LESSON PLAN OF DEPARTMENT OF ZOOLOGY ACADEMIC SESSION 2023-2024

HONOURS	MONTH	NO OF LECTURES (HOURS)		TOPIC	
		Theory	practical	Theory	Practical
Semester I DS-1 Non-Chordates I Theory Non-Chodates I Lab	**July**	**10**	**16**	**Unit 1: Protista, Parazoa & Metazoa** • Characteristic and classification up to classes. • Study of *Euglena*, *Amoeba* and *Paramoecium* • Locomotion and reproduction in protista **Unit 2: Porifera** • Characteristic and classification upto classes • Canal system and spicules in sponges **Unit 3: Cnidaria** • characteristic and classification upto classes • coral and coral reefs	• Study of whole mount of *Euglena, Amoeba, Paramoecium*. • Binary fission and Conjugation in Paramoecium • Examination of freshwater pond water collected from different places for diversity of protists in it.
	August	**8**	**12**	**Unit 1: Protista, Parazoa & Metazoa** • Evolution of symmetry and segmentation of Metazoa. • Life cycle and pathogenicity of *Giardia, Leishmania,* **Unit 3: Cnidaria** • Polymorphism in Cnidaria **Unit 6: Nemathelminthes** • General characteristics and Classification upto classes • Origin and evolution of parasitic helminthes.	• Study of *Sycon, Hyalonema, Euplectella, Spongilla.* • Study of *Obelia, Physalia, millepora, Aurelia, Tubipora, Corallium.* • Examination of freshwater pond water collected from different places for diversity of protists in it.
	September	**10**	**14**	**Unit-1: Protista, Parazoa & Metazoa** • Life cycle and pathogenicity of *Entamoeba* and *Plasmodium* **Unit 3: Cnidaria**	• Study of *Alcyonium, Gorgonia, Metridium, Pennatula, Fungia, Meandrina, Madrepora* • study of adult *Fasciola hepatica, Taenia*

				• Metagenesis in Obelia. **Unit 6: Nemathelminthes** • Life cycle and pathogenicity of *Ascaris*	*solium* and their life cycles. • Study of adult *Ascaris lumbricoides* and its life stages
	October	**2**	**2**	**Unit – 4: Ctenophora** • General characteristic	• One specimen/slide of any Ctenophore
	November	**07**	**8**	**Unit -5: Platyhelminthes** • General characteristics and Classification upto classes. • Life cycle and pathogenicity of *Fasciola*. **Unit 6: Nemathelminthes** • Life cycle and pathogenicity of *Ancylostoma* and *Wuchereria*	**Field trip and** Preparation of field report
	December	**8**	**8**	**Unit -5: Platyhelminthes** Life cycle and pathogenicity of *Taenia solium* **Unit 6: Nemathelminthes** Life cycle and pathogenicity of Ascaris *Lunbricoides*	Revision of Practical.
GENERAL	**MONTH**	**NO OF LECTURES (HOURS)**		**TOPIC**	
		Theory	**practical**	**Theory**	**practical**
Semester I **MA-1** **&** **Practical** **(Animal Diversity)**	**July**	**10**	**14**	**Unit-1 Kingdom Protista** • General characters and classification of Subkingdom Protozoa. • Locomotory organelles and locomotion in Protozoa **Unit-4 Phylum Platihelminthes** • General characters and classification up to classes. • Life history of *Taenia solium*. **Unit-8 Phylum Mollusca** • General characters and classification up to classes.	Spot identification of the specimens

				• Respiration in *Pila*	
	August	**8**	**12**	**Unit-2 Phylum Porifera** • General characters and classification up to classes. • Canal system in *Sycon*. **Unit-3 Phylum Cnidaria** • General characters and classification up to classes. • Polymorphism in Hydrozoa **Unit-7 Phylum Arthropoda** • General characters and classification up to classes. **Unit-5 Phylum Nematoda** • General characters and classification up to classes. • Life history of *Ascaris lumbricoides* and its parasitic adaptation. **Unit-6 Phylum Annelida** • General characters and classification up to classes.	Spot identification of the specimens
	Septembe r	**10**	**14**	**Unit-7 Phylum Arthropoda** • Vision in insect. • Metamorphosis in insects. **Unit-6 Phylum Annelida** • Nephridia in Annelida **Unit-12 Pisces** • General characters and classification up to Subclasses. • Osmoregulation in Fishes	Spot identification of the specimens
	October	**2**	**2**	**Unit-13 Amphibia** • General characters and classification up to classes.	Spot identification of the specimens

	November	**07**	**8**	**Unit-9 Phylum Echinodermata** • General characters and classification up to classes. • Water-vascular system in Asterias **Unit-10 Protochordates** • General features **Unit-13 Amphibia** • Metamorphosis in Toad **Unit-14 Reptiles** • General features and classification up to living Subclasses. • Biting mechanism in snakes, Poisonous and nonpoisonous snakes	• Study of the permanent slides • Identification of poisonous and non-poisonous snakes • Preparation of Animal album
	December	**8**	**10**	**Unit-10 Protochordates** • Feeding in Branchiostoma **Unit-11 Agnatha** • General characters and classification up to classes. **Unit-15 Aves** • General characters and classification up to orders. • Flight adaptations in birds **Unit-16 Mammals** • Classification up to Subclasses. • Origin and distribution of Cranial nerves in Cavia	• Preparation and submission of Animal album
HONOURS	**MONTH**	**NO OF LECTURES (HOURS)**		**TOPIC**	
		Theory	**practical**	**Theory**	**practical**
Semester II **DS-2:** **Non-Chordates** **II Theory** **Non-Chordates**	**January**	**10**	**14**	**Unit 1: Introduction to Coelomates** • Evolution of Coelom • Evolution of metamerism **Unit 3: Arthropoda** • General characteristics and	Study of specimens

II Lab				Classification up to classes.	
	February	**08**	**12**	**Unit 2: Annelida** • General characteristics and Classification up to classes. • Excretion in Annelida. **Unit 3: Arthropoda** • Vision in Arthropods • Respiration in Arthropods **Unit 5: Mollusca** • General characteristics and Classification up to classes	Study of specimens
	March	**08**	**10**	**Unit 3: Arthropoda** • Metamorphosis in insect • Social life in bees. **Unit 4: Onychophora** • General characteristics and Evolutionary significance **Unit 5: Mollusca** • Respiration inMollusca	Study of specimens
	April	**07**	**08**	**Unit 3: Arthropoda** • Social life in termites **Unit 5: Mollusca** • Torsion and detorsion in Gastropoda **Unit 6: Echinodermata** • General characteristics and Classification up to classes. **Unit 7:Hemichordata** • General characteristics	• Dissection of Digestive system of Periplaneta • Nervous system of Periplaneta
	May	**06**	**10**	**Unit 5: Mollusca** • Pearl formation in bivalves. **Unit 6: Echinodermata** • Water-vascular system in Asteroidea **Unit 7:Hemichordata** • Phylogenetic relationship with non-chordates and chordates.	• Digestive system, septal nephridia and pharyngeal nepridia of earthworm. • Prepare Project report

