



Rayat Shikshan Sanstha's

Radhabai Kale Mahila Mahavidyalaya, Ahmednagar

An ISO 9001:2015 Certified College

Affiliated to Savitribai Phule Pune University, Pune (PU/AN/ASC/034)

Department of Zoology Programme Outcomes (PO) of B.Sc

PO 1	<ul style="list-style-type: none">• Disciplinary Knowledge: Demonstrate comprehensive knowledge of the discipline that forms a part of a postgraduate programme. Execute strong theoretical and practical understanding generated from the specific programme in the area of work.
PO 2	<ul style="list-style-type: none">• Critical Thinking and Problem solving: Exhibit the skill of critical thinking and understand scientific texts and place scientific statements and themes in contexts and also evaluate them in terms of generic conventions. Identify the problem by observing the situation closely, take actions and apply lateral thinking and analytical skills to design the solutions.
PO 3	<ul style="list-style-type: none">• Social competence: Exhibit thoughts and ideas effectively in writing and orally; communicate with others using appropriate media, build effective interactive and presenting skills to meet global competencies. Elicit views of others, present complex information in a clear and concise way and help reach conclusions in group settings.
PO 4	<ul style="list-style-type: none">• Research-related skills and Scientific temper: Infer scientific literature, build a sense of enquiry and able to formulate, test, analyse, interpret and establish hypothesis and research questions; and to identify and consult relevant sources to find answers. Plan and write a research paper/project while emphasizing on academics and research ethics, scientific conduct and creating awareness about intellectual property rights and issues of plagiarism
PO 5	<ul style="list-style-type: none">• Trans-disciplinary knowledge: Create new conceptual, theoretical and methodological understanding that integrates and transcends beyond discipline-specific approaches to address a common problem..
PO 6	<ul style="list-style-type: none">• Effective Citizenship and Ethics: Demonstrate empathetic social concern and equity centred national development, and ability to act with an informed awareness of moral and ethical issues and commit to professional ethics and responsibility
PO 7	<ul style="list-style-type: none">• Environment and Sustainability: Understand the impact of the scientific solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.
PO 8	<ul style="list-style-type: none">• Self-directed and Life-long learning: Acquire the ability to engage in independent and life-long learning in the broadest context of socio-technological changes.



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Programme Specific Outcomes (PSO) B.Sc Zoology

PSO 1	<ul style="list-style-type: none">After completion of this course students will be able to contribute as policy makers in biodiversity conservation, animal preservation and environment protection
PSO 2	<ul style="list-style-type: none">Equip with the knowledge of animal classification and diversity, ecology and economic importance of animals
PSO 3	<ul style="list-style-type: none">Acquire the advanced concepts in insect rearing and various animal breedings for the food security of human beings
PSO 4	<ul style="list-style-type: none">Inculcate the traditional knowledge of using various animal based products in human healthcare system
PSO 5	<ul style="list-style-type: none">Adapt scientific research techniques in various applied branches of Zoology for sustainable development
PSO 6	<ul style="list-style-type: none">Perform procedures as per laboratory standards in the areas of Taxonomy, Physiology, Ecology, Cell biology, Genetics, Applied Zoology, Toxicology, Entomology, Sericulture, Biochemistry, Fish biology, Animal breeding and Clinical Pathology.
PSO 7	<ul style="list-style-type: none">Zoology course also provide a knowledge of applied subjects to develop various skills to make a career and become an entrepreneur in the field of aquatic biology, sericulture, apiculture, vermiculture, prawn culture, dairy management, animal breeding and management, wildlife conservation and management, wildlife photography etc.
PSO 8	<ul style="list-style-type: none">Analyze the relationships among animals, plants, and microbes
PSO 9	<ul style="list-style-type: none">Understand and analyze the ecological and evolutionary significance of different taxa of animals
PSO 10	<ul style="list-style-type: none">Analyze the mechanisms involved in life processes up to the molecular level.
PSO 11	<ul style="list-style-type: none">Gains knowledge about research methodologies, effective communication and skills of problem solving methods
PSO 12	<ul style="list-style-type: none">Contributes the knowledge for Nation building



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Course Outcomes

Sr.No	Class with Semester	Name of the Course	Course Code	Course Outcomes
1	F.Y.B.Sc Sem.- I	Genetics and Medical Zoology T	ZOO-101- T	CO1: Apply Mendelian genetic principles to predict outcomes of genetic crosses, interpret pedigrees and understand the basics of genetic inheritance.
				CO2: Recognize and explain the inheritance patterns and molecular basis of common genetic disorders, including both Mendelian and complex traits.
				CO3: Understand the concept of non - Mendelian genetics.
				CO4: Concept and characteristics of multiple alleles, ABO blood group system, Inheritance of Rh antigen, Erythroblastosis foetalis and their medicolegal importance
				CO5: Understand the structure of chromosomes, chromatin and its types, giant chromosomes and chromosomal aberrations.
				CO6: Successfully solve genetic problems using Punnett squares, probability calculations and pedigree analysis.
				CO7: Understand basic concepts of medical zoology
				CO8: Understand different epidemic, vector borne and microbial diseases in humans
				CO9: Understand about investigations and treatments of human physiological disorders.
		Practicals in Genetics and Medical Zoology (P)	ZOO-102- P	CO1: Calculate and interpret monohybrid, dihybrid, test and back cross ratios based on hypothetical data.
				CO2: Use collected data to understand the inheritance patterns of Mendelian traits.
				CO3: Identify and describe the chromosomal composition of a normal human karyotype
				CO4: Perform blood typing and interpret blood group results.
				CO5: Perform to understand study of facultative heterochromatin from humans.



