PROGRAMME STRUCTRURE FOR THE P.G. DEGREE M.Sc. ZOOLOGY IN UNIVERSITY DEPARTMENT (With effect from the academic year 2023-2024 onwards) MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI Learning Outcome Based Curriculam Framework System

ProgrammeObjectives:

Programme Objectives	**Title of the Programme**	
	M.Sc. Zoology	Develop an individual from rural, unreached socio-economically downtrodden society with academic integrity, values and ethics.
		Impart high level of education and understand the multidisciplinary, innovative, contemporary knowledge and will be able to do independent and applied research to be competent at national and international level.
		Motivate and develop a passion for lifelong learning with capability in technique and analytical methods in the core and applied research.
		Impart skill based, value added, employable, entrepreneurial, research oriented programmes to be self reliant.
		Offer a milieu for basic and advanced research to develop research outputs that are transferrable technologies, patents and publications.
		Offer courses and impart hands on scientific training for designing and execution of experiments to acquire higher education, research skills and employability in the reputed regional, national and international institutions

Programme Specific Outcomes

Title of the programme	
M.Sc. Zoology	Identify the diversity of organisms, differentiate them phylogenetically, morphologically and understand their habit and habitat, evolutionary significance, and their economic importance
	Understand the cellular and molecular mechanisms of organisms, know the microbial interactions and biochemical modifications in various organisms.

	Understand the cell differentiation, genetic inheritance, developmental process of an organism, and know the modern techniques viz. rDNA, Tissue engineering and the Artificial Reproductive Technology process.
	Learn the basics of the animal physiology, know the immune cells and immune organs, process of innate and acquired defence mechanisms and their role in allergy and organ transplantation.
	Design the experiments, know the methods of data collection and execute the experiments with modern instruments and interpret the data with recent statistical tools.
	Acquire knowledge on computational biological tools, know the biological database and sequence analysis methods, able to do molecular modelling and pharmacophore generation.

Course Outcome

Sl.N o	**Nature of Course**	**Title of the subject/course**	**Course outcome**
Semester I			
1	**CORE PAPER : I**	**Structure and function of invertebrates**	Remember the general concepts and major groups in animal classification, origin, structure, functions and distribution of life in all its forms.
			Understand the evolutionary process. All are linked in a sequence of life patterns.
			Apply this for pre-professional work in agriculture and conservation of life forms.
			Analyze what lies beyond our present knowledge of life process.
			Evaluate and to create the perfect phylogenetic relationship in classification.
	Core II	**Comparative Anatomy of Vertebrates**	Remember the general concepts and major groups in animal classification, origin, structure, functions and distribution of life in all its forms.
			Understand the evolutionary process. All are linked in a

			sequence of life patterns.
			Apply this for pre-professional work in agriculture and conservation of life forms.
			Analyze what lies beyond our present knowledge of life process.
			Evaluate and to create the perfect phylogenetic relationship in classification.
	Core III	**Lab Course on Invertebrates &Vertebrates**	Understand the structure and functions of various systems in animals
			Learn the adaptive features of different groups of animals
			Learn the mounting techniques
			Acquire strong knowledge on the animal skeletal system
	ELECTIVE-I (DISCIPLINE GENTRIC):	**BIOCHEMISTRY**	Understand the structure, function and metabolic pathways of carbohydrates
			Learn the classification, structural organization of proteins, types of bonds involved in protein stabilization and to understand types of enzymes, mechanism of enzyme action, regulation and inhibition.
			Acquire knowledge on the basic lipid biochemistry and further to understand the properties, biological functions and important disorders of lipid metabolism.
			Know the structure of nucleic acids, various forms of DNA, RNA and understand the structure and metabolism of vitamins.
			Learn about the structure of endocrine glands, different types of hormones, receptors

			and its role in signal transduction.
	Elective II : Generic	**Biostatistics**	Clear understanding of design and application of biostatistics relevant to experimental and population studies.
			Acquired skills to perform various statistical analyses using modern statistical techniques and software.
			Knowledge on the merits and limitation of practical problems in biological/ health management study as well as to propose and implement appropriate statistical design/ methods of analysis.
	Core-IV	**Lab Courses on Biochemistry and Biostatistics**	Analyze the biomolecules in the tissue and blood samples.
			Separate aminoacids and bioactive compounds using chromatography technique and to estimate glucose, urea and creatinine
			Enable to handle different types of microscope used in biological research, understand the functional differentiation of eukaryotic and prokaryotic cells.
			Acquire knowledge on the structure of blood components and blood biochemical parameters such as blood counting, grouping and ESR.
			Analyze the mechanism of mitosis, meiosis and enumerate the structure of polytene chromosome of chironomous larvae.
SEMESTER-II			

	Core V	**Cellular and Molecular Biology**	Understand the general concepts of cell and molecular biology.
			Visualize the basic molecular processes in prokaryotic and eukaryotic cells, especially relevance of molecular and cellular structures influencing functional features.
			Perceive the importance of physical and chemical signals at the molecular level resulting in modulation of response of cellular responses.
			Updated the knowledge on the rapid advances in cell and molecular biology for a better understanding of onset of various diseases including cancer.
	Core VI	**Developmental Biology**	Define the concepts of embryonic development
			Observe various stages of cell divisions under microscope
			Understand the formation of zygote
			Differentiate the blastula and gastrula stages
			Learn the distinguishing features of three different germ layers and formation of various tissues and organs
	Core VII	**Lab Course in Cell Biology and Developmental Biology**	Acquire knowledge to differentiate the cells of various living organisms and become awares of physiological processes of cells e.g. cell divisions, various stages of fertilization and embryo development.
			Understand and observe as well as correctly identify different cell types, cellular structures using different microscopic techniques.