	June	**06**	**06**	**Unit 5: Mollusca** • Evolutionary significance of trochophore larva. **Unit 6: Echinodermata** • Larval forms in Echinodermata. • Affinities with chordates.	• T.S. through pharynx, gizzard and typhlosolar intestine of earthworm. • Mount of mouth parts of Periplaneta. • Preparation and submission of Project report.
GENERAL	**MONTH**	**NO OF LECTURES (HOURS)**		**TOPIC**	
		Theory	**practical**	**Theory**	**Practical**
Semester I **MA-2** **&** **Practical (Physiology and Biochemistry)**	**January**	**10**	**14**	**Unit-1: Nerve and muscle** • Structure of neuron **Unit-2:Digestion** • Physiology of digestion in the alimentary canal. **Unit-9: Protein: Structure and Metabolism** • Proteins and their biological functions, functions of amino acids, • Physiochemical properties of amino acids, Peptides – structure and properties. • Primary, secondary, tertiary and quaternary structure of proteins. • Transamination, Deamination. • Urea cycle.	• Preparation of Haemin crystals • Identification of permanent histological slides
	February	**08**	**12**	**Unit-1: Nerve and muscle** • Resting membrane potential, Graded potential, Origin of action potential • Propagation of action potential through myelinated and unmyelinated nerve fibers. • Ultra-structure of skeletal muscle.	ii)Identification of permanent histological slides iii)Qualitative tests to identify functional groups of carbohydrates.

				Unit-2:Digestion • Absorption of carbohydrates, proteins and lipids. **Unit-5:Cardiovascular system** • Composition of blood, Homeostasis. • Structure of heart. • Origin and conduction of the cardiac impulse. • Cardiac cycle.	
	March	**08**	**10**	**Unit-1: Nerve and muscle** • Molecular and chemical basis of muscle contraction. **Unit-3: Respiration** • Pulmonary ventilation, Respiratory volumes and capacity. **Unit-6: Reproduction and Endocrine gland** • Physiology of male reproduction: hormonal control of spermatogenesis. • Physiology of female reproduction: hormonal control of menstrual cycle. **Unit-7: Carbohydrate: Structure and Metabolism** • Introduction to Carbohydrates, Structure and Types of Carbohydrates, Isomerism, • Glycolysis	iii)Qualitative tests to identify functional groups of carbohydrates. iv)Lowry`s method for quantitative test of protein
	April	**07**	**08**	**Unit-3: Respiration** • Transport of Oxygen. • Transport of Carbon-di-oxide. **Unit-6: Reproduction and Endocrine gland** • Structure and function of Pituitary. • Structure and function of Thyroid	iv)Lowry`s method for quantitative test of protein

				• Structure and function of pancreas • Structure and function of adrenal **Unit-7: Carbohydrate: Structure and Metabolism** • Krebs cycle • Pentose phosphate pathway **Unit-10: Enzymes** • Introduction, Classification of Enzymes • Mechanism of action • Enzyme kinetics • Inhibition and Regulation	
	May	**06**	**10**	**Unit-4: Excretion** • Structure of nephron. • Mechanism of urine formation • Counter-current Mechanism **Unit-7: Carbohydrate: Structure and Metabolism** • Gluconeogenesis • Electron Transport Systen	iv)Study of activity amylase under optimum conditions.
	June	**06**	**06**	**Unit-8: Lipid structure and Metabolism** • Introduction to lipids: Definitions; fats and oils; classes of lipids. • Biosysthesis of palmitic acid • B-oxidation of palmitic acid.	Revision of practical
HONOURS	**MONTH**	**NO OF LECTURES (HOURS)**		**TOPIC**	
		Theory	**practical**	**Theory**	**Practical**
Semester III **ZOOACOR05T** **&** **ZOOACOR05P**	**July**	**14**	**16**	**Unit 1**: Introduction to Chordates: • General characteristics and outline classification of phylum Chordata. **Unit 2**: Protochordata	• Protochordata *Herdmania*, *Branchiostoma* Colonial Urochordates; Sections of *Balanoglossus* through proboscis and branchiogenital regions,

(Chordates)				• General characteristics and classification of Urochordata and Cephalochordata upto Classes. • Metamorphosis in Ascidia. • Chordates features and feeding in Branchiostoma **Unit 3**: Origin of Chordates • Dipleurula concept and the Echinoderm theory of origin of chordates. • Advanced features of vertebrates over protochordates.	Sections of *Amphioxus* through pharyngeal, intestinal and caudal regions, *Herdmania* spicules, • Agnatha *Petromyzon, Myxine*
	August	**12**	**14**	**Unit 4**: Agnatha • General characteristics and classification of cyclostomes up to order. **Unit 5**: Pisces • General characteristics and classification of Chondrichthyes and Osteichthyes upto Subclasses. • Accessory respiratory organ • Migration of fishes • Parental care of fishes. • Swim bladder in fishes. **Unit 6**: Amphibia • General characteristics and classification up to living orders • Metamorphosis in amphibia.	• Fishes Scoliodon, Sphyrna, pristis, Torpedo, chimaera, Mystus, Heteropneustes, Labeo, Exocoetus, Echeneis, Anguilla, Hippocampus, Tetradon, Anabas, Flat fish.
	Septembe r	**10**	**10**	**Unit 6**: Amphibia • Parental care in amphibian. **Unit 7**: Reptilia • General characteristics and classification up to living orders. • Poison apparatus and biting mechanism in Snake. **Unit 8**: Aves • General characteristics and classification up to Sub-classes	• Amphibia: Ichthyophis, Necturus, Bufo, Hyla, Alytes, Salamander, • Reptilia: Chelone, Trionix, Hemidactylus, Varanus, Uromastix, Chameleon, Ophiosaurus.

				• Exoskeleton in Birds • Migration in Birds.	
	October	**2**	**2**	**Unit-8** • Principles and aerodynamics of flight.	• Mount of weberian Ossicles of Mystus or Grass Carp.
	November	**12**	**10**	**Unit 9**: Mammals • General characteristics and classification up to living orders. • Phylogenetic significance of Prototheria • Exoskeleton derivatives of mammals. • Adaptive radiation in mammals with reference to locomotory appendages.	• **Reptilia** Draco, Bungarus, Vipera, Naja, Hydrophis, Zamenis, Crocodylus. Identification of poisonous and non-poisonous snakes. • Aves Study of six common birds from different orders (Stork, Owl/Falcon, Sun bird, Jacanna, Duck) – types of beaks and claws.
	December	**10**	**08**	**Unit 9:** Mammals • Echolocation in Microchiropterans and Cetaceans. **Unit 10**: Zoogeography • Zoogeographical real. • Plate tectonic and continental drift theory. • Distribution of birds and mammals in different realms.	• Mammalia Sorex, Bat, Funambulus, Loris, Herpestes, Erinaceous • Power point presentation on study of any two animals from animals from two different classes by students • Pecten from Fowl head. • Dissection of Fowl head.
Semester III ZOOACOR06T & ZOOACOR06P (Physiology: Controlling and Coordinating Systems)	**July**	**14**	**16**	**Unit 1**: Tissues • Strusture,locations, classification and functions of epithelial tissues. • Strusture,locations,classification and functions of connective tissue tissues. • Strusture,locations, classification and functions of muscular tissue tissues. • Strusture,locations, classification and functions of nerve tissues.	• Recording of simple muscle twitch with electrical stimulation (Virtual)
	August	**11**	**14**	**Unit 2**: Bone and Cartilage • Structure and types of bones and	• Preparation of temporary mounts: Squamous epithelium, Striated muscle