				<p>CO6: Learn an experiment to know the structure of polytene chromosomes</p> <p>CO7: Learn various vector borne as well as protozoan diseases and their control measures.</p> <p>CO8: : Learn scientific approach or techniques used in clinical laboratories to investigate various diseases and will be skilled to work in research laboratories.</p> <p>CO9: Understand the human immune system and its response to the pathogen.</p> <p>CO10: Measurements of blood pressure under normal and stressed condition.</p>
		Apiculture (T)	OE - 101 - ZOO	<p>CO1: Students will gain skill of rearing honey bees.</p> <p>CO2: Students will be able to apply knowledge of bee economy in setting up their own apiary and they can be entrepreneur in this field.</p> <p>CO3: Acquire knowledge about different species and casts of the honey bees.</p> <p>CO4: Aware about economic importance of honey bees</p> <p>CO5: Identify role of honey bees in nature and in agricultural productivity</p> <p>CO6: Understand the basics about beekeeping tools, equipment, and managing beehives</p> <p>CO7: Aware about economic importance of honey bees.</p> <p>CO8: Acquire knowledge about distribution of species of honey bees.</p>
		Vermiculture Management (T)	SEC - 101 - ZOO	<p>CO1: Acquire a critical knowledge on the role of earthworms in making organic matter from biodegradable wastes</p> <p>CO2: Understand the biology of some important species of earthworms used in vermiculture.</p> <p>CO3: Acquire skills in production of vermicompost</p> <p>CO4: Explain benefits and problems with vermiculture and vermicompost.</p> <p>CO5: Become an entrepreneur by culturing earthworms.</p> <p>CO6: Acquire a knowledge about life cycle of earthworm.</p> <p>CO7: Understand economics importance of earthworm.</p> <p>CO8: Identify enemies and diseases of earthworm.</p>



2	F.Y.B.Sc Sem.- II	Cell Biology and Biomedical Techniques (T)	ZOO - 151 - T	<p>CO1: Demonstrate the knowledge of cell diversity</p> <p>CO2; Explain the cell membrane, cell – cell interactions and its dynamics.</p> <p>CO3: Understand nuclear structure and cell organelles.</p> <p>CO4: Explain mitochondria and its functions.</p> <p>CO5: Understand cytoskeleton and its functions</p> <p>CO6: Understand safety protocols, ethical standards, professional conduct and best practices.</p> <p>CO7: Know about the biomedical instruments, their functioning and principle of operation</p> <p>CO8: Apply immunological techniques for the detection of antigens, antibodies, and immune responses in disease diagnosis.</p> <p>CO9: Understand and perform hematological tests and diagnose common hematological Disorders and interpret urine analysis data</p>
		Practicals in Cell Biology and Biomedical Techniques (P)	ZOO - 152 - P	<p>CO1: Learn to visualize animal and plant cells under microscope.</p> <p>CO2: Understand principles and workings of simple, compound microscopes</p> <p>CO3: Acquire the skills to accurately measure microscopic objects using micrometry</p> <p>CO4: Staining and visualization of mitochondria by Janus green stain</p> <p>CO5: Estimate Hemoglobin using Sahli's haemometer.</p> <p>CO6: Perform RBC count in blood by using hemocytometer.</p> <p>CO7: Perform WBC count in blood by using hemocytometer.</p> <p>CO8: Study of human blood smear to observe different types of blood cell</p> <p>CO9: Study of principle & working of Spectrophotometer, PCR and ECG</p> <p>CO10: Work as a laboratory technician to do urine analysis - normal and abnormal Constituents.</p>
		Sericulture (T)	OE - 151 - ZOO	<p>CO1: To introduce the concept of sericulture.</p> <p>CO2: To explain the rearing technique and associated tools.</p> <p>CO3: To examine the diseases and learn the</p>



				control measures.
				CO4: To establish mulberry garden and processing of mulberry
				CO5: To explain Life cycle and Sexual dimorphism of silkworm
				CO6: Acquire knowledge in research field for biomedical and biotechnical areas.
				CO7: Gain knowledge about applications in sericulture industry
				CO8: Explore their own sericulture business.
		Vermiculture Management (P)	SEC - 151 - ZOO	CO1: Acquire a knowledge on role of earthworms in making vermicompost
				CO2: Understand the internal structure of earthworms used in vermiculture
				CO3: Acquire skills on production of vermicompost
				CO4: Able to prepare small scale and large-scale vermicomposting units.
				CO5: Become an entrepreneur by culturing earthworms.
				CO6: Able to produce allied products.
				CO7: Acquire a knowledge about life cycle of earthworms.
				CO8: Identify of enemies and diseases of earthworm.



