

Egra S.S.B. College
Department of Zoology
Session - 2023-2024

Sem – I

Paper	Teacher	Detailed Syllabus
<p style="text-align: center;">Major-1 (MJ-1) Theory</p>	<p>Dr. Sudipta Kumar Ghorai (SKG)</p>	<p><u>Unit 1. Products of evolutionary process</u></p> <p>Origin of life on Earth: Arrival of simple form from primordial chemicals.</p> <p>Complexity of Life: Cellularity from unicellular grade to multicellularity; Origin of metazoans; Body symmetry; Concept of mesozoa, parazoa & eumetazoa; Concept of evolution of germinal layer - diploblastic and triploblastic organization; Concept of coelenteron & transition of third germ layer; Concept of evolution of body cavity – acoelomate, blastocoelomate & eucoelomate; Types of coelom; Concept of protostome & deuterostome; Concept of anamniote & amniote with structural features of amniote egg.</p> <p>Sequence & strategies of life cycle: Concept of classification of life cycles, adaptations & relationship between ontogeny & phylogeny.</p>
	<p>Mr. Chandan Nandi (CN)</p>	<p><u>Unit 2. Basics of systematics & classification</u></p> <p>Definition, relationship & utility of Systematics, Taxonomy, Evolution, Classification & Nomenclature.</p> <p>Phyletic lineages: Kinds & components of classification; Linnaean hierarchy; Concept of species & clade; Zoological Nomenclature – principles & codes; Six kingdom classification; Concept of major & minor phyla.</p> <p><u>Unit 3. Diversity in Protists</u></p> <p>General characteristics and classification of subkingdom Protozoa upto phyla (Levine et.al, 1981),</p> <p>The Protistbauplan: Body structure, support, nutrition, gas exchange, excretion, locomotion & reproduction – basic organization (detail type study or related theory not to be discussed).</p>
		<p><u>Unit 4. Diversity in acoelomate Metazoa</u></p>

	<p>Mrs.Sanchita Nayak (SN)</p>	<p>General characteristics and classification upto classes: Porifera, Cnidaria, Ctenophora, & Platyhelminthes (Rupert & Barnes, 1994)</p> <p>Special features & structural diversity in sponges with special reference to cell types;</p> <p>Special features of cnidarians with reference to polymorphism and division of labour; Coral reefs with diversity, formation, function & conservation.</p> <p>Affinity of Ctenophora</p> <p>Basic organizations with reference to parasitic adaptation & adaptive radiation in flatworm.</p>
	<p>Mr.Debajyoti Pradhan (DP)</p>	<p><u>Unit 5. Diversity in pseudocoelomate and coelomate Non chordates</u></p> <p>Ecdysozoa: Characteristics of the representative taxa.</p> <p>Basic organizations with reference to parasitic adaptation & adaptive radiation in roundworm.</p> <p>General characteristics and classification of Annelida, Arthropoda, Mollusca & Echinodermata upto class (Ruppert & Barnes, 1994).</p> <p>Basic organization & diversity in annelids with special reference to metamerism.</p> <p>Basic organization & diversity in arthropods with special reference concept of arthropodisation & appendage evolution; Adaptive radiations in Crustacea, Chelicerata & Insecta; Basic idea of fossil arthropod - Trilobita & Myriapoda (structural details and phylogeny not needed).</p> <p>Basic organization and diversity in Mollusca with reference to torsion in mollusca with respect to disruption of bilateral symmetry & its significance.</p> <p>Affinity of Echinodermata.</p> <p>General characteristics, affinity & evolutionary significance of Onychophora</p>
	<p>Mr.Debasish Maity (DM)</p>	<p><u>Unit 6. Diversity in Hemichordata & lower Chordates</u></p> <p>Characteristics features of Phylum Hemichordata & Chordata; Concept of protochordates & vertebrates;</p>

