

DEPARTMENT OF ZOOLOGY

B.SC. SYLLABUS (HONOURS)

Teacher-wise topic allocation

SEMESTER I

Name of Teacher	PAPER	Unit/Topic	Teaching Methodology
DR. SANDIP CHOUDHURY	CODE: ZOO-HC-1016 NON-CHORDATES I: PROTISTS TO PSEUDOCOELOMATE S	Unit 1: Protista, Parazoa and Metazoa <ul style="list-style-type: none">• General characteristics and classification upto classes• Study of <i>Euglena</i>, <i>Amoeba</i> and <i>Paramecium</i>• Life cycle and pathogenicity of <i>Plasmodium vivax</i> and <i>Entamoeba histolytica</i>• Locomotion and reproduction in Protista• Evolution of symmetry and segmentation of Metazoa Practical	Explanation, Discussion using Green board, Power-point presentation Demonstration
	CODE: ZOO-HC-1026 PRINCIPLES OF ECOLOGY	Unit 1: Introduction to Ecology <ul style="list-style-type: none">• History of Ecology• Autecology and Synecology• Levels of organisation• Laws of limiting factors• Study of physical factors Unit2:Population <ul style="list-style-type: none">• Unitary and Modular populations• Unique and group attributes of population• Exponential and logistic growth• r and K strategies• Population regulation	Explanation, Discussion using Green board, Power-point presentation Field visit with activities

		Practical	
	CODE: ZOO-HG-1016 ANIMAL DIVERSITY	Unit 1: Kingdom Protista <ul style="list-style-type: none"> • General characters and classification up to classes • Locomotory Organelles and locomotion in Protozoa Unit 2: Phylum Porifera <ul style="list-style-type: none"> • General characters and classification up to classes • Canal System in Sycon Unit 10: Protochordates <ul style="list-style-type: none"> • General features and Phylogeny of Protochordata Unit 11: Agnatha <ul style="list-style-type: none"> • General features of Agnatha and classification of cyclostomes up to classes Unit 17: Mammals <ul style="list-style-type: none"> • Classification up to orders • Origin of mammals Practical	Explanation, Discussion using Green board, Power-point presentation Demonstration
JUNJUN BHUYAN	CODE: ZOO-HC-1016 NON-CHORDATES I: PROTISTS TO PSEUDOCOELOMATES	Unit 5: Platyhelminthes <ul style="list-style-type: none"> • General characteristics and Classification up to classes. • Life cycle and pathogenicity of <i>Fasciola hepatica</i> and <i>Taenia solium</i>. Unit 6: Nematelminthes <ul style="list-style-type: none"> • General characteristics and Classification up to classes. Lifecycle and pathogenicity of <i>Ascaris lumbricoides</i> and <i>Wuchereria bancrofti</i>. 	Explanation, Discussion using Green board, Power-point presentation
	PAPER II CODE: ZOO-HC-1026 PRINCIPLES OF ECOLOGY	Unit 4: Ecosystem <ul style="list-style-type: none"> • Types of ecosystems with one example in detail • Food chain: Detritus and grazing food chains • Linear and Y-shaped food 	Explanation, Discussion using Green board, Power-point presentation

		<p>chains</p> <ul style="list-style-type: none"> • Food web • Energy flow through the ecosystem • Ecological pyramids and Ecological efficiencies • Nutrient and biogeochemical cycle with one example of Nitrogen cycle Human modified ecosystem 	
NEERAJ BORA	<p>PAPER I</p> <p>CODE: ZOO-HC-1016</p> <p>NON-CHORDATES I: PROTISTS TO PSEUDOCOELOMATES</p>	<p>Unit 3: Cnidaria</p> <ul style="list-style-type: none"> • General characteristics and Classification upto classes. • Metagenesis in Obelia. • Polymorphism in Cnidaria Corals and coral reefs <p>Unit 4: Ctenophora</p> <ul style="list-style-type: none"> • General characteristics and Evolutionary significance <p>Unit 6: Nematelminthes</p> <ul style="list-style-type: none"> • Parasitic adaptations in helminthes. <p>Practical</p>	<p>Explanation, Discussion using Green board, Power-point presentation</p> <p>Demonstration</p>
	<p>PAPER II</p> <p>CODE: ZOO-HC-1026</p> <p>PRINCIPLES OF ECOLOGY</p>	<p>Unit 3: Community</p> <ul style="list-style-type: none"> • Community characteristics: species richness, dominance, diversity, abundance, vertical stratification, Ecotone and edge effect • Ecological succession with one example • Theories pertaining to climax community <p>Unit 5: Applied Ecology</p> <ul style="list-style-type: none"> • Ecology in Wildlife Conservation and Management. 	<p>Explanation, Discussion using Green board, Power-point presentation</p>
	<p>CODE: ZOO-HG-1016</p> <p>ANIMAL DIVERSITY</p>	<p>Unit 3: Phylum Cnidaria</p> <ul style="list-style-type: none"> • General characters and classification up to classes • Polymorphism in Hydrozoa <p>Unit 4: Phylum Platyhelminthes</p>	<p>Explanation, Discussion using Green board, Power-point presentation.</p> <p>Demonstration</p>

		<ul style="list-style-type: none"> • General characters and classification up to classes • Life history of <i>Taeniasolium</i> <p>Unit 5: Phylum Nematelminthes</p> <ul style="list-style-type: none"> • General characters and classification up to classes • Life history of <i>Ascarislumbricoides</i> and its parasitic adaptations <p>Unit 7: Phylum Arthropoda</p> <ul style="list-style-type: none"> • General characters and classification up to classes • Vision in Arthropoda • Metamorphosis in Insects <p>Unit 8: Phylum Mollusca</p> <ul style="list-style-type: none"> • General characters and classification up to classes • Torsion in gastropods <p>Unit 9: Phylum Echinodermata</p> <ul style="list-style-type: none"> • General characters and classification up to classes • Water-vascular system in Asteroidea <p>Unit 13: Amphibia</p> <ul style="list-style-type: none"> • General features and Classification up to orders • Parental care <p>Unit 14: Reptiles</p> <ul style="list-style-type: none"> • General features and Classification up to orders • Poisonous and non-poisonous snakes, • Biting mechanism in snakes <p>Practical</p>	
SANGHAMITRA BURAGOHAIN	CODE: ZOO-HC-1016 NON-CHORDATES I: PROTISTS TO PSEUDOCOELOMATE S	<p>Unit 2: Porifera</p> <ul style="list-style-type: none"> • General features and Classification up to orders • Canal system • Spicules in sponges 	Explanation, Discussion using Green board, Power- point presentation
	CODE: ZOO-HG-1016	<p>Unit 6: Phylum Annelida</p>	Explanation, Discussion using