				cartilages, Ossification. **Unit 5**: Reproductive System • Histology of testis • Histology of ovary. • Physiology of reproduction.	fibers and nerve cells.
	Septembe r	**13**	**10**	**Unit 3**: Nervous System • Structure of neuron • Resting membrane potential • Origin of action potential and its propagation across the myelinated and unmyalinated nerve fibers. • Types of synapse. • Reflex action and its type • Synaptic transmission and Neuromuscular junction.	• Study of permanent slides of Mammalian skin, cartilage, bone, Spinal cord, Nerve cell, pituitary
	October	**1**	**02**	**Unit 4**: Muscular System • Histology of different types of muscle.	• Study of permanent slides of Pancreas, testis,
	November	**11**	**10**	**Unit 4**: Muscular System • Ultrastructure of skeletal muscle • Characteristic of muscle fibers. • Molecular and chemical basis of muscle contraction. **Unit 5**: Reproductive system • Histology of testis and ovary • Physiology of reproduction	• Study of permanent slides of ovary, adrenal and thyroid • Microtomy: Preparation of permanent slide of any five (lung, salivary gland, stomach, small intestine, large intestine only) mammalian rat tissues
	December	**10**	**08**	**Unit 6**: Endocrine System • Mechanism of hormone action. • Signal transduction pathways for Steroidal and Non-steroidal hormones. • Hypothalamus – principal nuclei involved in neuroendocrine control of anterior pituitary and endocrine	• Microtomy: Preparation of permanent slide of any five (lung, salivary gland, stomach, small intestine, large intestine only) mammalian rat tissues

				system.	
Semester III ZOOACOR07T & ZOOACOR07P (Biochemistry)	**July**	**14**	**16**	Unit 1: Fundamentals of biochemical reaction and metabolism: • Ionization of water, weak acids and bases, buffering and pH changes in living system. • catabolism and anabolism, compartmentalization of metabolic pathways, Shuttle systems and membrane transporters; ATP as "Energy Currency of cell"; coupled reactions; Use of reducing equivalents and co-factors; intermediary metabolism and regulatory mechanisms.	• Qualitative tests of functional groups in carbohydrate, proteins and lipids.
	August	**11**	**14**	Unit 2: Carbohydrates • Structure and biological importance: Monosaccharides, Disaccharides, Polysaccharides; Derivatives of monosaccharides, • Carbohydrate metabolism: Glycolysis, Citric acid cycle, Pentose phosphate pathway, Gluconeogenesis. Unit 3: Lipids: • Structure and significance: Physiologically important saturated and unsaturated fatty acids, Triacylglycerols, Phospholipids, Sphingolipids, Steroids, Eicosanoids and terpinoids. 2. Lipid metabolism: beta-oxidation of fatty acids; fatty acid biosynthesis.	• Paper chromatography of amino acids • Quantitative estimation by Lowry method.
	Septembe r	**13**	**10**	Unit 4: Proteins: • Amino acid structure, Classification, General and	• Demonstration of protein seperation by SDS-PAGE

				Electrochemical properties of α amino acids. • Physiological importance of essential and non-essential amino acids • proteins bonds stabilizing protein structure; Levels of organization • Protein metabolism: Transamination, Deamination, Urea cycle, Fate of C-skeleton of Glucogenic and Ketogenic amino acids.	
	October	**01**	**02**	Unit 5: • Structure: purines and pyrimidines, Nucleosides, Nucleotides, Nucleic acids	• Demonstration of protein seperation by SDS-PAGE
	November	**11**	**10**	Unit 5: • Types of DNA and RNA, Complementarity of DNA, Hypo-Hyperchropmaticity of DNA. • Otlines of nucleotide metabolism. Unit 6: Enzymes: • Nomenclature and classification; Cofactors; Specificity of enzyme action; isozymes; • Mechanism of enzyme action; Enzyme kinetics; Derivation of Michaelis-Menten equation, Lineweaver-Burk plot; Factors affecting rate of enzyme-catalyzed reaction	• Study of the enzymatic activity of Trypsin and Lipase.
	December	**10**	**08**	Unit 6: • Enzyme inhibition; Allosteric enzymes and their kinetics; Strategy of enzyme action-catalytic and Regulatory	• Performing the Acid and alkaline phosphatise assay from serum/tissue.

				Unit 7: • Redox system; Review of mitochondrial respiratory chain, Inhibitors and un-couplers of Electron Transport System.	
GENERAL	**MONTH**	**NO OF LECTURES (HOURS)**		**TOPIC**	
SEMESTER III **ZOOGCOR03T** **ZOOGCOR03P** **Insect, Vectors & Diseases**		**Theory**	**Practical**	**Theory**	**Practical**
	July	**14**	**16**	**Unit-1 Introduction to Insects** • General features of insects • Morphological features, Head-Eyes, Types of antennae, Mouth parts with respect to feeding habit **Unit-7 Hemiptera as Disease Vectors** • Bugs as insect vectors; Blood-sucking bugs, Chaghas disease.	• Mounting and study of different kinds of mouth parts of insects
	August	**11**	**14**	**Unit-3 Insects as vector** • Detailed features of insect orders as vectors – Diptera, Siphonoptera, Siphunculata, Hemiptera. **Unit-7 Hemiptera as Disease Vectors** • Bed bugs as mechanical vectors, Control and prevention measures.	• Spot identification of following insect vectors through permanent slides/photographs: *Aedes, Culex, Anopheles, Pediculus humanuscapitis, Pediculus humanuscorporis,*
	Septembe r	**13**	**10**	**Unit-2 Concept of Vectors** • Brief introduction to vectors (mechanical and biological) Reservoirs, Host-vector relationship, Adaptations as vectors, Host specificity.	• Spot identification of following insect vectors through permanent slides/photographs: *Phithiruspubis, Xenopsylla cheopis, Cimex lectularius, Phlebotomus argentipes, Musca domestica.*
	October	**2**	**2**	**Unit-4 Dipteran as Disease Vectors** • Study of important Dipteran vectors – Mosquitoes.	• Spot identification

	November	**10**	**10**	**Unit- 4 Dipteran as Disease Vectors** • Study of important Dipteran vectors – Sand fly, Housefly • Study of mosquito born diseases – Malaria, Dengue, Chikungunya, Viral encephalitis, Filariasis, Control of mosquitoes. Unit – 6 Siphunculata as disease vectors • Human louse (head, body and pubic louse) as important insect vectors; Control of human louse	• Study of different diseases transmitted by above insect vectors
	December	**10**	**08**	**Unit-Siphonaptera as disease vectors** • Fleas as important insect vectors; Host-specificity, Study of flea borne diseases – plague, Typhus fever, Contrl of fleas	• Submission of a project report on any of the insect vectors and disease transmitted
SEMESTER III ZOOSSEC02M (Aquarium Fish Keeping)	**July**	**6**		**Unit-1 Introduction to Aquarium Fish Keeping** • The potential scope of aquarium Fish Industry as a Cottage Industry, Exotic and Endemic species of Aquarium Fishes	
	August	**6**		**Unit-2 Diversity of Aquarium fishes and their biology** • Common characters and sexual dimorphism of Fresh water and Marine aquarium fishes such as Guppy, Molly, Sword tail, Gold fish, angel fish, Blue morph, Anemone fish and Butterfly fish	
	Septembe r	**5**		**Unit-2 Diversity of Aquarium fishes and their biology** • Indigenous fishes suitable aquaria, problems of natural population depletion. Problem with exotic fishes	
	October	**1**		----------	
	November	**6**		**Unit-3 Food and feeding of aquarium fishes** • Use of live fish feed organism • Preparation and composition of formulated fish feeds, Aquarium fish as larval predator. **Unit-4 Fish transportation** • Live fish keeping, breeding, transport – Fish handling, packing and forwarding techniques	