		Evolutionary status & affinities of Hemichordate & Cyclostomata
	Mr. Debajyoti Pradhan (DP)	<p><u>Unit 7. Diversity in vertebrates: Anamniotes</u></p> <p>Basic organization and diversity of fishes with reference to aquatic adaptation & evolutionary transitions; Classification of Chondrichthyes & Osteichthyes upto subclasses (Romer 1959).</p> <p>Emergence of land vertebrates; Amphibian diversity and adaptability to dual mode of life; Classification of Amphibia upto order (Duellman & Trueb, 1986)</p>
	Dr. Sudipta Kumar Ghorai (SKG)	<p><u>Unit 8. Diversity in vertebrates: Amniotes</u></p> <p>Classification of Reptilia up to living order, Aves up to subclasses & Mammalia up to living order (Young, 1981)</p> <p>Adaptive radiations in reptiles, birds & mammals; Concept of volant, arboreal, cursorial, fossorial & secondary aquatic adaptations</p> <p>Origin of Birds & Mammals</p> <p>Features of venomous & non venomous snake, distribution & type of snake venom with antidote in India</p> <p>Features of flying birds & running birds</p> <p>Special features of Monotremes & Marsupials with evolutionary significance; Features of living primates – Prosimi & Anthropoidea.</p>
Major-1 (MJ-1) Practical	<p><u>UNIT 1-3</u></p> <p>Mr. Chandan Nandi & Mr. Debajyoti Pradhan</p> <p><u>UNIT 4 -8</u></p> <p>Dr. Sudipta Kumar Ghorai</p> <p><u>UNIT 9</u></p>	<p><u>Systematics and Diversity of Life-Protists to Chordates</u></p> <p>1. Basic requirements for laboratory work: Knowledge about the parts of microscope with their function & setting of microscopes; Knowledge of calibration, magnification & drawing with the help of camera lucida, ocular & stage micrometer with determination of magnification</p>

Mr. Chandan Nandi &
Mr. Debajyoti Pradhan
Dr.Sudipta Kumar
Ghorai

2. Basic idea of fixatives, preservatives & stains with preparation method for study of museum specimen, significance of study of museum specimen

3. Study of animals through identification of models, photographs, slides and museum specimens in the laboratory with details on their classification upto phylum/class/subclass/order as indicated in theory, along with biogeography, adaptive features, economic/medical/ecological importance and diagnostic features (atleast five):

- ✓ *Amoeba, Euglena, Paramoecium, Plasmodium vivax, P. falciparum, Entamoeba, Giardia, Noctiluca, Elphidium, Trypanosoma, Opalina*(at least 5)
- ✓ *Sycon, Euplectella, Euspongia* (bath sponge), Neptune's cup, (at least 1)
- ✓ *Obelia, Hydra, Aurelia, Physalia, Porpita, Tubipora, Corallium* (red coral), *Gorgonia, Madripora*(horn coral), *Fungia*(musroom coral), Brain coral, Sea anemone, Sea pen, *Beroe*(at least 5)
- ✓ *Fasciola hepatica, Teaniasolium, Echinococcus, Schistosoma, Ascaris Wuchereriabancrofti, Ancylostoma* (at least 3)
- ✓ *Nereis, Aphrodite, Sabella, Chaetopterus, Arenicola*, Leech, *Tubifex*, Earthworm (at least 5)
- ✓ *Carcinoscorpius*, Scorpion, *Balanus, Sacculina*, Crab, *Macrobrachium, Penaeus, Squilla, Eupagurus, Scolopendra, Julus*, Termite queen, Silkmoth, Honey bee (three casts), *Sitophilus, Tribolium*, Lady bird beetle, Wasp, Locust, Grasshopper, Dragon fly, Stick insect, Mosquito, *Cimex, Pediculus, Lepisma, Belostoma, Daphnia, Cyclops, Argulus, Peripatus* (at least 10)
- ✓ *Chiton, Achatina, Aplysia, Patella,*

