CO4: Discuss the setup of beekeeping business.
			CO5	CO5: Illustrate the bee keeping as occupation.
			CO6	Justify the presence of bees to increase the agriculture productivity.
M.Sc. II	ZODP 243	Zoology Practical Paper- 4 Animal Physiology- II	CO1	Determine the bleeding and clotting time of human blood.
			CO2	Demonstrate the invertebrate heart.
			CO3	Calculate the heartbeats of <i>Daphnia/Drosophila</i> larva.
			CO4	Determine serum urea and protein and glucose in human blood and urine.
			CO5	Justify the effects of various physical and chemical factors on frog heart and muscle.
M.Sc. II	ZODP 243	Zoology Practical Paper- 4 Pest Control	CO1	Identify beneficial and harmful insects.
			CO2	Identify and classify insect pest of agricultural, veterinary and public health importance.
			CO3	Know the effects of contact insecticides and fumigants on behavior of insect pests.
			CO4	Determine the LD50

			CO5	Behavior of insects to repellants and attractants.
			CO6	Know the principle and working of pesticide appliances.
			CO7	Identify and know the role of biological controlling agents.
			CO8	Know the non-insect pests.
M.Sc. II	ZODP 244	Zoology Practical Paper- 5 Mammalian Reproductive Physiology	CO1	Identify the histological slides of reproductive organ/tissues.
			CO2	Explain the various types of placenta in mammals.
			CO3	Comment on merits and demerits of contraceptive devices/methods.
			CO4	Illustrate the technique of gonadectomy.
			CO5	Perform vaginal smear technique to identify the phases of oestrous cycle.
			CO6	Distinguish the male and female anatomical features of reproductive system in mammals.
M.Sc. II	ZODP 244	Zoology Practical Paper- 5 Aquaculture	CO1	Identify Indian oysters.
			CO2	Identify the common freshwater fish used in culture farming.
			CO3	Demonstrate the processing and storing methods for fish and prawn.
			CO4	Test the freshness of fish/prawn by histological methods.
			CO5	Test the freshness of fish/prawn by biochemical methods.
			CO6	Prepare the culture of Daphnia and rotifers.
			CO7	Estimate the productivity of water bodies.
M.Sc. II	ZODP 244	Zoology Practical Paper- 5 Apiculture	CO1	Identify the honey bees
			CO2	Explain the bee morphology and behaviour
			CO3	Illustrate the bee enemies
			CO4	Justify the rearing techniques and bee management.