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1	S.Y.B.Sc Sem.- III & IV	Animal Diversity III & IV	ZO-231 & 241	CO1: The students will be able to understand, classify and identify the diversity of higher vertebrates.
				CO2: 2. The students will able to understand the complexity of higher vertebrates
				CO3: The students will be able to understand different life functions of higher vertebrates.
				CO4: The students will be able to understand the linkage among different groups of higher vertebrates
				CO5: The student will become aware regarding his role and responsibility towards nature as a protector, to understand his role as a trustee and conservator of life which he has achieved by learning, observing and understanding life.
		Applied Zoology I and II	ZO-232& ZO-242	CO1: The learner understands the basics about beekeeping tools, equipment, and managing beehives.
				CO2: The learner understands the basic information about fishery, cultural and harvesting methods of fishes and fish preservation techniques.
				CO3: The learner understands the biology, varieties of silkworms and the basic techniques of silk production.
				CO4: The learner understands the types of agricultural pests, Major insect pests of agricultural importance and Pest control practices
3	T.Y. Sem V	Pest Management	ZO-351	CO1: Define pest management.
				CO2: Describe the economic, ecological, and sociological benefits of IPM.
				CO3: Distinguish positive and negative impacts of pesticide use.
				CO4: Understand problems resulting from misuse, overuse, and abuse of chemical pesticides.
				CO5: 5. Define and describe pesticide resistance and how it develops.
				CO6: Identify ecological and biological

				<p>characteristics important in development of pest populations.</p> <p>CO7: Identify 10 tactics commonly used in IPM and be able to distinguish them</p> <p>CO8: Understand society's role in IPM decisions.</p> <p>CO9: Describe different groups of pests and compare them to weeds and plant pathogens.</p> <p>CO10: Analyze and compare management tactics to determine the best approach to reducing pest populations, weeds, and disease presence.</p> <p>CO11: Locate appropriate, scientifically valid sources of information on specific tactics to manage insect pests, weeds, and diseases.</p> <p>CO12: Know and how to develop an IPM program</p>
		Histology	ZO-352	<p>CO1: The students will be able to understand, classify and identify the different types of tissue.</p> <p>CO2: The students will understand the complexity of various tissues in an organ.</p> <p>CO3: The students will be able to learn structure & functions of various tissues.</p> <p>CO4: The students will understand the various diseases related to organs.</p> <p>CO5: The student will be able to know the role of glands in mammals.</p>
		Biological Chemistry	ZO-353	<p>CO1: Learners shall be able to understand basic concepts and significance of biochemistry</p> <p>CO2: The students will learn about the pH and Buffers.</p> <p>CO3: The students will learn about the chemical structures of carbohydrate, and their biological and clinical significance.</p> <p>CO4: The students will be able to understand, interpret structure and importance of proteins, carbohydrates and lipids</p> <p>CO5: Learners will be able to comprehend variations in enzyme activity and kinetics.</p>
		Genetics	ZO-354	<p>CO1: The students will be able to learn about laws of inheritance and concepts of genes.</p> <p>CO2: The students will be able to learn about gene mutation and sex determination.</p> <p>CO3: The students will be able to learn about pollution genetics including human population genetics.</p> <p>CO4: The students will be able to learn about sex linked inheritance and application of genetics.</p>
		Developmental Biology	ZO-355	<p>CO1: The students will be able to learn about fundamental and various theory of developmental biology.</p>



				CO2: The students will be able to learn about development process starting from fertilization to organogenesis.
				CO3: The students will be able to learn about development in reference to chick embryology.
		Parasitology	ZO-356	CO1: The students will be able to learn about basics and scope of parasitology.
				CO2: The students will be able to learn the types of host and parasite with examples
				CO3: The students will be able to learn about the morphology, life cycle, pathogenicity and treatment of common parasites (Protists and Platyhelminthes).
				CO4: The students will be able to learn about host-parasite relationships and their effects on host body.
				CO5: The students will be able to learn about the arthropod parasites and their role as vector
		Aquarium Management	ZO-3510	CO1: The students will be able to learn about introduction of aquarium fish keeping.
				CO2: The students will be able to learn about biology of aquarium fishes.
				CO3: The students will be able to learn about food and feeding of aquarium fishes.
				CO4: The students will be able to learn about maintenance of aquarium.
				CO5: The students will be able to learn about fish transportation, preservation and breeding.
		Poultry Management	ZO-3511	CO1: The students will be able to understand the Poultry farming practices.
				CO2: The students will be able to understand the poultry breeding techniques.
				CO3: The students will be able to understand poultry rearing techniques.
				CO4: The students will be able to understand feeding requirement and food ingredients.
				CO5: The students will be able to understand the poultry disease and their pathogens
				CO6: The students will be able to understand market value of poultry products
T.Y. Sem VI	Medical & Forensic Zoology		ZO 361	CO1: The students will be able to understand the basics principles of Medical and Forensic Zoology.
				CO2: The students will be able to understand scientific methods in crime detection.
				CO3: The students will be able to understand the advancements in the field of Medical and Forensic Zoology.
				CO4: The students will be able to understand modern tools, techniques and skills in forensic investigations.
				CO5: The students will be able to describe the fundamental principles and functions of

				forensic science and its significance to human society
	Animal Physiology	ZO 362		CO1: The various physiological organ-systems and their importance to the integrative functions of the human body. CO2: Understand Concept of energy requirements CO3: Various aspects of Digestive physiology. CO4: Circulatory system with medical conditions. CO5: Understand Respiratory mechanism and gases transport. CO6: Eliminations of waste materials from the body. CO7: Develop understanding in Structure and functions of muscles CO8: Understand formation of gametes and function of endocrine glands
	Molecular Biology	ZO 363		CO1: Student will get an insight into molecular mechanisms of various biological processes in cells and organisms CO2: Student will get an insight into the Structure of DNA and RNA, DNA and RNA as genetic material CO3: Student will get prepared learner to get insight into the Central Dogma of Molecular Biology CO4: Student will also understand the concept of gene regulation CO5: Student will get an insight into the DNA Damage and Repair.
	Entomology	ZO 364		CO1: Understand basic concepts in Entomology and its scope. CO2: Learn morphology and anatomy of Insects. CO3: Understand the concept of social organization in Insects. CO4: Understand the development process of Insects CO5: Identify disease causing insect vectors. CO6: Will be able to design and implement pest controlling methods against pests
	Techniques in Biology	ZO 365		CO1: Students will be able to learn about microscopy principal and definition. CO2: Students will be able to learn about microtechnique. CO3: Students will be able to learn about hematological and immunological technique. CO4: Students will be able to learn about laboratory and field technique
	Evolutionary Biology	ZO 366		CO1: Students will be able to learn most of the essential aspects of Evolutionary Biology in detail which will help them in acquiring