	December	**6**		**Unit-5 Maintenance of Aquarium** • General Aquarium maintenance – budget for setting up an Aquarium Fish Farm as a Cottage Industry	
HONOURS	**MONTH**	**NO OF LECTURES (HOURS)**		**TOPIC**	
		Theory	**Practical**	**Theory**	**Practical**
Semester IV ZOOACOR08T & ZOOACOR08P (Comparative Anatomy)	**January**	**12**	**10**	Unit 1: Integumentary System • Structure, function and derivatives of integument in amphibian, birds and mammals	• Study of placoid, cycloid and ctenoid scales through permanent slides/ photographs.
	February	**10**	**12**	Unit 2: Skeletal system • Overview of axial and appendicular skeleton; Jaw suspension; Visceral arches	• Study of disarticulated skeleton of toad, pigeon and guineapig
	March	**10**	**10**	Unit 3: Digestive System • Comparative anatomy of stomach; dentition in mammals Unit 4: Respiratory System • Respiratory organs in fish, amphibian	• Demonstration of carapace and plastron of turtle.
	April	**10**	**10**	Unit 4: Respiratory system • Respiratory organs of birds and mammals Unit 5: Circulatory System • General plan of Circulation, Comparative account of heart and aortic arches	• Identification of mammalian skulls: one herbivororous (Guineapig) and one carnivorous (dog)
	May	**9**	**10**	Unit 6: Urinogenital System: • Succession of kidneys, Evolution of urinogenital ducts, Types of mammalian uteri Unit 7: Nervous System • Comparative account of brain	• Dissection of Tilapia: circulatory system, brain
	June	**9**	**8**	Unit 7: Nervous System: • Cranial nerves in mammals Unit 8: Sense organs	• Dissection of Tilapia: Urinogenital system, pituitary

				• Classification of receptors, Brief account of auditory receptors in vertebrate.	
Semester IV ZOOACOR09T & ZOOACOR09P (Physiology: Life Sustaining System)	**January**	**12**	**10**	Unit 1: Physiology of Digestion • Structural organization and functions of Gastrointestinal tract and Associated gland; • Mechanical and chemical digestion of food, • Absorption of carbohydrates, Lipids, Proteins and Nucleic acids • Digestive enzymes	• Determination of ABO blood group.
	February	**12**	**10**	Unit 2: Physiology of Respiration • Mechanism of Respiration • Respiratory volumes and capacities • Transport of Oxygen and Carbon dioxide in blood. • Dissociation curve and the factors influencing it. • respiratory pigments • Carbon monoxide poisoning.	• Enumeration of red blood cells and white blood cells using haemocytometer
	March	**10**	**10**	Unit 3: Physiology of Circulation: • Components of blood and their function • Structure and functions of hemoglobin • Haemostasis • Blood clotting system. • Fibrinolytic system • Haemopoesis • Basic steps and its regulation. • Blood groups; ABO and Rh factor.	• Estimation of haemoglobin using Sahli,s Haemoglobinometer
	April	**10**	**10**	Unit 4: Physiology of Heart • Structure of mammalian heart. • Coronary circulation, • Structure and working of	• Preparation of haemin and haemochromogen crystals

				conducting myocardial fibers • Origin and conduction of cardiac impulses • Cardiac cycle and cardiac output. • Blood pressure and its regulation.	
	May	**9**	**10**	Unit 5: Thermoregulation and Osmoregulation • Physiological classification based on thermal biology • Thermal biology of endotherms • Osmoregulation in aquatic vertebrates; 4. Extra-renal osmo-regulatory organs in vertebrates	• Recording of blood pressure using a sphygmomanometer/ digital meter
	June	**9**	**8**	Unit 6: Renal Physiology • Structure of kidney and its functional unit • Mechanism of urine formation, • Regulation of acid-base balance.	• Practice and repeat of previous practicals
Semester IV ZOOACOR010T & ZOOACOR010P (Immunology)	**January**	**12**	**10**	Unit 1: Overview of Immune System • Basic concepts of health and diseases. • Historical perspective of immunology. • Organs (primary and secondary lymphoid organs and its importance) and cells of the immune system. • Concept of Haematopoiesis and development of progenitor cells of the immune system Unit 2: Innate and Adaptive Immunity • Principle of Innate and Adaptive Immunity • Components of innate immunity	• Demonstration of lymphoid organs
	February	**12**	**10**	Unit 2: Innate and Adaptive Immunity • Component of adaptive immunity	• Histological study of spleen, thymus and lymph nodes through slides/photographs

				Unit 3: Antigen, Antigen presentation and MHC • Concept of Antigen, Immunogen, Allergen and Pathogen • Adjuvants and haptens, • Factors influencing immunogenicity, Epitope • Types of Antigen Presenting Cells (APCs) • Structure of Major Histocompatibility Complex (MHC) molecules.	
	March	**10**	**10**	Unit 3: Antigen, Antigen presentation and MHC • Mechanism of antigen presentation and involvement of MHC molecules in details • Co-stimulatory molecules on APC Unit 3: T Cell development • Structure of T cell receptors, Co-stimulatory molecules on T cells • Concept of synapse between APC and T cells in details • Central differentialtion of T cells; • T cell selection in thymus. • Peripheral differentiation of T cells; Th1 and Th2	Preparation of stained blood film to study various types of blood cells
	April	**10**	**10**	Unit 4: Immunoglobulin • Structure and functions of different classes of immunoglobulins • Antigen-antibody interaction • Immunoassay (ELISA and RIA) • Hybridoma technology • Monoclonal antibody production Unit 7: Complement system • Components and pathways of complement activation	• ABO blood group determination

	May	**9**	**10**	Unit 6: Cytokines and Chemokines • Brief concept on types of Cytokines and chemokines • Cytokines (source and function of IL-1,2,4,5,6,8,10,12, interferons, TNF, TGF, GM-CSF, M-CSF) 3. Chemokines (source and function of CCL2, CCL3, CCL4, CCL5, CxCL8, CxCL10)	Demonstration of ELISA using kit
	June	**9**	**8**	Unit 8: Hypersensitivity • Gell and Coombs classification and brief description of various types of hypersensitivity. Unit 9: Immunology of diseases • Malaria, Visceral Leishmaniasis, Filariasis, Dengue and Tuberculosis Unit 10: Vaccines • Various types of vaccines. • Active and passive immunization (artificial and natural)	Practice and repeat of previous practical.
GENERAL	**MONTH**	**NO OF LECTURES (HOURS)**		**TOPIC**	
		Theory	**Practical**	**Theory**	**Practical**
SEMESTER IV ZOOGCOR04T ZOOGCOR04P Environment and Public Health	**January**	**12**	**10**	**Unit-1 Introduction** Sources of environmental hazards, Hazard identification and accounting, Fate of toxic and persistence substances in the environment, Dose response evaluation, Exposure assessment	To determine pH, in soil and water sample from different location.
	February	**12**	**10**	**Unit-2 Climate Change** Greenhouse gases and global warming, Acid rain, Ozone layer destruction, Effect of climate change on public health.	To determine Cl in soil and water sample from different location.
	March	**10**	**10**	**Unit-4 Waste management technologies** Sources of waste, types and characteristics,	To determine SO4 in soil and water sample from different location.