	ANIMAL DIVERSITY	<ul style="list-style-type: none"> • General characters and classification up to classes • Metamerism in Annelida <p>Unit 12: Pisces</p> <ul style="list-style-type: none"> • General features and classification upto orders • Osmoregulation in Fishes <p>Unit15: Aves</p> <ul style="list-style-type: none"> • General features and Classification up to orders • Flight adaptations in birds <p>Practical</p>	<p>Green board, Power-point presentation.</p> <p>Demonstration</p>
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SEMESTER II

Name of Teacher	PAPER	UNITS/TOPICS	Teaching Methodology
DR. SANDIP CHOUDHURY	PAPER I CODE: ZOO-HC-2016 NON-CHORDATES II: COELOMATES	<p>Unit 1: Introduction to Coelomates</p> <ul style="list-style-type: none"> • Evolution of coelom and metamerism <p>Unit 2: Annelida</p> <ul style="list-style-type: none"> • General characteristics and Classification upto classes • Excretion in Annelida 	<p>Explanation, discussion using Green board, Power-point presentation</p>
	PAPER II CODE: ZOO-HC-2026 CELL BIOLOGY	<p>Unit 7:Cell Division</p> <ul style="list-style-type: none"> • Mitosis, Meiosis, Cell cycle and its regulation <p>Unit 8:Cell Signaling</p> <ul style="list-style-type: none"> • GPCR and Role of second messenger (cAMP) <p>Practical</p>	<p>Explanation, Discussion using Green board, Power-point presentation</p> <p>Demonstration</p>
	COMPARATIVE ANATOMY AND DEVELOPMENTAL BIOLOGY OF VERTEBRATES CODE: ZOO-HG-2016	<p>Unit 1: Integumentary System</p> <ul style="list-style-type: none"> • Derivatives of integument w.r.t. glands and digital tips <p>Unit 2: Skeletal System</p> <ul style="list-style-type: none"> • Evolution of visceral arches <p>Unit 5: Circulatory System</p>	<p>Explanation, Discussion using Green board, Power-point presentation</p>

		<ul style="list-style-type: none"> • Evolution of heart and aortic arches 	
JUNJUN BHUYAN	PAPER I CODE: ZOO-HC-2016 NON-CHORDATES II: COELOMATES	Unit 5: Mollusca <ul style="list-style-type: none"> • General characteristics and Classification upto classes • Respiration in Mollusca • Torsion and detorsion in Gastropoda • Pearl formation in bivalves • Evolutionary significance of trochophore larva 	Explanation, Discussion using Green board, Power-point presentation
	PAPER II CODE: ZOO-HC-2026 CELL BIOLOGY	Unit 1: Over view of Cells <ul style="list-style-type: none"> • Prokaryotic and Eukaryotic cells • Virus • Viroids • Mycoplasma • Prions Unit 4: Mitochondria and Peroxisomes <ul style="list-style-type: none"> • Mitochondria: Structure, Semi- autonomous nature, Endosymbiotic hypothesis • Mitochondrial Respiratory Chain • Chemi-osmotic hypothesis • Peroxisomes Practical	Explanation, Discussion using Green board, Power-point presentation Demonstration
	COMPARATIVE ANATOMY AND DEVELOPMENTAL BIOLOGY OF VERTEBRATES CODE: ZOO-HG-2016	Unit 7: Nervous System <ul style="list-style-type: none"> • Comparative account of brain Unit 10: Late Embryonic Development <ul style="list-style-type: none"> • Implantation of embryo in humans, Formation of human placenta and functions, other types of placenta on the basis of histology • Metamorphic events in frog life cycle and its hormonal 	Explanation, Discussion using Green board, Power-point presentation

		regulation.	
NEERAJ BORA	PAPER I CODE: ZOO-HC-2016 NON-CHORDATES II: COELOMATES	Unit 3: Arthropoda <ul style="list-style-type: none"> • General characteristics and Classification upto classes • Vision and Respiration in Arthropoda • Metamorphosis in Insects • Social life in bees and termites 	Explanation, Discussion using Green board, Power-point presentation
	PAPER II CODE: ZOO-HC-2026 CELL BIOLOGY	Unit 2: Plasma Membrane <ul style="list-style-type: none"> • Various models of plasma membrane structure Transport across membranes: Active and Passive transport, Facilitated transport • Cell junctions: Tight junctions, Desmosomes, Gap junctions Unit 3: Endomembrane System <ul style="list-style-type: none"> • Structure and Functions: Endoplasmic Reticulum, Golgi Apparatus, Lysosomes 	Explanation, Discussion using Green board, Power-point presentation
	COMPARATIVE ANATOMY AND DEVELOPMENTAL BIOLOGY OF VERTEBRATES CODE: ZOO-HG-2016	Unit 3: Digestive System <ul style="list-style-type: none"> • Brief account of alimentary canal and digestive glands Unit 4: Respiratory System <ul style="list-style-type: none"> • Brief account of Gills, lungs, air sacs and swim bladder Unit 8: Sense Organs <ul style="list-style-type: none"> • Types of receptors Unit 11: Control of Development <ul style="list-style-type: none"> • Fundamental processes in development (brief idea) – Gene activation, determination, induction, Differentiation, morphogenesis, intercellular communication, cell movements and cell death 	Explanation, Discussion using Green board, Power-point presentation
SANGHAMITRA BURAGOHAIN	PAPER I CODE: ZOO-HC-2016 NON-	Unit 4: Onychophora <ul style="list-style-type: none"> • General characteristics and Evolutionary significance 	Explanation, Discussion using Green board, Power-