		<p><i>Dentalium, Doris, Oyster, Mussel, Sepia, Loligo, Octopus</i> (at least 8)</p> <p>✓ <i>Sea star, Brittle star, Antedon, Sea cucumber, Echinus</i> (at least 2)</p> <p><i>Balanoglossus, Salpa, Doliolum, Ascidia, Branchiostoma, Myxine, Petromyzon</i></p> <p>✓ <i>Scoliodon, Sphyrna, Trigon, Torpedo, Raja, Prystis, Chimaera, Labeorohita, Catla, Mystus, Heteropneustes, Clarias, Wallago, Notopterus, Tenualosa, Exocoetus, Anabas, Sucker fish, Flat fish, Tetradon, Hippocampus</i>(at least 10)</p> <p>✓ <i>Uraeotyphlus, Ichthyophis, Necturus, Cryptobranchus, Tylostotriton, Hyla, Alytes, Rhachophorus</i> (at least 5)</p> <p>✓ <i>Chelone, Trionyx, Hemidactylus, Varanus, Uromastix, Calotes, Mabuya, Gekko, Chameleo, Draco, Phrynosoma, Ophiosaurus, Bungurus, Naja, Daboia, Amphisma, Zamenis(Ptyas), Natrix, Ahatulla, Chrysopelea, Hydrophis, Crocodylus, Gavialis</i>(at least 8)</p> <p>✓ <i>Pistaculla, Passer, Kingfisher, Spilopelia</i> (spotted dove), <i>Milvus</i>(kite), <i>Black Cormorant, Cacatua, Ploceus, Orthotomus, Copsychus</i> (oriental magpie) <i>Coppersmith Barbet</i> (at least 5)</p> <p>✓ <i>Bandicota, Hystrix, Funambulus, Pteropus, Manis, Cavia, Lemur</i> (at least 2)</p> <p>4. Study of animals in nature Concept of the use of photographic device, sound recorder, GPS & binocular through demonstration or handling</p> <p>5. Observation & records of different animals from college campus or nearby any terrestrial field (forest, grassland, hill or mountain area etc.) or water body (pond, river, lake, sea etc.) or zoological park or museum</p>
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<p style="text-align: center;">SKILL ENHANCEMENT COURSES (SEC 1)</p> <p style="text-align: center;">Apiculture</p>	<p style="text-align: center;">Mr. Chandan Nandi & Mr. Debkumar Sahoo</p>	<ol style="list-style-type: none"> 1. Identification of different species of honeybees. Identification of different working groups of honey bees. Study the morphology and sexual dimorphism of honey bees. 2. Studies on pollen basket, mouth parts, sting apparatus, wax gland of worker honey bees. 3. Studies on the special structure of bee hives and beekeeping equipments. 4. Studies on various diseases of

		<p>adult Honeybees.</p> <ol style="list-style-type: none">5. Studies on the physical and chemical nature of Honey.6. Preparation of Honey based products.7. Visit to an apiculture farm and preparation a project report on apiculture.
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Sem – II		
Paper	Teacher	Detailed Syllabus
MJ-2 CELL BIOLOGY (Theory)		<p><u>Unit I: Cell theory and its modern version and interpretation.</u></p> <p>General structure of prokaryotes, bacteria, archaea and eukaryotes.</p> <p><u>Unit II: Plasma Membrane (structure and function):</u></p> <p>Concept of Lipid Bilayer Fluid Mosaic Model, Composition: Lipids (Phospholipids and Cholesterol), Peripheral and Integral Membrane proteins, Glycolipids and Glycoproteins; Membrane receptor modifications: microvilli, desmosomes and plasmodesmata; Mobility of membrane lipids and membrane proteins, Lipid rafts; Cell-cell junctions; Transport through plasma membrane: Active and passive transport, endocytosis and exocytosis.</p> <p><u>Unit III: Cytoplasmic organelles I:</u></p> <p>Basic concepts of ER, Golgi and Lysosome; Ultrastructure of ER, Overview of Protein sorting, Protein folding and processing in ER, Export of proteins and lipids from ER; Morphology and ultrastructure of Golgi Apparatus, Protein glycosylation within Golgi, Protein sorting and export from Golgi apparatus; Polymorphism and lysosome formation.</p> <p><u>Unit IV: Cytoplasmic organelles II:</u></p> <p>Mitochondria: Endosymbiotic hypothesis, Structure, Mitochondrial DNA, Mitochondrial Respiratory Chain; Centrosome Structure and function; Peroxisomes: Structure and Functions.</p> <p><u>Unit V: Cytoskeletal structures</u></p> <p>Structure, and function: Microtubules, Actin filaments, and Intermediate filaments; Basic composition and function of ECM; Cell-matrix Interactions.</p> <p><u>Unit VI: Nucleus:</u></p> <p>Structure and functions of interphase nucleus.</p>