				sewage disposal and its management, solid waste disposal	
	April	**10**	**10**	**Unit-4 Waste management technologies** Biomedical waste handling and disposal, Nuclear waste handling and disposal, waste from thermal plants. **Unit-5 Diseases** Cause, symptoms and control of tuberculosis, Asthma, Cholera,	To determine NO3 in soil and water sample from different location.
	May	**9**	**10**	**Unit-5 Diseases** Cause, symptoms and control of Minamata disease, typhoid	Practice and repeat of previous practical.
	June	**9**	**8**	**Unit-3 Pollution** Air, water, noise pollution sources and effects, Pollution control.	Practice and repeat of previous practical.
SEMESTER IV ZOOSSEC02M (Vermicompost Production)	**January**	**5**		**Unit-1 Introduction to Vermicompost Production** Natural role of earthworms in soil fertility, Concept of Vermicompost – the need for it **Unit-5 Properties of the Vermicompost** **Unit-6 benefits of vermicompost**	
	February	**4**		**Unit-2 Production** Suitable worm species and their availability-for large scale/small scale, Climate and temperature, Feedstock- for small scale and home farming/ large scale or commercial	
	March	**5**		**Unit-3 Operations and maintenance** Smells, Moisture, Pest species, Worms escaping, Nutrient levels **Unit-4 Harvesting**	
	April	**4**		**Unit-7 Use as soil conditioner** **Unit-8 Application of vermicompost**	
	May	**6**		**Unit-9 Visit to Vermicompost centre and Prepare the Report**.	
	June	**6**		Submission of Report	
HONOURS	**MONTH**	**NO OF LECTURES (HOURS)**		**TOPIC**	
		Theory	**Practical**	**Theory**	**Practical**
SEMESTER V	**July**	**14**	**16**	**Unit 1: Nucleic acids:**	• Demonstration of polytene chromosome

ZOOACOR11T ZOOACOR11P (Molecular Biology)				• Salient features of DNA and RNA. Watson and Crick model of DNA. **Unit 2: Replication:** • Mechanism of DNA replication in prokaryotes . • Semi-conservative, bidirectional and discontinuous replication. • RNA priming. • Replication of telomeres. **Unit 3:Transcription:** • Mechanism of transcription in prokaryotes and eukaryotes. • Transcription factors. • Difference between prokaryotes and eukaryotes transcription	from Drosophila/Chironomid larvae. • Isolation and quantification of genomic DNA using spectrophotometer (A260 measurement).
	August	**11**	**14**	**Unit 4: Translation:** • Mechanism of protein synthesis in prokaryotes • Ribosome structure and assembly in prokaryotes • Fidelity of protein synthesis, aminoacyltRNAsynthetase and charging of tRNA. • Proteins involved in initiation, elongation and termination of polypeptide chain. • Inhibitors of protein synthesis • Difference between prokaryotic and eukaryotic translation.	• Isolation and quantification of genomic DNA using spectrophotometer (A260 measurement).
	Septembe r	**13**	**10**	**Unit 4: Translation:** • Genetic code, degeneracy of the genetic code and Wobble Hypothesis. **Unit 5: Post Translational Modification and Processing of Eukaryotic RNA:** • Capping and Poly A tail formation in mRNA. • Spilt genes: concept of introns and exons, splicing mechanism • Alternative splicing, exon shuffling • RNA editing, Processing tRNA	• Agarose gel electrophoresis for DNA
	October	**2**	**2**	**Unit-6 Gene regulation** • Regulation of Transcription in	• Agarose gel electrophoresis for DNA

				prokaryotes: lac operon	
	November	**10**	**10**	**Unit-6 Gene regulation** • Regulation of Transcription in prokaryotes: trp operon • Regulation of transcription in eukaryotes: Activators, enhancers, silencer, repressors, miRNA mediated gene silencing • Genetic imprinting **Unit-7 DNA Repair Mechanism** • Types of DNA repair mechanism: RecBCD model in prokaryotes. • Nucleotide and base excision repair	• Demonstration of polytene chromosome from Drosophila/Chironomid larvae. • Isolation and quantification of genomic DNA using spectrophotometer (A260 measurement).
	December	**10**	**08**	**Unit-7 DNA Repair Mechanism** • SOS repair. **Unit 8: Molecular Lab Techniques** • PCR • Western and Southern blot • Sanger DNA sequencing • cDNA technology.	Practice and repeat previous practical
SEMESTER V ZOOACOR12T ZOOACOR12P (Genetics)	**July**	**14**	**16**	**Unit 1: Mendelian Genetics and its extention** • Background of Mendel`s experiment • Principles of Mendelian inheritance • Incomplete dominance and co-dominance, epistasis, multiple alleles, lethal alleles • Pleiotropy. Sex-linked, Sex-influenced and sex-limited inheritance, Polygenic Inheritance **Unit 2: Linkage, CrossingOver and Chromosomal Mapping** • Linkage and crossing over, Molecular basis of Crossing Over. • Measuring Recombination frequency and linkage intensity using three factor crosses, Interference and coincidence.	• Chi-suare analyses • Statistical tests of data and decision making Chi square test for goodness of fit and student t test for comparing means of two small samples from normal populations (paired/unpaired)
	August	**11**	**14**	**Unit 3: Mutations** • Types of gene mutations (Classification) • Types of chromosomal aberrations (Classificatio with one suitable example of each) • Chromosomal aberrations, gene mutations and human diseases (Down`s, Klinefelter`s, Turner`s, Cri-du Chat, Sickel cell, Haemophilia, Thalassemia, Albinism.	• Pedigree analysis of some inherited traits in human.

				• Sex chromosomes and sex-linked inheritance.	
	September	**13**	**10**	**Unit 3: Mutations** • Non-disjunction and variation in chromosome number; Molecular basis of mutations in relation to UV light and chemical mutagens **Unit 4: Sex determination** • Mechanism of sex determination in Drosophila with reference to alternative splicing. • Sex determination in mammals. • Dosage compensation in Drosophila and Human.	• Pedigree analysis of some inherited traits in human
	October	**2**	**2**	**Unit 5: Extra-chromosomal Inheritance** • Criteria for extra chromosomal inheritance	• Pedigree analysis of some inherited traits in human
	November	**10**	**10**	**Unit 5: Extra-chromosomal Inheritance** • Antibiotic resistance in Chlamydomonas, Kappa particle in Paramoecium, Shell spiralling in snail. **Unit 6: Recombination in Bacteria and Virus** • Conjugation, Transformation, Transduction, Complementation test in Bacteriophage..	• Identification of chromosomal aberration in Drosophila from photograph
	December	**10**	**08**	**Unit 7: Transposable Genetics Elements** • Transposons in bacteria • Ac-Ds elements in Maize and P elements in Drosophila • LINE, SINE, Alu elements in humans	Repeat and practice on the basis of necessary
SEMESTER V ZOOADSE01T ZOOADSE01P (Animal Behaviour And Chronobiology)	**July**	**14**	**16**	**Unit 1: Introduction to animal behaviour** • A brief history of animal behaviour studies including the works of Fabre, Darwin, Von Frisch, Lorenz, Tinbergen, Jane Goodal, BiruteGaldikas, Dian Fossey, Salim Ali, Gopal Bhattacharya, M. K. Chandrashekhar, RaghavendraGadgkar.	• To study nests and nesting habits of the birds and social insects. • To study geotaxis behaviour in earthworm.