	CHORDATES II: COELOMATES	Unit 6: Echinodermata <ul style="list-style-type: none"> • General characteristics and Classification upto classes • Water-vascular system in Asteroidea Larval forms in Echinodermata Affinities with Chordates	point presentation
	PAPER II CODE: ZOO-HC-2026 CELL BIOLOGY	Unit5:Cytoskeleton <ul style="list-style-type: none"> • Structure and Functions: Microtubules, Microfilaments and Intermediate filaments Unit6:Nucleus <ul style="list-style-type: none"> • Structure of Nucleus: Nuclear envelope, Nuclear pore complex, Nucleolus • Chromatin: Euchromatin and Hetrochromatin and packaging(nucleosome) Practical	Explanation, Discussion using Green board, Power-point presentation Demonstration
	COMPARATIVE ANATOMY AND DEVELOPMENTAL BIOLOGY OF VERTEBRATES CODE: ZOO-HG-2016	Unit 6:Urinogenital System <ul style="list-style-type: none"> • Succession of kidney, Evolution of urinogenital ducts • Unit 9: Early Embryonic Development Gametogenesis: Spermatogenesis and oogenesis w.r.t. mammals, vitellogenesis in birds; • Fertilization: External (amphibians), internal (mammals), blocks to polyspermy; Early development of frog and humans (structure of mature egg and its membranes, patterns of cleavage, fate map, up to formation of gastrula);types of morphogenetic movements; 	Explanation, Discussion using Green board, Power-point presentation

		Fate of germ layers; Neurulation in frog embryo.	
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SEMESER III

Name of Teacher	PAPER	UNITS	Teaching Methodology
DR. SANDIP CHOUDHURY	PAPER I DIVERSITY OF CHORDATA CODE: ZOO-HC-3016	<p>Unit 1: Introduction to Chordates</p> <ul style="list-style-type: none"> General characteristics and outline classification <p>Unit2:Protochordata</p> <ul style="list-style-type: none"> General characteristics of Hemichordata, Urochordata and Cephalochordata; Study of larval forms in protochordates; Retgressive metamorphosis in Urochordata <p>Unit 3: Origin of Chordata</p> <ul style="list-style-type: none"> Dipleurula concept and the Echinoderm Theory of origin of chordates Advanced features of vertebrates over Protochordata <p>Unit4:Agnatha</p> <ul style="list-style-type: none"> General characteristics and classification of cyclostomes up to class <p>Unit9:Mammals</p> <ul style="list-style-type: none"> General characters and classification up to order; Affinities of Prototheria; Adaptive radiation with reference to locomotory appendages <p>Unit10:Zoogeography</p> <ul style="list-style-type: none"> Zoo geographical realms, Theories pertaining to distribution of animals, Plate tectonic and Continental drift theory, distribution of vertebrates in 	<p>Explanation, Discussion using Green board, Power-point presentation</p> <p>Demonstration</p>

		different realms Practical	
	PAPER II ANIMAL PHYSIOLOGY: CONTROLLING AND COORDINATING SYSTEMS CODE: ZOO-HC-3026	Unit 1: Tissues <ul style="list-style-type: none"> • Structure, location, classification and functions of epithelial tissue, connective tissue, muscular tissue and nervous tissue Unit 2: Bone and Cartilage Structure and types of bones and cartilages, Ossification, bone growth and resorption Unit 3: Nervous System <ul style="list-style-type: none"> • Structure of neuron, resting membrane potential, Origin of action potential and its propagation across the myelinated and unmyelinated nerve fibers; • Types of synapse, Synaptic transmission and, Neuromuscular junction; • Reflex action and its types - reflex arc; • Physiology of hearing and vision. Practical	Explanation, Discussion using Green board, Power-point presentation
	PHYSIOLOGY AND BIOCHEMISTRY CODE: ZOO-HG-3016	Unit 1: Nerve and muscle <ul style="list-style-type: none"> • Structure of a neuron, Resting membrane potential, Graded potential, Origin of Action potential and its propagation in myelinated and non-myelinated nerve fibres, • Ultra-structure of skeletal muscle, • Molecular and chemical basis of muscle contraction Unit 7: Carbohydrate Metabolism <ul style="list-style-type: none"> • Glycolysis, Krebs Cycle, Pentose phosphate pathway, Gluconeogenesis, metabolism, Review of electron transport chain Glycogen Unit 10: Enzymes <ul style="list-style-type: none"> • Introduction, Mechanism of action, Enzyme Kinetics, Inhibition and Regulation 	Explanation, Discussion using Green board, Power-point presentation

<p>JUNJUN BHUYAN</p>	<p>PAPER III FUNDAMENTALS OF BIOCHEMISTRY CODE: ZOO-HC-3036</p>	<p>Unit1:Carbohydrates</p> <ul style="list-style-type: none"> • Structure and Biological importance: Monosaccharides, Disaccharides, Polysaccharides and Glycoconjugates <p>Unit2:Lipids</p> <ul style="list-style-type: none"> • Structure and Significance: Physiologically important saturated and unsaturated fatty acids, Tri-acylglycerols, Phospholipids, Glycolipids, Steroids <p>Unit3:Proteins</p> <ul style="list-style-type: none"> • Amino acids: Structure, Classification and General properties of α- amino acids; • Physiological importance of essential and non-essential α- amino acids • Proteins: Bonds stabilizing protein structure; Levels of organization in proteins; • Denaturation; Introduction to simple and conjugate proteins • Immunoglobulins: Basic Structure, Classes and Function, Antigenic Determinants <p>Practical</p>	<p>Explanation, Discussion using Green board, Power-point presentation</p>
<p>NEERAJ BORA</p>	<p>PAPER I DIVERSITY OF CHORDATA CODE: ZOO-HC-3016</p>	<p>Unit5:Pisces</p> <ul style="list-style-type: none"> • General characteristics of Chondrichthyes and Osteichthyes, classification up to order • Migration, Osmoregulation and Parental care in fishes <p>Unit7:Reptilia</p> <ul style="list-style-type: none"> • General characteristics and classification up to order; • Affinities of Sphenodon; • Poison apparatus and Biting mechanism in snakes <p>Unit8:Aves</p> <ul style="list-style-type: none"> • General characteristics and classification up to order Archaeopteryx-- a connecting link; • Principles and aerodynamics of flight, Flight adaptations and Migration in birds 	<p>Explanation, Discussion using Green board, Power-point presentation</p>