				<p>better understanding regarding the subject</p> <p>CO2: Explain important processes, principles and concepts and critically evaluate theories and empirical research within evolutionary biology</p> <p>CO3: Apply evolutionary theory and concepts to address empirical and theoretical questions in evolutionary biology.</p> <p>CO4: Independently investigate evolutionary questions using literature and analyses of empirical data.</p> <p>CO5: Communicate the principles, theories, problems and research results associated with questions that lie within the evolutionary framework to students.</p>
		Environmental Impact Assessment	ZO 3610	<p>CO1: Students will be able to learn about concepts of environment, pollution, sustainable development.</p> <p>CO2: Students will be able to learn about environmental impact assessment overview, act, stakeholders and process.</p> <p>CO3: Students will be able to learn about environment protection act.</p>



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Department of Zoology

Programme Outcomes M Sc

PO 1	<ul style="list-style-type: none">• Disciplinary Knowledge: Demonstrate comprehensive knowledge of the discipline that forms a part of a postgraduate programme. Execute strong theoretical and practical understanding generated from the specific programme in the area of work.
PO 2	<ul style="list-style-type: none">• Critical Thinking and Problem solving: Exhibit the skill of critical thinking and understand scientific texts and place scientific statements and themes in contexts and also evaluate them in terms of generic conventions. Identify the problem by observing the situation closely, take actions and apply lateral thinking and analytical skills to design the solutions.
PO 3	<ul style="list-style-type: none">• Social competence: Exhibit thoughts and ideas effectively in writing and orally; communicate with others using appropriate media, build effective interactive and presenting skills to meet global competencies. Elicit views of others, present complex information in a clear and concise way and help reach conclusions in group settings.
PO 4	<ul style="list-style-type: none">• Research-related skills and Scientific temper: Infer scientific literature, build a sense of enquiry and able to formulate, test, analyse, interpret and establish hypothesis and research questions; and to identify and consult relevant sources to find answers. Plan and write a research paper/project while emphasizing on academics and research ethics, scientific conduct and creating awareness about intellectual property rights and issues of plagiarism
PO 5	<ul style="list-style-type: none">• Trans-disciplinary knowledge: Create new conceptual, theoretical and methodological understanding that integrates and transcends beyond discipline-specific approaches to address a common problem..
PO 6	<ul style="list-style-type: none">• Effective Citizenship and Ethics: Demonstrate empathetic social concern and equity centred national development, and ability to act with an informed awareness of moral and ethical issues and commit to professional ethics and responsibility
PO 7	<ul style="list-style-type: none">• Environment and Sustainability: Understand the impact of the scientific solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.
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Programme Specific Outcomes M.Sc Zoology

PSO 1	<ul style="list-style-type: none">• Academic Competence:<ol style="list-style-type: none">1. Describe fundamental concepts, principles and processes underlying the life science its different disciplines.2. Understand the evolutionary, genetical, molecular, histological, and behavioural context of biological thought and research, and the contributions of physiological, anatomical, immunological and cellular studies of animals, to the resolution of medical, social and environmental issues even at molecular level.3. Demonstrate a wide range of biochemical techniques, physiological processes, cellular activities, developmental and evolutionary processes, statistical methods and bioinformatics..
PSO 2	<ul style="list-style-type: none">• Personal and Professional competence:<ol style="list-style-type: none">1. Demonstrate the competence in fundamental zoological skills/techniques and experimentation using various methods in animal models and their behaviour, cell and molecular biology, biochemistry, developmental biology and immunology.2. Illustrate methods in evolutionary biology, environmental science , biostatistics and bioinformatics and analyse biological data statistically.3. Formulation of ideas, scientific writing and authentic reporting, effective presentation and communication skills .
PSO 3	<ul style="list-style-type: none">• Research Competence:<ol style="list-style-type: none">1. Analyse and interpret results obtained in cell biology, molecular biology, biochemistry, genetics, developmental biology, immunology, histology.2. Create biological data and skills to explore and authenticate data for experimental and research purpose.
PSO 4	<ul style="list-style-type: none">• Entrepreneurial and Social competence:<ol style="list-style-type: none">1. Evaluate data of the societal relevance of biological systems and the processes and apply the knowledge of zoology in the different fields to address problems related to human kind.2. Collaborate in various zoological services with demonstration of true values of leadership, co-operation, hard work, teamwork etc. during the field works, surveys and field visits.