				• The objectives of modern animal behaviour studies: Tinbergen 4 questions. • Methods of studying behaviour: observation vs watching, Ad libitum observations, Focal animal studies, Instantaneous scan	
	August	**11**	**14**	**Unit 1: Introduction to animal behaviour** • Branches of aimal behavior studies. **Unit 2: Behaviours of Individuals** • Reflexes and Orientations • Instinct • Learning: Imprinting and other Programmed Learning, Habituation, Innovations and Cultural Transmission / Social learning.	• To study the behavioural responses of wood lice to dry and humid condition • To study the phototaxis behavior in insect larvae.
	Septembe r	**13**	**10**	**Unit 3: Social and Sexual Behaviour** • Social behaviour: Concept of Society; Communication and the senses Altruism • Insect`s society with honey bee as example; Foraging in honey bee and advantages of the waggle dance • Sexual behaviour: Asymmetry of sex, Sexual dimorphism, Mate choice, Intra-sexual selection (male rivalry), Inter-sexual selection (female choice)	• Study and actogram construction of locomotor activity of suitable animal model
	October	**2**	**2**	**Unit 3: Social and Sexual Behaviour** • .Pheromones	• Study and actogram construction of locomotor activity of suitable animal model
	November	**10**	**10**	**Unit 4: Introduction to Chronobiology** • Historical development of chronobiology • Biological oscillation: the concept of average, amplitude, phase and period • Adaptive significance of biological clock	• Visit to forest/Wildlife Sanctuary/Biodiversity Park/ Zoological Park to study behavioural activities of animals and prepare a short report.
	December	**10**	**08**	**Unit 5: Biological Rhythm** • Types and characteristicsof biological	• Study of circadian functions in humans (daily eating, sleep and temperature patterns)

				rhythm: Short and Long-term rhythm;Circadian rhythms; Tidal rhythm and lunar rhythm • Concept of synchronization and masking; Photic and non-photic zeitgebers;Circannual rhythm. • Photoperiod and regulation of seasonal reproduction of vertebrates; Role of melatonin.	
SEMESTER V ZOOADSE03T ZOOADSE03P (Endocrinology)	**July**	**14**	**16**	**Unit 1:Introduction to Endocrinology** • General Idea of endocrine systems, • Classification, 3.Characteristic and transport of hormones, 4.Neurosecretions and neurohormones **Unit2:Epiphysis,Hypothalamo-hypophysial Axis** • Structure of pineal gland • Secretions and their functions in biological rhythms and reproduction. • Structure and functions of hypothalamus and hypothalamic nuclei • Regulation of neuroendocrine glands.	• Dissect and display of endocrine glands in rat • Study of permanent slides of all the endocrine glands
	August	**11**	**14**	**Unit2:Epiphysis,Hypothalamo-hypophysial Axis** • Feedback mechanisms • Structure of pituitary gland, hormones and their functions, • Hypothalamo-hypophysial portal system • Disorders of pituitary gland	• Study of permanent slides of all the endocrine glands • Estimation of plasma level of any hormone using ELISA
	Septembe r	**13**	**10**	**Unit 3: Peripheral Endocrine glands** • Structure, hormones, functions and regulation of Thyroid gland, Parathyroid, Adrenal, Pancreas	• Estimation of plasma level of any hormone using ELISA
	October	**2**	**2**	**Unit 3: Peripheral Endocrine glands** • Structure, hormones, functions and regulation of ovary	• Study of permanent slides of all the endocrine glands
	November	**10**	**10**	**Unit 3: Peripheral Endocrine glands** • Structure, hormones, functions and regulation of Testis.	• Tissue fixation, embedding in paraffin, microtomy and slide preparation of any endocrine gland

				• Hormones in homeostasis, Disorders of endocrine glands. **Unit 4: Regulation of Hormone Action** • Mechanism of action of steroidal, non-steroidal hormones with receptors.	
	December	**10**	**08**	**Unit 4: Regulation of Hormone Action** • Bioassays of hormones using RIA and ELISA. • Estrous cycle in rat • Menstrual cycle in Human • Multifaceted role of Vasopressin and Oxytocin • Hormonal regulation of parturirion	• Designing of primers of any hormones
GENERAL	**MONTH**	**NO OF LECTURES (HOURS)**		**TOPIC**	
		Theory	**Practical**	**Theory**	**Practical**
SEMESTER V ZOOGDSE01T ZOOGDSE01P (Applied Zoology)	**July**	**14**	**16**	**Unit-1 Introduction to Host-Parsite Relationship** • Host, Definitive host, Intermediate host, Parasitism, Symbiosis, Commensalism, Reservoir, Zoonosis **Unit-2Epidemiology of Diseases** • Transmission, prevention and control of diseases: Tuberculosis and Typhoid **Unit-10 Fish Technology** • Genetic improvement in aquaculture industry: induced breeding and transportation of fish seed.	• Study and Identification of *Entamoebahistolytica, Plasmodium vivax,Ancylostomaduodenale and Wucheriabancrofti.* • Maintenance of freshwater aquarium
	August	**11**	**14**	**Unit-3 Rickettsia and Spirichetes** • Brief account of *Rickettsia Prowazekii, Borreliarecurrentis and Treponemapallidum*. **Unit-4Parasitic Protozoa**	• Study and Identification of arthropod vectors associated with human diseases: *Pediculus, Culex, Anopheles, Aedes and Xenopsylla*

				• Life history and pathogenicity of *Entamoebahistolytica, Plasmodium vivax, Trypanosomagambiense.*	
	Septembe r	**13**	**10**	**Unit-5 Parasitic Helminthes** • Life history and pathogenicity of *Ancylostomaduodenale and Wucheriabancrofti*. **Unit-6 Insects of Economic Importance** • Biology, control and damage caused by *Helicoverpaarmigera, Pyrillaperpusilla*, and *Papiliodemoletus, Callosobruchuschinensis.*	• Study and Identification of insect damage to different plant parts/stored grains through damaged products/ photographs
	October	**2**	**2**	**Unit-6 Insects of Economic Importance** • Biology, control and damage caused by *Sitophilusoryzae* and *Triboliumcastaneum.*	• Study and Identification of insect damage to different plant parts/stored grains through damaged products/ photographs
	November	**10**	**10**	**Unit- 7Insects of Medical Importance** • Medical importance and control of *Pediculushumanuscorporis, Anopheles, Culex, Aedes, Xenopsyllacheopis*. **Unit – 8Animal Husbandry** • Preservation of semen and insemination in cattle	• Identifying features and economic importance of *Nilaparvatalugens, Apioncorchori, Scirpophagaincertulus, Callosobruchuschinensis, Sitophilusoryzae and Triboliumcastaneum.*
	December	**10**	**08**	**Unit-9 Poultry Farming** • Principles of poultry breeding, Management of breeding stock and broilers, Processing and preservation of eggs	• Visit to poultry farm/ animal breeding center/ vector biology/ parasitology center. Submission of visit report
SEMESTER V ZOOSSEC02M (Aquarium Fish Keeping)	**July**	**6**		**Unit-1 Introduction to Aquarium Fish Keeping** • The potential scope of aquarium Fish Industry as a Cottage Industry, Exotic and Endemic species of Aquarium Fishes	