	<p>PAPER II</p> <p>ANIMAL PHYSIOLOGY: CONTROLLING AND COORDINATING SYSTEMS CODE: ZOO-HC-3026</p>	<p>Unit 5: Reproductive System</p> <ul style="list-style-type: none"> • Histology of testis and ovary; • Physiology of male and female reproduction; • Puberty, • Methods of contraception in male and female <p>Unit 6: Endocrine System</p> <ul style="list-style-type: none"> • Histology of endocrine glands - pineal, pituitary, thyroid, parathyroid, pancreas, adrenal; hormones secreted by them and their mechanism of action; • Classification of hormones; • Regulation of their secretion; • Mode of hormone action, Signal transduction pathways for steroidal and non-steroidal hormones; • Hypothalamus (neuroendocrine gland)- principal nuclei involved in neuro-endocrine control of anterior pituitary and endocrines system; • Placental hormones <p>Practical</p>	<p>Explanation, Discussion using Green board, Power-point presentation</p>
	<p>Physiology and biochemistry</p> <p>Code: ZOO-HG-3016</p>	<p>Unit3: Respiration</p> <ul style="list-style-type: none"> • Pulmonary ventilation, Respiratory volumes and capacities, Transport of Oxygen and carbon dioxide in blood <p>Unit 5: Cardiovascular system</p> <ul style="list-style-type: none"> • Composition of blood, Hemostasis, Structure of Heart, Origin and conduction of the cardiac impulse, Cardiac cycle <p>Unit 6: Reproduction and Endocrine Glands</p> <ul style="list-style-type: none"> • Physiology of male reproduction: hormonal control of spermatogenesis; • Physiology of female reproduction: hormonal control of menstrual cycle • Structure and function of pituitary, thyroid, Parathyroid, pancreas and adrenal 	<p>Explanation, Discussion using Green board, Power-point presentation Demonstration</p>

		<p>Unit 9: Protein metabolism</p> <ul style="list-style-type: none"> • Transamination, Deamination and Urea Cycle <p>Practical</p>	
	<p>CODE: ZOO-SE-3014 Ornamental Fish & Fisheries</p>	<ol style="list-style-type: none"> 1. Ornamental Fish Diversity of North East India. 2. Aquarium plant diversity in the wetland of Assam. 3. Construction and management of Home Aquarium. 4. Natural feed of Ornamental Fish 5. Strategies for maintenance of natural colour of Ornamental Fish 6. Natural Breeding of <i>Tricogaster</i> species 7. Health management of Ornamental Fish 8. Feed formulation of Ornamental Fish 9. Development of Biological filtration in Aquarium 10. Pure culture of planktons <p>Practical's</p> <ol style="list-style-type: none"> 11. Identification of Ornamental Fish 12. Culture of Indigenous ornamental fish in Aquarium 13. Estimation of Physico-chemical characteristics of Aquarium water 14. Biological filter for removal of Ammonia from Aquarium 15. Culture of Planktons 	<p>Explanation, Discussion using Green board, Power-point presentation</p> <p>Field visits</p>
<p>SANGHAMITR A BURAGOHAIN</p>	<p>PAPER I DIVERSITY OF CHORDATA</p>	<p>Unit6:Amphibia</p> <ul style="list-style-type: none"> • Origin of Tetrapoda (Evolution of terrestrial ectotherms); • General characteristics and classification 	<p>Explanation, Discussion using Green board, Power-</p>

	CODE: ZOO-HC-3016	upto order; <ul style="list-style-type: none"> Parental care in Amphibians 	point presentation
	PAPER II ANIMAL PHYSIOLOGY: CONTROLLING AND COORDINATING SYSTEMS CODE: ZOO-HC-3026	Unit 4: Muscle <ul style="list-style-type: none"> Histology of different types of muscle; Ultra structure of skeletal muscle; Molecular and chemical basis of muscle contraction; Characteristics of muscle twitch; Motor unit, summation and tetanus 	Explanation, Discussion using Green board, Power-point presentation
	PAPER III FUNDAMENTALS OF BIOCHEMISTRY CODE: ZOO-HC-3036	Unit 4:NucleicAcids <ul style="list-style-type: none"> Structure: Purines and pyrimidines, Nucleosides, Nucleotides, Nucleic acids Cot Curves: Base pairing, Denaturation and Renaturation of DNA Types of DNA and RNA, Complementarity of DNA, Hypo- Hyperchromaticity of DNA Unit5:Enzymes <ul style="list-style-type: none"> Nomenclature and classification; Cofactors; Specificity of enzyme action; Isozymes; Mechanism of enzyme action; Enzyme kinetics; Factors affecting rate of enzyme-catalyzed reactions; Derivation of Michaelis-Menten equation, Concept of Km and Vmax, Lineweaver- Burk plot; Multi-substrate reactions; Enzyme inhibition; Allosteric enzymes and their kinetics; Regulation of enzyme action 	Explanation, Discussion using Green board, Power-point presentation
	Physiology and biochemistry Code: ZOO-HG-3016	Unit2: Digestion <ul style="list-style-type: none"> Physiology of digestion in the alimentary canal; Absorption of carbohydrates, proteins, lipids 	Explanation, Discussion using Green board, Power-point

		Unit 4: Excretion <ul style="list-style-type: none"> Structure of nephron, Mechanism of Urine formation, Counter-current Mechanism Unit 8: Lipid Metabolism <ul style="list-style-type: none"> Biosynthesis and β oxidation of palmitic acid Practical	presentation Demonstration
	CODE: ZOO-SE-3014 Ornamental Fish & Fisheries	7. Health management of Ornamental Fish 8. Feed formulation of Ornamental Fish 10. Pure culture of planktons	Explanation, Discussion using Green board, Power-point presentation

SEMESTER IV

Name of Teacher	PAPER	UNITS/TOPICS	Teaching Methodology
DR. SANDIP CHOUDHURY	COMPARATIVE ANATOMY OF VERTEBRATES CODE: ZOO-HC-4016	Unit 7:Nervous System <ul style="list-style-type: none"> Comparative account of brain Autonomic nervous system, Spinal cord, Cranial nerves in mammals Unit 8:Sense Organs <ul style="list-style-type: none"> Classification of receptors. Brief account of visual and auditory receptors in man 	Explanation, Discussion using Green board, Power-point presentation
	ANIMAL PHYSIOLOGY: LIFE SUSTAINING SYSTEMS CODE: ZOO-HC-4026	Unit4:Blood <ul style="list-style-type: none"> Components of blood and their functions; Structure and functions of haemoglobin Haemostasis: Blood clotting system, Kallikrein-Kininogen system, Complement system & Fibrinolytic system, Haemopoiesis Blood groups: Rh factor, ABO and MN Unit 5: Physiology of Heart <ul style="list-style-type: none"> Structure of mammalian heart; Coronary circulation; Structure and 	Explanation, Discussion using Green board, Power-point presentation Demonstration