			Develop handling - skills through the wet-lab course.
			Learn the method of culturing of *Drosophila* and identification of their wild and mutant strains
			Acquire skills to perform human karyotyping and chromosome mapping to identify abnormalities
	Elective III (Discipline Centric):	**a)Economic Entomology**	Understand taxonomy, classification and life of insects in the animal kingdom.
			Know the life cycle, rearing and management of diseases of beneficial insects.
			Know the type of harmful insects, life cycle, damage potential and management of pests including natural pest control
			Recognize insects which act as vectors causing diseases in animals and human.
			Overall understanding on the importance of insects in human life.
		b) Poultry Farming	To understand the various practices in Poultry farming. To know the needs for Poultry farming and the status of India in global market.
			To be able to apply the techniques and practices needed or Poultry farming.
			To know the difficulties in Poultry farming and be able to propose plans against it.
		c) Dairy Farming	To understand the various practices in Dairy farming. To know the needs for Dairy farming and the status of India in global market.
			To be able to apply the

			techniques and practices needed for Dairy farming.
			To know the difficulties in Dairy farming and be able to propose plans against it.
	Elective IV (Generic)	**Research Methodology**	Understand the importance of pH in biological research
			Learn the working principles of different instruments
			Gain the knowledge on techniques of micro and macro molecules separation.
			Acquire knowledge on the basic principle and application of various modules of light and electron microscopy
SEMESTER-III	**Core IX**	**Genetics**	Explain the organization and functions of genetic material in the living system.
			Understand various sequential processes in protein synthesis
			Explicate the structures and functions of chromosomes and identify the diseasescaused by the chromosomal abnormalities.
			Able to distinguish lytic and lysogenic cycle and explain the mechanisms of genetic recombination of the microbes.
			Understand the principle and application of rDNA technology for the welfare of human being.
	Core X	**Evolution**	To understand the concept of evolution. It provides a comprehensive account of evidences to support concept of evolution and different theories for exploring the mechanism of evolution.
			Study the origin of eukaryotic cells; Evolution of unicellular

			eukaryotes; Anaerobic metabolism, photosynthesis and aerobic metabolism.
			Understand the major events in the evolutionary time scale; Origins of unicellular and multi-cellular organisms.
			Comprehend the origin of new genes and proteins; Gene duplication and divergence.
			Appreciate the concepts and rate of change in gene frequency through natural selection, migration and random genetic drift
	Core XI	**Animal Physiology**	Understand the functions of different systems of animals
			Learn the comparative anatomy of heart structure and functions
			Know the transport and exchange of gases, neural and chemical regulation of respiration
			Acquire knowledge on the organization and structure of central and peripheral nervous systems
	Core Industry Module	**Medical Laboratory Techniques**	Understand protocols and procedures to collect clinical samples for blood analysis and to study human physiology.
			Explain the characteristics of clinical samples and demonstrate skill in handling clinical equipment.
			Evaluate the hematological and histological parameters of biological samples.
	Core Practical XII	**Genetics, Evolution And Animal Physiology**	Know the preparation of karyotypes of metaphase chromosome of human and identify the disease causing gene by karyotyping.
			Acquire knowledge on

			genetic drift or bottle neck principle operating on a small population.
			Construct the family chart for the sex linked inheritance
			Know the evolutionary history of living system and understand the connecting link between the phyla.
			Acquire knowledge on the construction of phylogenetic tree to understand the evolutionary history.
	Elective V (Discipline Centric):	**A)Apiculture**	Analyze major trends in a given economic sector / sub-sector and identify Business Opportunities
			Develop effective personal management skills like time management and communication skills.·
			Devise a simple marketing and sales strategies and plan for a small business
			Knowledge on the processing of honey and byproducts of honey.
			Work out Business plan and economics of the project
		B) Sericulture	Analyze major trends in a given economic sector / sub-sector and identify Business Opportunities
			Develop effective personal management skills like time management and communication skills.·
			Devise a simple marketing and sales strategies and plan for a small business
			Knowledge on the processing of silk and byproducts of silk.
			Work out Business plan and economics of the project
		c) Vermiculture	To understand the various