	August	**6**		**Unit-2 Diversity of Aquarium fishes and their biology** • Common characters and sexual dimorphism of Fresh water and Marine aquarium fishes such as Guppy, Molly, Sword tail, Gold fish, angel fish, Blue morph, Anemone fish and Butterfly fish	
	September	**5**		**Unit-2 Diversity of Aquarium fishes and their biology** • Indigenous fishes suitable aquaria, problems of natural population depletion. Problem with exotic fishes	
	October	**1**		**----------**	
	November	**6**		**Unit-3 Food and feeding of aquarium fishes** • Use of live fish feed organism • Preparation and composition of formulated fish feeds, Aquarium fish as larval predator. **Unit-4 Fish transportation** • Live fish keeping, breeding, transport – Fish handling, packing and forwarding techniques	
	December	**6**		**Unit-5 Maintenance of Aquarium** • General Aquarium maintenance – budget for setting up an Aquarium Fish Farm as a Cottage Industry	
HONOURS	**MONTH**	**NO OF LECTURES (HOURS)**		**TOPIC**	
		Theory	**Practical**	**Theory**	**Practical**
SEMESTER VI **ZOOACOR13T** **ZOOACOR13P** **(Developmental Biology)**	**January**	**12**	**14**	**Unit 1: Introduction** • Basic concepts: Phases of development, Cell-cell interaction, Differentiation and growth, Differential gene expression **Unit 2: Early embryonic Development** • Gametogenesis: Spermatogenesis and Oogenesis • Types of eggs and egg membrane	• Study of whole mount of developmental stages of chick through permanent slides .
	February	**10**	**10**	**Unit 2: Early embryonic Development** • Fertilization (External and internal): Changes in gametes, Block to polyspermy. • Planes and patterns of cleavage • Types of blastula. • Fate map (including techniques).	• Study of the developmental stages and life cycle of Drosophila from stock culture.
	March	**12**	**12**	**Unit 2: Early embryonic Development**	• Study of different sections of placenta

				• Early development of frog and chick upto gastrulation • Embryonic induction and organization. **Unit 3: Late Embryonic Development** • Fate of germ layers • Extraembryonic membranes in birds	
	April	**09**	**10**	**Unit 3: Late Embryonic Development** • Implantation of embryo in humans • Placenta (Structure, types and functions of placenta) **Unit 4: Post Embryonic Development** • Development of brain and eye in vertebrate.	• Project report on Drosophila culture/chick embryo development
	May	**10**	**08**	**Unit 4: Post Embryonic Development** • Regeneration: Modes of regeneration, epimorphosis, morphallaxis and compensatory regeneration (with one example each) **Unit 5: Implications of Developmental Biology** • Teratogenesis: Teratogenic agents and their effects on embryonic development. • In vitro fertilization.	• Project report on Drosophila culture/chick embryo development
	June	**07**	**06**	**Unit 5: Implications of Developmental Biology** • Stem cell (ESC) • Amniocentesis	• Repeat and practice on the basis of necessary.
SEMESTER VI **ZOOACOR13T** **ZOOACOR13P** **(Evolutionary Biology)**	**January**	**12**	**14**	**Unit 1: Origin of Earliest life** • Chemogeny, RNA Worls, Biogeny, Origin of photosynthesis • Evolution of eukaryotes, three domains of life **Unit 2: Historical Review of Evolutionary Concept** • Pre-Darwinan Concepts and theories including Lamarckism • Darwinian theory • Neo-Darwinian Synthesis	• Study of fossils from models/photographs – Direct ancestors of horse, Archeopteryx

				• Anti-evolutionary ideas of Creationism and their scientific refusal.	
	February	**10**	**10**	**Unit 3: Evidence in Favour of Evolution** • Fossil records: Types of fossils, 2. Geological time scale, transitional forms: example of fossils depicting the evolutionary stages of the modern horse • Molecular (universality of genetic code and protein synthesis machinery) evidence. **Unit 4: Sources of Variation** • Heritable variations present in natural populations (classical study of Lewontin and Hubby, 1966 in Drosophila, as example)	• Study of homology and analogy from suitable specimens (from photographs and models)
	March	**12**	**12**	**Unit 5: Population Genetics** • Concepts of populations and calculation of allele frequencies in a population • Hardy-Weinberg Law and equilibrium • Evolutionary forces disrupting H-W equilibrium • Natural selection: Definition as the non-differential rate of reproductions and survivals of competing alleles, concept of fitness, selection coefficient, Types of natural selection with examples- Disrupting, Stabilizing, Directional.	Verification of H-W equilibrium in a population by chi square analysis
	April	**09**	**10**	**Unit 5: Population Genetics** • Genetic drift – outline of its mechanism, basic concepts and examples of founder`s effect, bottleneck phenomenon • Role of Gene flow and Mutation rates in changing allele frequencies in a population (No mathematical model)	• Verification of H-W equilibrium in a population by chi square analysis

				Unit 6: Products of Evolution • Inter-population variations: clines, races, • Species concepts and mode of speciation • Isolating mechanism • Adaptive radiations/macroevolution as exemplified by Galapagos finch.	
	May	**10**	**08**	**Unit 7: Extinction** • Major mass extinctions in the history of life and their impacts on biodiversity on earth **Unit 8: Origin and Evolution of Man** • Unique hominin characteristics contrasted with primate characteristics. • Primate phylogeny: from Dryopithecus leading to *Homo sapiens*. • Molecular evidences of human origin and migrations.	• Collection of sample of height,weight, age, sex data at least 100 individuals and applying of different statistical analyses.
	June	**07**	**06**	**Unit 9: Molecular Phylogeny** • The basic concept of molecular phylogeny • Neutral theory of molecular evolution • Molecular clock • Example of evolution in vertebrate globin genes.	• Collection of sample of height,weight, age, sex data at least 100 individuals and applying of different statistical analyses.
SEMESTER VI **ZOOADSE04T** **ZOOADSE04P** **(Fish And Fishery)**	**January**	**12**	**14**	**Unit 1: Introduction and Classification** • General description of fish • Feeding habit, habitat and manner of reproduction • Classification of fish (upto Subclasses) with important example **Unit 2: Morphology and Physiology** • Types of fins and their modification • Locomotion of fishes, Hydrodynamics • Types of scales • Use of scales in classificationand determination of age of fish	• Morphometric and meristic characters of fishes
	February	**10**	**10**	**Unit 2: Morphology and Physiology** • Gills and gas exchange	• Study of Petromyzon, Myxine, Pristis, Chimaera, Exocoetus, Hippocampus,