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1	M.Sc I Sem.- I	Advanced Biochemistry	ZOO 501 MJ	CO1: Understand the basic terminologies of Biochemistry.
				CO2: Describe the concepts and regulation of metabolism
				CO3: Describe the oxidation of fatty acids and its significance
				CO4: Illustrate the reactions, energetic and regulation of glycolysis, glycogen biosynthesis, TCA cycle, purine and pyrimidine metabolism.
				CO5: Draw the general reactions of various metabolic pathways.
				CO6: Justify the role of enzymes and their regulation in metabolism
2		Advanced Cell Biology	ZOO 502 MJ	CO1: The learner will understand the preparation of staining methods and nuclear organization.
				CO2: Demonstrate the ability to use discipline specific research techniques.
				CO3 : Organization of cytoskeleton and their associated protein. CO4 : The learner will understand the application and pluripotency of stem cell. CO5 : The learner will be aware about the cell culture & its applications. CO6 : To understand the organization of cell signaling and their receptors.
				CO3: Organization of cytoskeleton and their associated protein
				CO4: The learner will understand the application and pluripotency of stem cell.
				CO5: The learner will be aware about the cell culture & its applications.
		Comparative	ZOO	CO1: The course gives detailed idea



		Embryology	503 MJ	<p>about advantage in the area of clinical embryology.</p> <p>CO2: Basic definitions and concepts in embryology.</p> <p>CO3: Concept of fertilization and how internal and external fertilization ensures species specificity.</p> <p>CO4: Different types of egg and cleavage patterns according to developmental need of embryo and processes of blastulation.</p> <p>CO5: To understand the mechanism of gastrulation resulting into separation of germ layers.</p> <p>CO6: To understand the mechanism of regeneration and metamorphosis in organisms</p>
		Medical Entomology	ZOO 504 MJ	<p>CO1: Understand, classify, and identify insects of medical and veterinary importance. CO2 : Incorporate the subject knowledge in designing innovative techniques of vector control. CO3 : Better prepared to contribute to the field of public and community health. CO4 : Understand molecular aspects of diseases of medical importance. CO5 : Capable of joining the research areas pertinent to vector borne diseases</p> <p>CO2: Incorporate the subject knowledge in designing innovative techniques of vector control.</p> <p>CO3: Better prepared to contribute to the field of public and community health.</p> <p>CO4: Understand molecular aspects of diseases of medical importance.</p> <p>CO5: Capable of joining the research areas pertinent to vector borne diseases</p>
		Biosystematics and Biodiversity	ZOO 505 MJ	<p>CO1: Explain Fundamental concepts and principles used in Systematics and Biodiversity.</p> <p>CO2: Assess the current status of animal biodiversity of our Nation & the World and threats to biodiversity.</p> <p>CO3: Identity and classify major groups of animal kingdom.</p> <p>CO4: Apply techniques of animal collection, preservation, and identification.</p> <p>CO5: Explain and perform basic Taxonomic procedures employed by</p>



				<p>animal taxonomists. CO6: Explain and use Zoological nomenclature during taxonomic research.</p> <p>CO7: Explain and Discuss the basic concepts in molecular phylogenetics.</p> <p>CO8: Explain and apply Techniques used in Phylogenetic analysis and Calculation of biodiversity indices.</p>
		Laboratory Exercises in Biochemistry and Cell Biology	ZOO 506 MJP	<p>CO1: Make the buffers of known pH and molarity.</p> <p>CO2: Estimate protein & carbohydrates from the given sample</p> <p>CO3 : Assess the enzyme activity and factors affecting it</p> <p>CO4: Perform paper chromatography, thin layer chromatography.</p> <p>CO5: Analyse samples using thin layer and paper chromatography.</p> <p>CO6: Isolate subcellular organelles and perform marker enzyme assays.</p> <p>CO7: Identify various stages of mitosis and meiosis</p> <p>CO8: Understand and differentiate between dead and live cells.</p> <p>CO9: Isolate nuclei, lysosomes & mitochondria from cells</p>
		Laboratory exercises in Biosystematics, Biodiversity and Medical Entomology	ZOO 507 MJP	<p>CO1 Apply and perform the techniques of animal collection, preservation, and identification.</p> <p>CO2: Apply and perform the techniques of animal specimen storage and curation of preserved specimens.</p> <p>CO3: Apply and perform the calculation of biodiversity indices.</p> <p>CO4: Apply and Perform Phylogenetic analysis using MEGA software.</p> <p>CO5: Conduct biodiversity survey with scientific and non-invasive collection techniques and understand role as biodiversity protector, preserver and promotor of life of animals</p> <p>CO6: Understand the medical importance of insects and their role as vector. Know the causes of arthropod-borne diseases.</p> <p>CO7: Know the role of insects in forensic investigations.</p> <p>CO8: Apply knowledge of prophylaxis or preventive measures against diseases caused by insect vectors.</p>



		Fresh Water Zoology	ZOO 510 MJ	CO1: Get introduced to the freshwater ecosystems. CO2: Illustrate the physical and chemical properties of water CO3: Acquire first-hand experience of the aquatic biodiversity. CO4: Acquire skills to critically evaluate scientific aspects of Freshwater Zoology. CO5: Get aware with the threats and an opportunity to resolve the issues related to freshwater habitats CO6: Introduced with the current issues of the subject
		Laboratory Exercises in Freshwater Zoology	ZOO 511 MJP	CO1: Get hands on training experience in limnological techniques. CO2: Will be able to identify freshwater invertebrates. CO3: Understand the relevance of freshwater fauna to the aquatic ecosystems. CO4: Able to culture zooplanktons. CO5: Understand the aquatic adaptations in freshwater fauna
		Research Methodology	ZOO 514 MJ	CO1: Explain concept of research methodology. CO2: Define research problem. CO3: Explain need of literature review in research. CO4: Prepare research designs and explain their characteristics. CO5: Collect and present the data CO6: Analyse data by using appropriate tests
		Laboratory Exercises in Research Methodology	ZOO 515 MJP	CO1: Suggest suitable title for a research article. CO2: Write the abstract, key words, result, discussion, conclusion and citations of references CO3: Write a research project proposal to seek funding. CO4: Use MS excel in presentation and analysis of data using common statistical tests. CO5: Conduct a scientific survey. CO4: Use MS excel in presentation and analysis of data using common statistical tests. CO5: Conduct a scientific survey
2.	M.Sc I Sem II	Molecular Biology	ZOO 551 MJ	CO1: Discuss the basic features of chromatin essentially to get insight of