		<p>Ultrastructure of nuclear membrane and pore complex (basic concept). Nucleolus: general organization, chemical composition and functions, nuclear sap/ nuclear matrix, nucleo-cytoplasmic interactions.</p> <p><u>Unit VII: Cell Cycle:</u></p> <p>Cell cycle, cell division- mitosis and meiosis. Cell division check points and their regulation. Role of growth factors. Mutations in the genes that regulate cell cycle and division and their role in causing cancer. Programmed cell death (Apoptosis). Cancer: Basic concept of cancer, Protooncogene&Tumor suppressor genes, Activation of a protooncogene to Oncogene.</p> <p><u>Unit VIII: Cell signalling:</u></p> <p>Modes of cell-cell communication; Types of signalling molecules and receptors: GPCR and G-protein mediated signalling(Adenylcyclase-cAMP), Enzymelinked Receptors: RTK (ras-raf).</p> <p><u>Unit IX: Tools and techniques used to study cell</u></p> <p>Principle of Light Microscope: Bright field, Phase contrast microscope, Fluorescence Microscope, Principle of SEM & TEM.</p> <p>Animal cell culture: Types of cell culture- monolayer and suspension culture. Types of culture media. Sterilization methods for culture wares and culture media.</p> <p>Maintenance of a cell line and storage of cells.</p> <p>Subcellular fractionation and ultracentrifugation.</p>
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<p style="text-align: center;">MJ-2 CELL BIOLOGY (Practical)</p>		<ol style="list-style-type: none"> 1. Cell viability study by Trypan Blue Exclusion method. 2. Preparation of chromosome squashes from grasshopper/cockroach testes for the observation of stages of meiosis. 3. Preparation of temporary stained squash of onion root tip to study various stages of mitosis. 4. Preparation of permanent slide to show the presence of Barr body in human female blood cells/cheek cells.
<p style="text-align: center;">SKILL ENHANCEMENT COURSES (SEC 2)</p> <p style="text-align: center;">Aquarium fish keeping</p>		<ol style="list-style-type: none"> 1. Identification of fresh water indigenous and exotic ornamental fishes. Identification of marine indigenous and exotic aquarium fishes. 2. Construction and installation of modern age aquahome. 3. Studies on Aquarium plants. 4. Feed formation and preparation of pelleted diet for aquarium fishes. Live fish food organism for ornamental fishes. 5. Ornamental fish breeding practice. 6. Studies on different disease of ornamental fishes. 7. Field visit to an ornamental fish farm and preparation of a field report.

Sem – III		
Paper	Teacher	Detailed Syllabus
C5 T -Chordates II	<p>Mr. Debasish Maity</p> <p>(D M)</p>	<p><u>Unit 1: Introduction to Chordates</u> General characteristics and outline classification of Phylum Chordata</p> <p><u>Unit 2: Protochordata</u> General characteristics and classification of sub-phylum Urochordata and Cephalochordata up to Classes. Retrogressive metamorphosis in Ascidia. Chordate Features and Feeding in Branchiostoma</p> <p><u>Unit 3: Origin of Chordata</u> Dipleurula concept and the Echinoderm theory of origin of chordates Advanced features of vertebrates over Protochordata</p> <p><u>Unit 4: Agnatha</u> General characteristics and classification of cyclostomes up to order</p> <p><u>Unit 5: Pisces</u> General characteristics and classification of Chondrichthyes and Osteichthyes up to Subclasses Accessory respiratory organ, migration and parental care in fishes Swim bladder in fishes. Classification up to Sub-Classes .</p>
	Mr. Chandan Nandi	<p><u>Unit 6: Amphibia</u> General characteristics and classification up to living Orders. Metamorphosis and parental care in Amphibia</p> <p><u>Unit 7: Reptilia</u> General characteristics and classification up to living Orders. Poison apparatus and Biting mechanism in Snake</p>
	Mr. Prabad Pratim Pal	<p><u>Unit 8: Aves</u> General characteristics and classification up to Sub-Classes Exoskeleton and migration in Birds Principles and aerodynamics of flight</p>