		<p>working of conducting myocardial fibers. Origin and conduction of cardiac impulses Cardiac cycle; Cardiac output and its regulation, Frank-Starling Law of the heart, nervous and chemical regulation of heart rate. Electrocardiogram, Blood pressure and its regulation</p> <p>Practical</p>	
	<p>GENETICS AND EVOLUTIONARY BIOLOGY CODE: ZOO-HG-4016</p>	<p>Unit 1: Introduction to Genetics</p> <ul style="list-style-type: none"> Mendel's work on transmission of traits, Genetic Variation, Molecular basis of Genetic Information <p>Unit 2: Mendelian Genetics and its Extension</p> <ul style="list-style-type: none"> Principles of Inheritance, Chromosome theory of inheritance, Incomplete dominance and co-dominance, Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, sex linked inheritance, extra-chromosomal inheritance <p>Unit 12: Extinction</p> <ul style="list-style-type: none"> Mass extinction (Causes, Names of five major extinctions, K-T extinction in detail), Role of extinction in evolution <p>Practical</p>	<p>Explanation, Discussion using Green board, Power-point presentation</p> <p>Demonstration</p>
<p>JUNJUN BHUYAN</p>	<p>BIOCHEMISTRY OF METABOLIC PROCESSES</p> <p>CODE: ZOO-HC-4036</p>	<p>Unit 1: Overview of Metabolism</p> <ul style="list-style-type: none"> Catabolism vs Anabolism, Stages of catabolism, Compartmentalization of metabolic pathways, Shuttle systems and membrane transporters; ATP as "Energy Currency of cell"; Coupled reactions; Use of reducing equivalents and cofactors; I ntermediary metabolism and regulatory mechanisms <p>Unit 2:Carbohydrate Metabolism</p> <ul style="list-style-type: none"> Sequence of reactions and 	<p>Explanation, Discussion using Green board, Power-point presentation</p> <p>Demonstration</p>

		<p>regulation of glycolysis, Citric acid cycle, Phosphate pentose pathway, Gluconeogenesis, Glycogenolysis and Glycogenesis</p> <p>Unit 3:Lipid Metabolism</p> <ul style="list-style-type: none"> • β-oxidation and omega-oxidation of saturated fatty acids with even and odd number of carbon atoms; • Biosynthesis of palmitic acid; • Ketogenesis <p>Unit 4:Protein Metabolism</p> <ul style="list-style-type: none"> • Catabolism of amino acids: Transamination, Deamination, Urea cycle; • Fate of C-skeleton of Glucogenic and Ketogenic amino acids <p>Unit 5:Oxidative Phosphorylation</p> <ul style="list-style-type: none"> • Redox systems; Review of mitochondrial respiratory chain, Inhibitors and un-couplers of Electron Transport System <p>Practical</p>	
NEERAJ BORA	<p>COMPARATIVE ANATOMY OF VERTEBRATES</p> <p>CODE: ZOO-HC-4016</p>	<p>Unit 3:Digestive System</p> <ul style="list-style-type: none"> • Alimentary canal and associated glands, dentition <p>Unit 4:Respiratory System</p> <ul style="list-style-type: none"> • Skin, gills, lungs and air sacs; Accessory respiratory organs <p>Unit 6:Urinogenital System</p> <ul style="list-style-type: none"> • Succession of kidney, Evolution of urinogenital ducts, Types of mammalian uteri <p>Practical</p>	<p>Explanation, Discussion using Green board, Power-point presentation</p> <p>Demonstration</p>
	<p>ANIMAL PHYSIOLOGY: LIFE SUSTAINING SYSTEMS CODE: ZOO-HC-4026</p>	<p>Unit 2: Physiology of Respiration</p> <ul style="list-style-type: none"> • Histology of trachea and lung; Mechanism of respiration, Pulmonary ventilation; Respiratory volumes and capacities; Transport of oxygen and carbon dioxide in blood; Respiratory pigments, Dissociation curves and the factors influencing it; 	<p>Explanation, Discussion using Green board, Power-point presentation</p> <p>Demonstration</p>

		<p>Carbon monoxide poisoning; Control of respiration</p> <p>Unit 3:Renal Physiology</p> <ul style="list-style-type: none"> • Structure of kidney and its functional unit; Mechanism of urine formation; Regulation of water balance; Regulation of acid-base balance <p>Practical</p>	
	<p>GENETICS AND EVOLUTIONARY BIOLOGY CODE: ZOO-HG-4016</p>	<p>Unit 6: History of Life</p> <ul style="list-style-type: none"> • Major Events in History of Life <p>Unit 7: Introduction to Evolutionary Theories</p> <ul style="list-style-type: none"> • Lamarckism, Darwinism, Neo-Darwinism <p>Unit 8: Direct Evidences of Evolution</p> <ul style="list-style-type: none"> • Types of fossils, Incompleteness of fossil record, Dating of fossils, Phylogeny of horse <p>Unit 9: Processes of Evolutionary Change</p> <ul style="list-style-type: none"> • Organic variations; Isolating Mechanisms; Natural selection (Example: Industrial melanism); Types of natural selection (Directional, Stabilizing, Disruptive), Artificial selection <p>Unit11:Macro-evolution</p> <ul style="list-style-type: none"> • Macro-evolutionary Principles (example: Darwin’s Finches) 	<p>Explanation, Discussion using Green board, Power-point presentation</p>
	<p>CODE: ZOO-SE-4014 SEC 2 NON-MULBERRY SERICULTURE</p>	<p>Unit 1: Introduction Sericulture:</p> <ul style="list-style-type: none"> • Definition, history and present status of Mulberry and Non-Mulberry Sericulture; Silk route Varieties of Silk; Types and distribution of non-mulberry or wild 	<p>Explanation, Discussion using Green board, Power-point presentation</p>