				• Swim bladder: Types and role in respiration, buoyancy. • Osmoregulation in elasmobranchs • Reproductive strategies (special reference to Indian fish); Electric organs • Bioluminiscence	Gambusia, Labeo, Heteropneustes, Anabus
	March	**12**	**12**	**Unit 3: Fisheries** • Inland fisheries; marine fisheries • Environmental factors influencing the seasonal variations in fish catches in the Arabian sea and the Bay • Fishing crafts and gears. • Depletion of fisheries resources • Application of remote sensing and GIS in fisheries • Fisheries law and regulation	• Study of different types scales • Study of crafts and gears used in fisheries
	April	**09**	**10**	**Unit 4: Aquaculture** • Sustainable aquaculture • Extensive, semi-intensive and intensive culture of fish • Pen and cage culture • Polyculture • Composite fish culture • Brood stock management • Induced breeding of fish • Management of finfish hatcheries	• Water quality criteria for Aquaculture: Assessment of PH, conductivity, Total solids, Total dissolved solids
	May	**10**	**08**	**Unit 4: Aquaculture** • Preparation and maintenance of fish aquarium • Preparation of compound diets of fish • Role of water quality in aquaculture • Fish diseases: Bacterial, viral and parasitic • preservation and processing of harvested fish • Fishery by-products	• Project report on a visit to any fish farm/ pisciculture unit/Zebra fish rearing lab
	June	**07**	**06**	**Unit 5: Fish in Research** • Transgenic fish	• Study of air breathing organs in Channa, Heteropneustes, Anabas and Clarias.

				• Zebra fish as a model organism in research	
SEMESTER VI ZOOADSE05T ZOOADSE05P (Parasitology)	**January**	**12**	**14**	**Unit 1: Introduction to Parasitology** • Brief introduction of parasitism and other animal associations • Partasites, Parsitoid and Vectors (Mechanical and biological) • Host-parasite relationship • Zoonosis **Unit 2: Parasitic Protists** • Study of morphology, Life cycle, Prevalence, Epidemiology, Pathogenicity, Diagnosis, Prophylaxis and Treatment of *Entamoebahistolytica, Giardia intestinalis*	• Study of life stages of *Entamoebahistolytica, Giardia intestinalis, Trypanosomagambiense, Leishmaniadonovani, Plasmodium vivax* through permament slides
	February	**10**	**10**	**Unit 2: Parasitic Protists** • Study of morphology, Life cycle, Prevalence, Epidemiology, Pathogenicity, Diagnosis, Prophylaxis and Treatment of *Trypanosomagambiense, Leishmaniadonovani, Plasmodium vivax, Plasmodium falciparum and Toxoplasma gondii*.	• Study of adult and life stages of *Fasciola hepatica, Schistosomahaematobium, Taeniasolium,Hymenolepisnana.*throughperma ment slides
	March	**12**	**12**	**Unit 3: Parasitic Platyhelminthes** • Study of morphology, Life cycle, Prevalence, Epidemiology, Pathogenicity, Diagnosis, Prophylaxis and Treatment of *Fasciola hepatica, Paragonimuswestermani, Schistosomahaematobium, Taeniasolium,Echinococcusgranulosus and Hymenolepis nana.*	• Study of adult and life stages of *Ascarislumbricoides, Ancylostomaduodenale, Wuchereriabancrofti, Trichinellaspiralis* through permament slides
	April	**09**	**10**	**Unit 4: Parasitic Nematodes** • Study of morphology, Life cycle, Prevalence, Epidemiology, Pathogenicity, Diagnosis, Prophylaxis and Treatment of *Ascarislumbricoides, Ancylostomaduodenale,*	• Study of plant parasitic root knot nematode, Meloidogyne from the soil sample 2.Study of *Pediculushumanus* (head and body louse*), Xenopsyllacheopis*and *Cimexlectularius* through permament slides

				Wuchereriabancrofti, Trichinellaspiralis • Study of structure, life cycle and importance of Meloidogyne (root knot nematode), Pratylencus (lesion nematode)	
	May	**10**	**08**	**Unit 5: Parasitic Arthropods** • Mosquitoes and flies as vectors of human pathogen • Biology, importance and control of myiasis causing diptera • Biology, importance and control of ticks, mites, *Pediculushumanus* (head and body louse*), Xenopsyllacheopis*and *Cimexlectularius*	• Study of monogenea from gills of fresh/marine fish • Study of nematode/cestode parasites from the intestines of Poultry bird
	June	**07**	**06**	**Unit 6: Parasitic Vertebrates** • A brief account of parasitic vertebrates; Cookiectter Shark, Candiru, Hood Mocking bird and vampire bat	• Study of nematode/cestode parasites from the intestines of Poultry bird
GENERAL	**MONTH**	**NO OF LECTURES (HOURS)**		**TOPIC**	
		Theory	**Practical**	**Theory**	**Practical**
SEMESTER VI ZOOGDSE01T ZOOGDSE01P (Immunology)	**January**	**12**	**14**	**Unit-1 Overview of the Immune System** • Introduction to basic concept in immunology, Components of immune system, Principles of innate and adaptive immune system	• Demonstration of lymphoid organs in human through model/photograph.
	February	**10**	**10**	**Unit-2 Cells and Organs of the Immune system** • Haematopoiesis, Cells of immune system and organs (Primary and Secondary lymphoid organs) of the immune system. Unit -3 Antigens • Basic properties of antigens, B and T cell epitopes, haptens and	• Histological study of spleen, thymus and lymph nodes through slides/ photograph

				adsjuvants	
	March	**12**	**12**	**Unit-3Antibodies** • Structures, classes and function of antibodies, monoclonal antibodies, antigen antibody interactions as tools for research and diagnosis. **Unit-5 Working of the immune system** • Structure and function of MHC.	• Preparation of stained blood film to study various types of blood cells.
	April	**09**	**10**	**Unit-5 Working of the immune system** • Exogenous and endogenous pathway of antigen presentation and processing, Basic properties and functions of cytokines, Complement system	• Preparation of stained blood film to study various types of blood cells.
	May	**10**	**08**	**Unit-6Immune System in Health and Diseases** • Gell and Coomb`s classification and brief description of various types of hypersensitivities, Introduction to concepts of autoimmunity and immunodeficiency.	• ABO blood group determination
	June	**07**	**06**	**Unit-7 Vaccines** General introduction to vaccines, Types of vaccines	Repeat and Practice
SEMESTER VI ZOOSSEC02M (Vermicompost Production)	**January**	**5**		**Unit-1 Introduction to Vermicompost Production** Natural role of earthworms in soil fertility, Concept of Vermicompost – the need for it **Unit-5 Properties of the Vermicompost** **Unit-6 benefits of vermicompost**	
	February	**4**		**Unit-2 Production** Suitable worm species and their availability-for large scale/small scale, Climate and temperature, Feedstock- for small scale and home farming/ large scale or commercial	
	March	**5**		**Unit-3 Operations and maintenance** Smells, Moisture, Pest species, Worms escaping, Nutrient levels **Unit-4 Harvesting**	

	April	**4**	**Unit-7 Use as soil conditioner** **Unit-8 Application of vermicompost**
	May	**6**	**Unit-9 Visit to Vermicompost centre and Prepare the Report**.
	June	**6**	Submission of Report