	<p>Mr. Debkumar Sahoo (DS)</p>	<p>Unit 9: Mammals General characters and classification up to living orders Affinities of Prototheria .Exoskeleton derivatives of mammals . Adaptive radiation in mammals with reference to locomotory appendages Echolocation in Micro chiropterans and Cetaceans</p>
	<p>Mr. Prabad Pratim Pal</p>	<p>Unit 10: Zoogeography Zoogeographical realms, Plate tectonic and Continental drift theory, distribution of birds and mammals in different realms</p>
<p>CP5: Chordates Lab</p>	<p>UNIT 1 -6 Mr.Chandan Nandi Mr. Debasish Maity</p> <p>Unit 7 Mr. Debajyoti Pradhan</p> <p>Unit 8 -9 Dr.Sudipta Kumar Ghorai</p>	<p>List of Practical</p> <p>1. Protochordata <i>Balanoglossus, Herdmania, Branchiostoma</i></p> <p>2. Agnatha <i>Petromyzon, Myxine</i></p> <p>3. Fishes <i>Scoliodon, Sphyrna, Pristis, Torpedo, Chimaera, Mystus, Heteropneustes, Labeo, Exocoetus, Echeneis, Anguilla, Hippocampus, Tetradon/ Diodon, Anabas, Flat fish</i></p> <p>4. Amphibia <i>Ameletus, Bufo, Hyla, Alytes, Axolotl, Tylototriton</i></p> <p>5. Reptilia <i>Chelone, Trionyx, Hemidactylus, Varanus, Uromastix, Chamaeleon, Ophiosaurus, Draco, Bungarus, Vipera, Naja, Hydrophis, Zamenis, Crocodylus.</i> Key for Identification of poisonous and non-poisonous snakes</p> <p>6. Mammalia: Bat (Insectivorous and Frugivorous), <i>Funambulus</i></p> <p>7. Pecten from Fowl head</p> <p>8. Dissection of brain and pituitary of Tilapia</p>

<p>CC-6: Animal Physiology: Controlling & Coordinating Systems</p>	<p>Mrs.Sanchita Nayak (SN)</p>	<p><u>Unit 1: Tissues</u> Structure, location, classification and functions of epithelial tissue, connective tissue, muscular tissue and nervous tissue and, fixation and staining of tissues.</p> <p><u>Unit 2: Bone and Cartilage</u> Structure and types of bones and cartilages, Ossification</p>
	<p>Mr. Debajyoti Pradhan(DP)</p>	<p><u>Unit 3: Nervous System</u> 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</p> <p><u>Unit 4: Muscular system</u> Histology of different types of muscle; Ultra structure of skeletal muscle; Molecular and chemical basis of muscle contraction; Characteristics of muscle fibre</p> <p><u>Unit 5: Reproductive System</u> Histology of testis ,ovary Physiology of Reproduction</p> <p><u>Unit 6: Endocrine System</u> Histology and function of pituitary, thyroid, pancreas and adrenal Classification of hormones; Mechanism of Hormone action Signal transduction pathways for Steroidal and Non steroidal hormones Hypothalamus (neuroendocrine gland) - principal nuclei involved in neuroendocrine control of anterior pituitary and endocrine system Placental hormones.</p>