		<p>or vanyasericigenous insects in N-E India</p> <p>Unit 2: Biology of Non-mulberry Silkworm:</p> <ul style="list-style-type: none"> Life cycle of silkworm- Eri and Muga Structure of silk gland and Nature of Silk <p>Unit 3: Rearing of Silkworms (Eri and Muga Silkworm):</p> <ul style="list-style-type: none"> Food plants of Eri and Muga Silkworm Rearing Operation: Rearing house/Site and rearing appliances Disinfectants: Formalin, bleaching powder Rearing technology: Early age and Late age rearing Environmental conditions in rearing- Temperature, Humidity, Light and Air Types of mountages Harvesting and storage of cocoons Spinning and Reeling of silk 	
SANGHAMITRA BURAGOHAIN	<p>COMPARATIVE ANATOMY OF VERTEBRATES</p> <p>CODE: ZOO-HC-4016</p>	<p>Unit 1: Integumentary System</p> <ul style="list-style-type: none"> Structure, functions and derivatives of integument <p>Unit 2: Skeletal System</p> <ul style="list-style-type: none"> Overview of axial and appendicular skeleton, Jaw suspensorium, Visceral arches <p>Unit 5: Circulatory System</p> <ul style="list-style-type: none"> General plan of circulation, evolution of heart and aortic arches <p>Practical</p>	<p>Explanation, Discussion using Green board, Power-point presentation</p> <p>Demonstration</p>
	<p>ANIMAL PHYSIOLOGY: LIFE SUSTAINING SYSTEMS</p> <p>CODE: ZOO-HC-4026</p>	<p>Unit 1: Physiology of Digestion</p> <ul style="list-style-type: none"> Structural organization and functions of gastrointestinal tract and associated glands; Mechanical and chemical digestion of food; Absorptions of carbohydrates, lipids, proteins, water, minerals and 	<p>Explanation, Discussion using Green board, Power-point presentation</p>

		<p>vitamins; Hormonal control of secretion of enzymes in Gastrointestinaltract.</p>	
	<p>GENETICS AND EVOLUTIONARY BIOLOGY CODE: ZOO-HG-4016</p>	<p>Unit 3: Linkage, Crossing Over and Chromosomal Mapping</p> <ul style="list-style-type: none"> Linkage and crossing over, Recombination frequency as a measure of linkage intensity, two factor and three factor crosses, Interference and coincidence, Somatic cell genetics - an alternative approach to gene mapping <p>Unit4: Mutations</p> <ul style="list-style-type: none"> Chromosomal Mutations: Deletion, Duplication, Inversion, Translocation, Aneuploidy and Polyploidy; Gene mutations: Induced versus Spontaneous mutations, Back versus Suppressor mutations, <p>Unit 5: Sex Determination</p> <ul style="list-style-type: none"> Chromosomal mechanisms, dosage compensation <p>Unit 10:Species Concept</p> <ul style="list-style-type: none"> Biological species concept (Advantages and Limitations); Modes of speciation (Allopatric, Sympatric) 	<p>Explanation, Discussion using Green board, Power-point presentation</p>
	<p>SEC 2 NON-MULBERRY SERICULTURE CODE: ZOO-SE-4014</p>	<p>Unit 4: Pests and Diseases:</p> <ul style="list-style-type: none"> Pests of Eri and Muga silkworm Pathogenesis of Eri and Muga silkworm diseases: Protozoan, viral, fungal and bacterial Prevention and control measures of pests and diseases <p>Unit 5: Entrepreneurship in Non-Mulberry Sericulture:</p> <ul style="list-style-type: none"> Varieties of Non-Mulberry Silk 	<p>Explanation, Discussion using Green board, Power-point presentation</p> <p>Farm visit</p>

		products and economics in India Prospectus of Non-Mulberry Sericulture in India: Non-Mulberry Sericulture industry in different states, employment generation and potential Visit to various sericulture Govt. /Private Farm/ Centers	
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SEMESTER V

Name of Teacher	PAPER	UNITS/TOPICS	Teaching Methodology
DR. SANDIP CHOUDHURY	MOLECULAR BIOLOGY CODE: ZOO-HC-5016	Unit 8: Regulatory RNAs <ul style="list-style-type: none"> Ribo-switches, RNA interference, miRNA, siRNA 	Explanation, Discussion using Green board, Power-point presentation
	PRINCIPLES OF GENETICS CODE: ZOO-HC-5026	Unit 1: Mendelian Genetics and its Extension <ul style="list-style-type: none"> Principles of inheritance, Incomplete dominance and co- dominance, Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, Sex-linked, sex- influenced and sex-limited characters inheritance. Unit 2: Linkage, Crossing Over and Chromosomal Mapping <ul style="list-style-type: none"> Linkage and crossing over, Cytological basis of crossing over, Molecular mechanisms of crossing over including models of recombination, Recombination frequency as a measure of linkage intensity, Two factor and three factor crosses, Interference and coincidence, Somatic cell hybridization. Unit3:Mutations <ul style="list-style-type: none"> Types of gene mutations (Classification), Types of chromosomal aberrations 	Explanation, Discussion using Green board, Power-point presentation Demonstration

		<p>(Classification, figures and with one suitable example of each), Molecular basis of mutations in relation to UV light and chemical mutagens; Detection of mutations: CLB method, attached X method.</p> <p>Unit 6: Polygenic Inheritance</p> <ul style="list-style-type: none"> • Polygenic inheritance with suitable examples; simple numerical based on it. <p>Unit 7: Recombination in Bacteria and Viruses</p> <ul style="list-style-type: none"> • Conjugation, Transformation, Transduction, Complementation test in Bacteriophage <p>Practical</p>	
	<p>CODE: ZOO-HE-5016 COMPUTATIONAL BIOLOGY and BIOSTATICS</p>	<p>Unit 1: Introduction to Bioinformatics</p> <ul style="list-style-type: none"> • Importance, Goal, Scope; Genomics, Transcriptomics, Systems Biology, Functional Genomics, Metabolomics, Molecular Phylogeny; Applications and Limitations of Bioinformatics <p>Unit 2: Biological Databases</p> <ul style="list-style-type: none"> • Introduction to biological databases; Primary, secondary and composite databases; Nucleic acid databases (GenBank, DDBJ, EMBL and NDB); Protein databases (PIR, SWISS-PROT, TrEMBL, PDB); Metabolic pathway database (KEGG, EcoCyc, and MetaCyc); Small molecule databases (PubChem, Drug Bank, ZINC, CSD) <p>Unit 3: Data Generation and Data Retrieval</p> <ul style="list-style-type: none"> • Generation of data (Gene sequencing, Protein sequencing, Mass spectrometry, Microarray), Sequence submission tools (BankIt, Sequin, Webin); Sequence file format (flat file, FASTA, GCG, EMBL, Clustal, Phylip, Swiss-Prot); Sequence annotation; Data retrieval systems (SRS, Entrez) <p>Unit 3: Basic Concepts of Sequence Alignment</p> <ul style="list-style-type: none"> • Scoring Matrices (PAM, BLOSUM), Methods 	<p>Explanation, Discussion using Green board, Power-point presentation</p> <p>Demonstration</p>