				<p>gene.</p> <p>CO2: To study the structure and types of DNA and RNA, physical properties and topology of DNA and genome organization.</p> <p>CO3: Understand the details of DNA replication in prokaryotes and eukaryotes, enzymes involved in the process of replication, significance of replisome and primosome.</p> <p>CO4: Understand the process of transcription both in prokaryotes and eukaryotes with reference to enzymes involved in details, transcriptional unit.</p> <p>CO5: Understand the genetic code; ribosome structure</p>
		Comparative Endocrinology	ZOO 552 MJ	<p>CO1: Discuss the chemical signals & bioregulation of endocrine gland in vertebrates.</p> <p>CO2: Explain the synthesis, secretion, metabolism & mechanism of action of vertebrate hormone.</p> <p>CO3: Describe the hypothalamus - pituitary system</p> <p>CO4: Justify the comparative aspects of hormones and their physiological functions / role in vertebrates.</p> <p>CO5: Describe the adrenal glands of mammalian and non - mammalian vertebrates.</p> <p>CO6: Explain the hormonal control of calcium and phosphate homeostasis.</p> <p>CO7: Discuss the comparative endocrinology of feeding, digestion and metabolism in vertebrates.</p>
		Comparative Animal Physiology	ZOO 553 MJ	<p>CO1: Explain digestive system, concept of digestion and enzymes involved digestion.</p> <p>CO2: Understand the process of respiration and importance of O₂ and CO₂.</p> <p>CO3: Illustrate the structure of the skeletal muscle, proteins involved in muscle contraction and role of Calcium ions in contraction.</p> <p>CO4: Justify the concepts of osmole, osmolarity, tonicity and ionic regulation in different environment</p> <p>CO5: Explain process of excretion, functions of mammalian kidney and role</p>



				of Renin - Angiotensin system in excretion.
				CO6: Understand different thermo-biological terminology and mechanism of thermoregulation in different animals.
				CO7: Explain different types of sense organs and their functions
		Biochemical Techniques	ZOO 554 MJ	CO1: Understand the principle of light, fluorescence, scanning, transmission electron microscope.
				CO2: Understand the principle of centrifugation, various types of Centrifugations, rotors and its applications.
				CO3: Understand the principle and differences between various types of chromatography techniques.
				CO4: Know about agarose and polyacrylamide gel electrophoresis.
		Integrated Pest Management	ZOO 555 MJ	CO1: Understand basics of IPM, principles, tools, ethics & significances.
				CO2: Detect and diagnose different insect pests, their diseases & calculate economic injury level, economic threshold level.
				CO3: Understand pesticides, fungicides, herbicides, bio-herbicides and different methods used for pest control
				CO4: Know different Entomopathogenic organisms.
				CO5: Apply advanced technology for pest control
		Laboratory Exercises in Biochemical & Molecular Techniques	ZOO 556 MJP	CO1: Understand various components of light, fluorescence, scanning, transmission electron microscope.
				CO2: Perform density gradient centrifugation.
				CO3: Perform thin layer chromatography.
				CO4: Perform paper chromatography
				CO5: Perform sterilization of lab equipment.
				CO6: Isolation and quantification of prokaryotic and eukaryotic nucleic acids. C
				CO7: Understand how to extract and quantify DNA from samples.
				CO8: Understand how to extract and quantify RNA from samples
				CO9: Understand how to extract and



				quantify proteins from samples.
				CO10: Know the in-depth knowledge about agarose and polyacrylamide gel electrophoresis
		Laboratory Exercises in Comparative Animal Physiology & Endocrinology	ZOO 557 MJP	CO1: Perform estimation of amylase from human saliva.
				CO2: Demonstrate oxygen consumption in relation to body size.
				CO3: Demonstrate rate of salt loss / gain in fish.
				CO4: Demonstrate effect of different physiological conditions on red blood cells.
				CO5: Perform detection of nitrogenous waste products in different animal groups.
				CO6: Perform estimation of sugar in rat / crab / human blood.
				CO7: Demonstrate bleeding & clotting time of human blood
		Economic Zoology	ZOO 562 MJ	CO1: To gain knowledge about economically important branches of zoology.
				CO2: To gain knowledge about aquaculture.
				CO3: To acquaint knowledge about the culture techniques of fish.
				CO4: To acquaint the knowledge about biofloc fish farming.
				CO5: To learn concepts of sponge cultivation and related practices.
				CO6: To motivate the students for starting their self-employment
		Laboratory Exercises in Economic Zoology	ZOO 563 MJP	CO1: To gain knowledge about economic importance of prawn species
				CO2: To gain knowledge about economic importance of molluscs.
				CO3: To acquaint knowledge about the culture techniques of pearl
				CO4: To acquaint the knowledge about biofloc fish farming.
				CO5: To learn tank design and construction.
				CO6: To motivate the students for starting their self-employment
		On Job Training OR Field Project	ZOO 581 OJT / FP	CO1: Develop problem-solving skills.
				CO2: Demonstrate knowledge of research processes.
				CO3: Develop hands-on experience in a specific field of zoology.