<p>C6P: Animal Physiology: Controlling & Coordinating Systems Lab</p>	<p>Mr. Debajyoti Pradhan (DP)</p>	<ol style="list-style-type: none"> 1. Recording of simple muscle twitch with electrical stimulation (or Virtual) 2. Demonstration of the unconditioned reflex action (Deep tendon reflex such as knee jerk reflex) 3. Preparation of temporary mounts: Squamous epithelium, Striated muscle fibres and nerve cells 4. Study of permanent slides of Mammalian skin, Cartilage, Bone, Spinal cord, Nerve cell, Pituitary, Pancreas, Testis, Ovary, Adrenal, Thyroid and Parathyroid 5. Microtomy: Preparation of permanent slide of any five mammalian (Goat/white rat) tissues
<p>C7T: Fundamentals of Biochemistry</p>	<p>Mr. Santosh Kumar Bera & Mr. Debkumar Sahoo</p>	<p>Unit 1: Carbohydrates Structure and Biological importance: Monosaccharides, Disaccharides, Polysaccharides; Derivatives of Monosaccharides</p> <p>Carbohydrate metabolism: Glycolysis, Citric acid cycle, Pentose phosphate pathway, Gluconeogenesis</p> <p>Unit 2: Lipids Structure and Significance: Physiologically important saturated and unsaturated fatty acids, Tri-acylglycerols, Phospholipids, Sphingolipid, Glycolipids, Steroids, Eicosanoids and terpenoids.</p> <p>Lipid metabolism: β-oxidation of fatty acids; Fatty acid biosynthesis</p> <p>Unit 3: Proteins Amino acids Structure, Classification, General and Electro chemical 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</p> <p>Unit 4: Nucleic Acids Structure: Purines and pyrimidines, Nucleosides, Nucleotides, Nucleic acids Types of DNA and RNA, Complementarity of DNA, Hypo- Hyperchromaticity of DNA Basic concept of nucleotide metabolism</p> <p>Unit 5: Enzymes Nomenclature and classification; Cofactors; Specificity of enzyme action; Isozymes; Mechanism of enzyme action;</p>

		<p>Enzyme kinetics; Derivation of Michaelis-Menten equation, Lineweaver-Burk plot; Factors affecting rate of enzyme-catalyzed reactions; Enzyme inhibition; Allosteric enzymes and their kinetics; Strategy of enzyme action- Catalytic and Regulatory (Basic concept with one example each)</p> <p>Unit 5: Oxidative Phosphorylation Redox systems; Review of mitochondrial respiratory chain, Inhibitors and un-couplers of Electron Transport System</p>
<p>C7P: Fundamentals of Biochemistry Lab</p>	<p>Mr. Santosh Kumar Bera (SKB)</p>	<p>List of Practical</p> <ol style="list-style-type: none"> 1. Qualitative tests of functional groups in carbohydrates, proteins and lipids. 2. Paper chromatography of amino acids. 3. Quantitative estimation of Lowry Methods. 4. Demonstration of proteins separation by SDS-PAGE. 5. To study the enzymatic activity of Trypsin and Lipase. 6. To perform the Acid and Alkaline phosphatase assay from serum/ tissue.
<p>SEC1: Apiculture</p>		<p>Unit 1: Biology of Bees History, Classification and Biology of Honey Bees Social Organization of Bee Colony Unit 2: Rearing of Bees Artificial Bee rearing (Apiary), Beehives – Newton and Langstroth Bee Pasturage Selection of Bee Species for Apiculture Bee Keeping Equipment Methods of Extraction of Honey (Indigenous and Modern)</p> <p>Unit 3: Diseases and Enemies Bee Diseases and Enemies Control and Preventive measures Unit 4: Bee Economy Products of Apiculture Industry and its Uses (Honey, Bees Wax, Propolis), Pollen etc</p> <p>Unit 5: Entrepreneurship in Apiculture Bee Keeping Industry – Recent Efforts, Modern Methods in employing artificial Beehives for cross pollination in horticultural gardens</p>