		<p>of Alignment (Dot matrix, Dynamic Programming, BLAST and FASTA); Local and global alignment, pair wise and multiple sequence alignments; Similarity, identity and homology of sequences.</p> <p>Unit 4: Applications of Bioinformatics</p> <ul style="list-style-type: none"> Structural Bioinformatics (3-D protein, PDB), Functional genomics (genome- wide and high throughput approaches to gene and protein function), Drug discovery method (Basic concepts) <p>Unit5:Biostatistics</p> <ul style="list-style-type: none"> Introduction, calculation of standard deviation, standard error, Co- efficient of Variance, Chi-square test, Z test, t-Test <p>Practical</p>	
<p>JUNJUN BHUYAN</p>	<p>MOLECULAR BIOLOGY CODE: ZOO- HC-5016</p>	<p>Unit 1:Nucleic Acids</p> <ul style="list-style-type: none"> Salient features of DNA and RNA Watson and Crick model of DNA <p>Unit 2:DNA Replication</p> <ul style="list-style-type: none"> DNA Replication in prokaryotes and eukaryotes, mechanism of DNA replication, Semi-conservative, bidirectional and semi-discontinuous replication, RNA priming, Replication of circular and linear ds-DNA, replication of telomeres <p>Unit 6:Gene Regulation</p> <ul style="list-style-type: none"> Transcription regulation in prokaryotes: Principles of transcriptional regulation with examples from lac operon and trpoperon; Transcription regulation in eukaryotes: Activators, repressors, enhance rs, silencer elements; Gene silencing, Genetic impr3 i0 nting <p>Unit 7: DNA Repair Mechanisms</p> <ul style="list-style-type: none"> Pyrimidine dimerization and mismatch 	<p>Explanation, Discussion using Green board, Power-point presentation</p> <p>Demonstration</p>

		repair Practical	
	CODE: ZOO-HE-5036 ENDOCRINOLOGY	Unit 1: Introduction to Endocrinology <ul style="list-style-type: none"> History of endocrinology, Classification, Characteristic and Transport of Hormones, Neuro secretions and Neuro hormones 	Explanation, Discussion using Green board, Power-point presentation
NEERAJ BORA	MOLECULAR BIOLOGY CODE: ZOO-HC-5016	Unit3:Transcription <ul style="list-style-type: none"> RNA polymerase and transcription Unit, mechanism of transcription in prokaryotes and eukaryotes, synthesis of rRNA and mRNA, transcription factors Unit4:Translation <ul style="list-style-type: none"> Geneticcode,DegeneracyofthegeneticcodeandWobbleHypothesis;Processof protein synthesis in prokaryotes: Ribosome structure and assembly in prokaryotes, fidelity of protein synthesis, aminoacyl tRNAsynthetases and charging of tRNA; Proteins involved in initiation, elongation and termination of polypeptidechain;Inhibitorsofproteinsynthesis;Differencebetweenprokaryotic and eukaryotic translation Unit 5: Post Transcriptional Modifications and Processing of Eukaryotic RNA <ul style="list-style-type: none"> Structure of globin mRNA; Split genes: concept of introns and exons, splicing mechanism, alternative splicing, exon shuffling, and RNA editing, Processing of tRNA Practical	Explanation, Discussion using Green board, Power-point presentation Practical
	CODE: ZOO-HE-5036 ENDOCRINOLOGY	Unit 2: Epiphysis, Hypothalamo-hypophysialAxis <ul style="list-style-type: none"> Structure of pineal gland, Secretions and their functions in biological rhythm sand reproduction. Structure of hypothalamus, Hypothalamic 	Explanation, Discussion using Green board, Power-point

		<p>nuclei and their functions, Regulation of neuroendocrine glands, Feedback mechanisms</p> <ul style="list-style-type: none"> • Structure of pituitary gland, Hormones and their functions, Hypothalamo- hypophysial portal system, Disorders of pituitary gland. <p>Unit3:Peripheral Endocrine Glands</p> <ul style="list-style-type: none"> • Structure, Hormones, Functions and Regulation of Thyroid gland, Parathyroid, Adrenal, Pancreas, Ovary and Testis • Hormones in homeostasis, Disorders of endocrine glands <p>Practical</p>	<p>presentation</p> <p>Demonstration</p>
SANGHAMITR A BURAGOHAIN	<p>PRINCIPLES OF GENETICS</p> <p>CODE: ZOO-HC-5026</p>	<p>Unit 4:Sex Determination</p> <ul style="list-style-type: none"> • Chromosomal mechanisms of sex determination in Drosophila and Man <p>Unit 5:Extra-chromosomal Inheritance</p> <ul style="list-style-type: none"> • Criteria for extra-chromosomal inheritance, Antibiotic resistance in Chlamydomonas, Mitochondrial mutations in Saccharomyces, Infective heredity in Paramecium and Maternal effects <p>Unit 8: Transposable Genetic Elements</p> <ul style="list-style-type: none"> • Transposons in bacteria, Ac-Ds elements in maize and P elements in Drosophila, Transposons in humans 	<p>Explanation, Discussion using Green board, Power-point presentation</p>
	<p>CODE: ZOO-HE-5036 ENDOCRINOLOGY</p>	<p>Unit4: Regulation of Hormone Action</p> <ul style="list-style-type: none"> • Hormone action at Cellular level: Hormone receptors, transduction and regulation Hormone action at Molecular level: Molecular mediators, Genetic control of hormone action 	<p>Explanation, Discussion using Green board, Power-point presentation</p>