				CO4: Perform literature review using print and online databases.
				CO5: Select and define appropriate research problem and parameters to prepare a project report.
				CO6: Identify, explain, compare, and prepare the key elements of a research proposal.
				CO7: Compare and contrast quantitative and qualitative research paradigms.
				CO8: Use sampling methods, measurement scales and instruments, and appropriate uses of each.
				CO9: Develop awareness about biodiversity conservation
3.	M.Sc II Sem II	Entomology - I	ZOO - 601 - MJP	CO1: Understand origin and evolution of insects and their relation to other arthropods.
				CO2: Classify insects up to family with distinguishing characters and examples of each order and family.
				CO3: Explain the structure, chemical composition and functions of Integument and Derivatives of Integument.
				CO4: Explain the structure of insect body regions and their appendages.
				CO5: Identify different modifications in Antennae, Wings, and Legs of an insect.
				CO6: Understand the Comparative anatomical and histological structure of various body systems.
				CO7: Explain the location structure and functions of various Endocrine and Exocrine glands.
				CO8: Explain the location and structure of Light and Sound producing organs in various insects.
		Physiology of Reproduction	ZOO - 602 - MJ	CO1: Explain the male and female reproductive systems.
				CO2: Understand reproductive patterns.
				CO3: Understand the sexual cycles with examples.
				CO4: Illustrate the process of fertilization.
				CO5: Explain the hormonal regulation in pregnancy.
				CO6: Describe the hormonal co-ordination of reproductive processes.
				CO7: Know the artificial control of reproduction.



				CO8: Understand process of placenta formation, lactation, parturition, etc.
		Developmental Biology	ZOO - 603 - MJ	CO1: Understand advantages and disadvantages of different model organisms used in research.
				CO2: Learn the processes of organogenesis.
				CO3: Understand mechanism of vertebrate eye development.
				CO4: Acquire the knowledge of molecular signaling during neural induction.
				CO5: Acquire the knowledge of post embryonic development such as apoptosis, aging and senescence.
				CO6: Understand importance of environmental cues in normal animals development.
				CO7: Understand the mechanism of evolutionary changes
				CO8: Learn the concept of teratogen and different abnormalities caused by teratogens.
		Insect Physiology & Biochemistry	ZOO - 604 - MJ	CO1: Explain the structure, chemistry and functions of various systems of insects.
				CO2: Explain and understand the process of excretion, detoxification and water balance.
				CO3: Elaborate the role of insect hormones in physiological processes
				CO4: Describe the structure, physiology and biochemistry of flight muscle.
				CO5: Describe the process of protein, carbohydrate, lipid digestion and metabolism in insect body.
				CO6: Explain the characteristics of haemolymph and types of haemocytes..
				CO7: Understand the endocrine system and various hormones.
				CO8: Understand the process of insecticide degradation and detoxification
		Lab Exercises in Entomology - I	ZOO - 605 - MJP	CO1: Understand different collection methods for collecting insects.
				CO2: Perform various insect preservation techniques for further study.
				CO3: Identify and classify insect orders with the help of their morphological

				<p>features.</p> <p>CO4: Could dissect the insect to observe its body systems and can mount mouthparts, leg, wings, etc.</p> <p>CO5: Identify type of mouth parts, antenna, legs and wings of insects..</p> <p>CO6: Learn about head orientations, articulations, and appendages with respect to their functions</p> <p>.CO7: Know about insect abdominal appendages and their significance.</p> <p>CO8: The knowledge acquired and skill developed in the field of entomology will help in increasing farmer's income, better human health and decreased environmental pollution as well as meet out the future challenges in health and agricultural sectors</p>
		Laboratory Exercises in Physiology of Reproduction and Insect Physiology & Biochemistry	ZOO - 606 - MJP	<p>CO1: Understand anatomy and histology of male and female reproductive system in rat / mouse.</p> <p>CO2: Learn how to examine vaginal smears.</p> <p>CO3: Understand types of placenta and uterine muscles.</p> <p>CO4: Know about various contraceptive devices and their importance.</p> <p>CO5: Asses effect of temperature on water loss in Cockroach.</p> <p>CO6: Understand the role of amylase in Cockroach.</p> <p>CO7: Estimate oxygen consumption in dragon fly nymph</p> <p>CO8: Understand the heart and haemocytes of Cockroach. CO9: Determine the trehalase activity in haemolymph of an insect.</p>
		Animal Behaviour	ZOO - 612 - MJ	<p>CO1: Define animal behaviour as the actions living things carry out to survive and reproduce.</p> <p>CO2: Use concepts of animal behaviour to understand human behaviour.</p> <p>CO3: Understand the ecological aspects of animal behaviour.</p> <p>CO4: Know about the strategies of organization in animals and their interactions..</p> <p>CO5: Understand the reproductive behaviour of animals.</p> <p>CO6: Learn how animals communicate</p>