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Sem – IV		
Paper	Teacher	Detailed Syllabus
C8 T - Comparative Anatomy of Vertebrates	Mr. Prabad Pratim Pal	<p><u>Unit 1: Integumentary System</u></p> <p>Structure, function and derivatives of integument in amphibian, birds and mammals</p> <p><u>Unit 2: Skeletal System</u></p> <p>Overview of axial and appendicular skeleton; Jaw suspension; Visceral arches.</p>
	Mr. Debkumar Sahoo (DS)	<p><u>Unit 3: Digestive System</u></p> <p>Comparative anatomy of stomach; dentition in mammals</p> <p><u>Unit 4: Respiratory System</u></p> <p>Respiratory organs in fish, amphibian, birds and mammals</p>
	Mr. Debasish Maity (DM)	<p><u>Unit 5: Circulatory System</u></p> <p>General plan of circulation, Comparative account of heart and aortic arches</p> <p><u>Unit 6: Urinogenital System</u></p> <p>Succession of kidney, Evolution of urinogenital ducts, Types of mammalian uteri</p>
	Mr. Debajyoti Pradhan	<p><u>Unit 7: Nervous System</u></p> <p>Comparative account of brain, Cranial nerves in mammals</p> <p><u>Unit 8: Sense Organs</u></p> <p>Classification of receptors, Brief account of olfactory and auditory receptors in vertebrate</p>
C8P: Comparative Anatomy of Vertebrates	Mr Debasish Maity Mr. Prabad Pratim Pal	<p>List of Practical</p> <ol style="list-style-type: none"> 1. Study of placoid, cycloid and ctenoid scales through permanent slides/photographs. 2. Study of disarticulated skeleton of Toad, Pigeon and Guineapig. 3. Demonstration of Carapace and plastron of turtle. 4. Identification of mammalian skulls: One

		<p>herbivorous (Guineapig) and one carnivorous(Dog) animal.</p> <p>5. Dissection of Tilapia: Circulatory system, Brain, pituitary, urinogenital system.</p>
<p>C9T: Animal Physiology: Life Sustaining Systems</p>	<p>Mr. Santosh Kumar Bera</p>	<p><u>Unit 1: Physiology of Digestion</u></p> <p>Structural organisation and functions of Gastrointestinal tract and Associated glands;Mechanical and chemical digestion of food, absorption of Carbohydrates, Lipids, Proteins and Nucleic Acids; Digestive enzymes</p> <p><u>Unit 2: Physiology of Respiration</u></p> <p>Mechanism of Respiration, Respiratory volumes and capacities, transport of Oxygen and Carbon dioxide in blood, Dissociation curves and the factors influencing it, respiratory pigments; Carbon monoxide poisoning</p> <p><u>Unit 3: Physiology of Circulation</u></p> <p>Components of Blood and their functions; Structure and functions of haemoglobin Haemostasis;Blood clotting system, Fibrinolytic system Haemopoiesis; Basic steps and its regulation Blood groups; ABO and Rh factor</p>
	<p>Mr. Debajyoti Pradhan</p>	<p><u>Unit 4: Physiology of Heart</u></p> <p>Structure of mammalian heart, Coronary Circulation, Structure and working of conducting myocardial fibres, Origin and conduction of cardiac impulses Cardiac Cycle and cardiac output Blood pressure and its regulation</p> <p><u>Unit 5: Thermoregulation & Osmoregulation</u></p> <p>Physiological classification based on thermal biology. Thermal biology of endotherms</p> <p>Osmoregulation in aquatic vertebrates Extrarenal osmoregulatory organs in vertebrates</p> <p><u>Unit 6: Renal Physiology</u></p> <p>Structure of Kidney and its functional unit, Mechanism of urine formation, Regulation of acid-base balance</p>

<p>C9P: Animal Physiology: Life Sustaining Systems Lab</p>	<p>Mr. Santosh Kumar Bera</p>	<p>List of Practical</p> <ol style="list-style-type: none"> 1. Determination of ABO Blood group 2. Enumeration of red blood cells and white blood cells using haemocytometer 3. Estimation of haemoglobin using Sahli's haemoglobinometer 4. Preparation of haemin and haemochromogen crystals 5. Recording of blood pressure using a sphygmomanometer
<p>C10T: Immunology</p>	<p>Dr. Sudipta Kumar Ghorai (SKG)</p>	<p><u>Unit 1: Overview of Immune System</u></p> <p>Basic concepts of health and diseases, Historical perspective of Immunology, Cells and organs of the Immune system</p> <p><u>Unit 2: Innate and Adaptive Immunity</u></p> <p>Anatomical barriers, Inflammation, Cell and molecules involved in innate immunity, Adaptive immunity (Cell mediated and humoral).</p> <p><u>Unit 3: Antigens</u></p> <p>Antigenicity and immunogenicity, Immunogens, Adjuvants and haptens, Factors influencing immunogenicity, B and T-Cell epitopes</p> <p><u>Unit 4: Immunoglobulins</u></p> <p>Structure and functions of different classes of immunoglobulins, Antigen- antibody interactions, Immunoassays (ELISA and RIA), Hybridoma technology, Monoclonal antibody production</p> <p><u>Unit 5: Major Histocompatibility Complex</u></p> <p>Structure and functions of MHC molecules.</p> <p>Structure of T cell Receptor and its signalling, T cell development & selection</p>