SEMESTER VI

Name of Teacher	PAPER	UNITS/TOPICS	TEACHING METHODOLOGY
<p>DR. SANDIP CHOUDHURY</p>	<p>CODE: ZOO- HC-6026</p> <p>EVOLUTIONARY BIOLOGY</p>	<p>1: Life Unit's Beginnings</p> <ul style="list-style-type: none"> • Chemogeny, RNA world, Biogeny, Origin of photosynthesis, Evolution of eukaryotes <p>Unit4: Sources of variations</p> <ul style="list-style-type: none"> • Heritable variations and their role in evolution <p>Unit5: Population genetics</p> <ul style="list-style-type: none"> • Hardy-Weinberg Law (statement and derivation of equation, application of law to human Population) • Evolutionary forces upsetting H-W equilibrium; • Natural selection (concept of fitness, selection coefficient, derivation of one unit of selection for a dominant allele, genetic load, mechanism of working, types of selection, density-dependent selection, heterozygous superiority, kin selection, adaptive resemblances, sexual selection. • Genetic Drift (mechanism, founder's effect, bottleneck phenomenon; • Role of Migration and Mutation in changing allele frequencies <p>Unit7: Extinctions</p> <ul style="list-style-type: none"> • Background and mass extinctions (causes and effects), • detailed example of K-T extinction <p>Unit8: Origin and evolution of man</p> <ul style="list-style-type: none"> • Origin and evolution of man, • Unique hominin characteristics contrasted with primate characteristics, • primate phylogeny from Dryopithecus leading to Homo sapiens, molecular analysis of human origin 	<p>Green board, Power-point presentation</p> <p>Demonstration</p>

		<p>Unit9: Phylogenetic trees</p> <ul style="list-style-type: none"> • Multiple sequence alignment, • construction of phylogenetic trees, • interpretation of trees <p>Practical</p>	
	<p>ZOO-HE-6056</p> <p>DISSERTATION</p>		<p>Research based guidance</p>
<p>JUNJUN BHUYAN</p>	<p>CODE: ZOO-HC-6016</p> <p>DEVELOPMENTAL BIOLOGY</p>	<p>Unit 2: Early Embryonic Development</p> <ul style="list-style-type: none"> • Gametogenesis, Spermatogenesis, Oogenesis; • Types of eggs, Egg membranes; • Fertilization (External and Internal): Changes in gametes, Blocks to polyspermy; • Planes and patterns of cleavage; • Types of Blastula; • Fate maps (including Techniques); • Early development of frog and chick up to gastrulation; • Embryonic induction and organizers <p>Unit 3: Late Embryonic Development</p> <ul style="list-style-type: none"> • Fate of Germ Layers; • Extra-embryonic membranes in birds; • Implantation of embryo in humans, • Placenta (Structure,types and functions of placenta) <p>Unit 4: Post Embryonic Development</p> <ul style="list-style-type: none"> • Metamorphosis: Changes, hormonal regulations in amphibians and insects; • Regeneration: Modes of regeneration, epimorphosis, morphallaxis and compensatory regeneration (with one example each); • Ageing: Concepts and Theories <p>Unit 5: Implications of Developmental Biology</p> <ul style="list-style-type: none"> • Teratogenesis: Teratogenic agents and their 	<p>Green board, Power-point presentation</p> <p>Demonstration</p>

		<p>effects on embryonic development;</p> <ul style="list-style-type: none"> In vitro fertilization, Stem cell (ESC), Amniocentesis <p>Practical</p>	
SANGHAMITRA BURAGOHAIN	<p>CODE: ZOO- HC-6016</p> <p>DEVELOPMENTAL BIOLOGY</p>	<p>Unit1:Introduction</p> <ul style="list-style-type: none"> Historical perspective and basic concepts: Phases of development, Cell-Cell interaction, Pattern formation, Differentiation and growth, Differential gene expression, Cytoplasmic determinants and asymmetric cell division 	<p>Green board, Power-point presentation</p>
	<p>CODE: ZOO- HC-6026</p> <p>EVOLUTIONARY BIOLOGY</p>	<p>Unit2: Historical review of evolutionary concept</p> <ul style="list-style-type: none"> Lamarckism, Darwinism, Neo-Darwinism <p>Unit3: Evidences of Evolution</p> <ul style="list-style-type: none"> Fossil record (types of fossils, transitional forms, geological time scale, evolution of horse, Molecular (universality of genetic code and protein synthesising machinery, three domains of life, neutral theory of molecular evolution, molecular clock , example of globin gene family, rRNA/cyt c 	<p>Green board, Power-point presentation</p>
	<p>CODE: ZOO- HE-6026</p> <p>FISH AND FISHERIES</p>	<p>Unit4: Aquaculture</p> <ul style="list-style-type: none"> 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; Preparation and maintenance of fish aquarium; Preparation of compound diets for fish; Role of water quality in aquaculture; Fish diseases: Bacterial, viral and parasitic; Preservation and processing of harvested fish, Fishery by-product 	<p>Green board, Power-point presentation</p> <p>Demonstration</p>

		Practical	
	ZOO-HE-6056 DISSERTATION		Research based guidance
NEERAJ BORA	CODE: ZOO-HC-6026 EVOLUTIONARY BIOLOGY	Unit6: Product of evolution <ul style="list-style-type: none"> • Micro evolutionary changes (inter-population variations, clines, races, • Species concept, • Isolating mechanisms, • modes of speciation—allopatric, sympatric, • Adaptive radiation / macroevolution (exemplified by Galapagos finches 	Green board, Power-point presentation
	CODE: ZOO-HE-6026 FISH AND FISHERIES	UNIT 1: Introduction and Classification <ul style="list-style-type: none"> • General description of fish; • Account of systematic classification of fishes (upto classes); • Classification based on feeding habit, habitat and manner of reproduction. UNIT 2: Morphology and Physiology <ul style="list-style-type: none"> • Types of fins and their modifications; • Locomotion in fishes; • Hydrodynamics; • Types of Scales, Use of scales in Classification and determination of age of fish; • Gills and gas exchange; • Swim Bladder: Types and role in Respiration, buoyancy; • Osmoregulation in Elasmobranchs; • Reproductive strategies (special reference to Indian fishes); • Electric organs; Bioluminescence; • Mechanoreceptors; • Schooling; Parental care; Migration 	Green board, Power-point presentation Demonstration

		<p>UNIT3:Fisheries</p> <ul style="list-style-type: none"> • Inland Fisheries; Marine Fisheries; • Environmental factors influencing the seasonal variations in fish catches in the Arabian Sea and the Bay of Bengal; • Fishing crafts and Gears; • Depletion of fisheries resources; • Application of remote sensing and GIS in fisheries; • Fisheries law and regulations <p>UNIT 5: Fish in research</p> <ul style="list-style-type: none"> • Transgenic fish, Zebra fish as a model organism in research <p>Practical</p>	
	<p>ZOO-HE-6056</p> <p>DISSERTATION</p>		<p>Research based guidance</p>