			practices in vermiculture. To know the needs for Vermiculture and the status of India in global market.
			Able to apply the techniques and practices needed for vermiculture.
			To know the difficulties in Vermiculture and be able to propose plans against it.
SEMESTER-IV	**Core XII**	**Immunology**	Various basic concepts in immunology and organization of immune systems.
			Mechanisms of immune response in health and their defects in various diseases.
			The application of immunological principles in biomedical sciences including blood transfusion, tissue grafting and organ transplantation.
			Vaccinology and its importance in disease management
	Core XIV	**Ecology**	Learn about the ecosystem, biotic communities and utilizing the energy processing
			Study the various community and population and population control
			Understand the fundamentals of climatic conditions and its impact on environment
			Realizing the nature of pollution and the ways for its control/reduction
			Impact of environmental studies on solid waste management
	Core Lab-XV	**Immunology & Ecology**	Acquire knowledge on primary productivity in an aquatic ecosystem.
			Develop skill to analyze

			physico-chemical parameters of water.
			Measure and assess the diversity, density and richness of the species through biodiversity index.
			Understand waste water treatement plant and their utilization in agroecosytem
			Knowledge on the impact of global warming and climate change
			Know the impact of Oxygen, temperature and salinity on living organism and estimate the RQ value of organism.
			Acquire knowledge on enzymatic activity with aid of digestion process of an organism.
			Learn the calculation of body mass index and correlate the energy level.
			Understand the antibody-antigen interaction and involved the determination of blood group.
			Describe the various immunological technique.
	Elective VI (Industry/Entrepreneurship) (20 % Theory + 80 % practical)	**a) Aquaculture**	To develop knowledge on the fish farm and their maintenance.Understand the methods of fish seed and feed production anddevelops knowledge on hatchery techniques
			To apply the knowledge about different culture methods in aquaculture and gain knowledge on fish and shrimp breeding techniques and larval culture
			Identifies the different fishes diseases, diagnosis and their management strategies. Understands Ornamental

			fishes and central aquaculture organizations
		B) Fish Processing Techniques	Understand the functional properties of seafood proteins and know the pigments, enzymes, hydrolases, oxidoreductases, collagen and skin characteristics of seafood.
			Be familiar with the technological aspects of freezing, processing, packaging - Determination of freezing points from time-temperature plots-preparation of fish for freezing.
			To know the advantages of canning in relation to other preservation methods and understand the soil age of canned foods - types, causes and preventive measures-hygiene and sanitation and waste disposal.
			Understand the Importance of packaging in fish processing, - Properties of packaging materials, Labelling and bar coding - methods of transportation of frozen fish.
			Know the procedure on fish liver oil extraction, purification, preservation, storage application. Usage of shrimp wastes chitin, chitosan-production and its pharmaceutical importance.
		C)Mushroom Processing: Value Added Products	Will understand the structure and morphology of mushroom, Nutritive value of mushroom, Pharmaceutical value Types of mushroom - Life cycle of mushroom
			Will know the different units in Mushroom cultivation-

			Machinery, Equipments and instruments in mushroom production, Farm Design for mushroom production- Pure culture of mushroom and its preservation techniques, Raw materials and Sterilization
			Will understand the pawning and casing and culture practice-Ingredients, formulation of substrate preparation and crop management of oyster mushroom, Traditional and modern cultivation technologies of paddy straw mushrooms.
			Will understand the Growth regulators for mushroom yield enhancement, Post-harvest handling of fresh mushrooms, Recycling of spent mushroom waste, Microbial diseases of mushroom and their management.
			Will understand the Value added products preparation of Mushroom, Marketing of mushroom :Global and domestic, Entrepreneurial capital, SWOT analysis, Licenses legal frame work , Government Schemes
	Skill Enhancement Course [SEC] – III	**a)Animal behavior**	Recall and record genetic basis and evolutionary history of behaviour.
			Analyse and identify innate, learned and cognitive behaviour and differentiate between various mating systems.
			Classify movement and migration behaviours and explain environmental influence upon behaviour.

		B)Animal Cell Biotechnology	Know the history of animal cell culture, laboratory requirements, equipments and media requirements for animal cell culture and applications of animal cell culture technique.
			Understand the basic concept of tissue culture, organ culture, tissue engineering, application of tissue engineering in organ generation and ethical implication in tissue engineering.
			Types modifying enzymes their uses in animal cell biotechnology. concept of transgenic animals , ethical, social and legal concern related to transgenic animals, applications of transgenic animals, Construction of recombinant animal viral vectors, different animal viral vectors. application of animal viral vectors
			Concept & Methods of Genetic Engineering, manipulation of gene expression in eukaryotes, generation of transgenic animals; RNA interference (RNAi), Antisense oligodeoxynucleotide Technology - gene knock out/ gene targeting, Applications of the gene knock out/ targeting.
			Pregnancy Diagnosis in Animals; Sperm and Embryo sexing; Stem Cell Technology and Therapeutics;Cell Cryopreservation and Animal Conservation; GLP Ethical

			Issues related to the Animal Cell culture.
		c) Stem cell biology	Understand the basic knowledge of stem cells and their origin
			Differentiating the embryonic and adult stem cells
			Understand and apply the current stem cell therapies for their research