				with each other. CO7: Understand about the modes of parental caring in various animals. CO8: Know about the extraordinary phenomenon defence mimicry and camouflage
		Laboratory Exercises in Animal Behaviour	ZOO - 613 - MJP	CO1: Learn how phototaxis and chemotaxis brings about changes in <i>Drosophilabehaviour</i> CO2: Record the behaviour of human in the absence of visual cues. CO3: Assess the stress developed during social situations. CO4: Perform different test to record human social behaviour. CO5: Analyse the stress conditions during Maze test. CO6: Learn to record and interpret behaviour of animals in the field. CO7: Understand how birds interact with each other with the help of vocal cuesl. CO8: Organize field works and nature trai
		Research Project	ZOO - 631 - RP	CO1: Find a novel research topic by identifying a research gap in the current trends.. CO2: Demonstrate an understanding of the ethical issues associated with practitioner research. CO3: Search literature from various reputed journals and write a review of literature. CO4: Analyse data and synthesize research findings. CO5: Use research findings to address local problem faced by the society CO6: Apply foundational research skills to address a research question CO7: Demonstrate planning, time and change management skills. CO8: Demonstrate a capacity to communicate research results clearly, comprehensively and persuasively. CO9: Gain practical and / or theoretical knowledge about particular area of Zoology
4.	M.Sc II Sem IV	Entomology - II	ZOO - 651 - MJ	CO1: Understand the processes of Gametogenesis, Fertilization and oviposition. CO2: Understand early embryonic

				<p>developmental stages of insect which will help him/her in future studies</p> <p>. CO3: Explain post-embryonic developmental stages including types of Larva, Nymph and Pupa.</p> <p>CO4: Understand the different types of metamorphosis in insects.</p> <p>CO5: Explain specialized reproductive mechanisms in insects.</p> <p>CO6: Understand the Hadorn's experiments with imaginal disc, Regeneration and Aging.</p> <p>CO7: Explain Occurrence, Initiation, Preparations for diapauses and its Controls.</p> <p>CO8: Apply this knowledge in the field of research and applied zoology</p>
		Ecology and Evolution	ZOO - 652 - MJ	<p>CO1: Understand the concept of Ecology and environment.</p> <p>CO2: Explain various ecosystems.</p> <p>CO3: Know more about ecological succession.</p> <p>CO4: Explain the interactions of animals.</p> <p>CO5: Provide comprehensive overview of concept of evolution.</p> <p>CO6: Explain origin of life especially Prokaryotes as well as Eukaryotes.</p> <p>CO7: Explore salient features of various theories of evolution comprising of Lamarckism Darwinism and Neo-Darwinism.</p> <p>CO8: Understand the concepts of Analogy, Homology, Paleontological evidences, Embryological evidences</p>
		Environmental Biology	ZOO - 653 - MJ	<p>CO1: Analyze current environmental issues and evaluate potential solutions.</p> <p>CO2: Relate the features of human populations to different types of environmental degradation.</p> <p>CO3: Evaluate scientific basis of environmental issues.</p> <p>CO4: Assess the costs/benefits of conservation vs. remediation or technological solutions.</p> <p>CO5: Recognize the impact of globalization on the environment</p> <p>CO 6: Recognize the ecological footprints left by different peoples of the Earth.</p>



				CO 7: Know about different biomes and their characteristics.
				CO 8: Understand green techniques to minimize pollution
		Lab Exercises in Entomology - II	ZOO - 654 - MJP	CO1: Understand detailed structure of parts of male and female reproductive system of Insect.
				CO2: Will be able to identify different types of insect egg.
				CO3: Understand the embryonic development of insect.
				CO4: Learn various post embryonic changes in insect development.
				CO5: Identify various types of Larvae, Nymph and Pupa of Insect.
				CO6: Collection and preservation of Eggs, Larvae, Nymph and Pupa of insect.
				CO7: Able to dissect Housefly to observe its body systems and can mount halter and mouthparts
				. CO8: Dissect Butterfly to study different systems and able to mount mouthparts, genital appendages, antenna, leg and wing scales.
		Laboratory Exercises in Ecology, Evolution and Environmental Biology	ZOO - 655 - MJP	CO1: Estimate dissolved oxygen and carbon dioxide.
				CO2: Estimate water alkalinity of given water sample.
				CO3: Know about Paleontological and Embryological evidences of evolution.
				CO4: Understand animal adaptations of bat, sea turtle, Draco, Exocoetus.
				CO5: Learn successive stages of man evolution.
				CO6: Know about ecosystem and its abiotic as well as biotic components.
				CO7: Understand various types of bio-indicators and their importance.
				CO8: Learn collection of effluent from various industries.
				CO9: Analyse toxic effects of pollutants on aquatic fauna.
				CO10: Learn about solid waste management
		Immunology	ZOO - 662 - MJ	CO1: List the primary and secondary immune organs.
				CO2: Explain the concepts of immunity, self-non, self-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
		Laboratory Exercises in Immunology	ZOO - 663 - MJP	CO1: Learn double diffusion or Ouchterlony technique..
				CO2: Understand the histology of lymphoid organs.
				CO3: Know about Immuno electrophoresis.
				CO4: Perform differential count of leucocytes.
				CO5: Analyze the blood groups and will know about the immunology of blood transfusion.
				CO6: Know about rocket electrophoresis to estimate antigen concentrations
				CO7: Perform cell counting and viability testing.
				CO8: Identify the pattern of identity of antigen- antibody reactions
		Research Project	ZOO - 681 - RP	CO1: Identify and discuss the role and importance of research in the life sciences.
				CO2: Identify and discuss the issues and concepts salient to the research process.
				CO3: Identify and discuss the complex issues inherent in selecting a research problem, selection of an appropriate research design, and implementing a research project.
				CO4: Identify and discuss the concepts and procedures of sampling, data collection, analysis and reporting
				CO5: Read, comprehend, and explain research articles in their academic discipline.
				CO6: Preparing and representing the data.
				CO7: Write a dissertation in a scientific



				way.
				CO8: Work in the important research projects at renowned institutes and he / she can make a career in the research field