	<p>Mr. Santosh Kumar Bera (SKB)</p>	<p><u>Unit 6: Cytokines</u></p> <p>Types, properties and functions of cytokines.</p> <p><u>Unit 7: Complement System</u></p> <p>Components and pathways of complement activation.</p> <p><u>Unit 8: Hypersensitivity</u></p> <p>Gell and Coombs' classification and brief description of various types of hypersensitivities.</p> <p><u>Unit 9: Immunology of diseases</u></p> <p>Malaria, Filariasis, Dengue and Tuberculosis</p> <p><u>Unit 10: Vaccines</u></p> <p>Various types of vaccines. Active & passive immunization (Artificial and natural).</p>
<p>C10P: Immunology Lab</p>	<p>Mr. Santosh Kumar Bera (SKB)</p>	<p>List of Practical</p> <ol style="list-style-type: none"> 1. Demonstration of lymphoid organs. 2. Histological study of spleen, thymus and lymph nodes through slides/ photographs 3. Preparation of stained blood film to study various types of blood cells. 4. ABO blood group determination. 5. Demonstration of ELISA

<p>SEC2T: Sericulture</p>	<p>Mr. Prabad Pratim Pal</p>	<p><u>Unit 1: Introduction</u></p> <p>Sericulture: Definition, history and present status; Silk route Types of silkworms, Distribution and Races Exotic and indigenous races. Mulberry and non-mulberry Sericulture</p> <p><u>Unit 2: Biology of Silkworm</u></p> <p>Life cycle of <i>Bombyx mori</i> Structure of silk gland and secretion of silk</p> <p><u>Unit 3: Rearing of Silkworms</u></p> <p>Selection of mulberry variety and establishment of mulberry garden Rearing house and rearing appliances. Disinfectants: Formalin, bleaching powder, RKO Silkworm rearing technology: Early age and Late age rearing Types of mountages Spinning, harvesting and storage of cocoons</p> <p><u>Unit 4: Pests and Diseases</u></p> <p>Pests of silkworm: Uzi fly, dermestid beetles and vertebrates Pathogenesis of silkworm diseases: Protozoan, viral, fungal and bacterial Control</p> <p><u>Unit 5: Entrepreneurship in Sericulture</u></p> <p>Prospectus of Sericulture in India: Sericulture industry in different states, employment, potential in mulberry and non-mulberry sericulture Visit to various sericulture centres.</p>
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Sem – V		
Paper	Teacher	Detailed Syllabus
C11T: Molecular Biology	Mr. Santosh Kumar Bera	<p><u>Unit 1: Nucleic Acids</u></p> <p>Salient features of DNA and RNA. Watson and Crick Model of DNA</p> <p><u>Unit 2: DNA Replication</u></p> <p>Mechanism of DNA Replication in Prokaryotes, Semi-conservative, bidirectional and discontinuous Replication, RNA priming, Replication of telomeres</p> <p><u>Unit 3: Transcription</u></p> <p>Mechanism of Transcription in prokaryotes and eukaryotes, Transcription factors, Difference between prokaryotic and eukaryotic transcription.</p>
	Dr. Sudipta Kumar ghorai	<p><u>Unit 4: Translation</u></p> <p>Mechanism of protein synthesis in prokaryotes, Ribosome structure and assembly in prokaryotes, fidelity of protein synthesis, aminoacyl tRNA synthetases and charging of tRNA; Proteins involved in initiation, elongation and termination of polypeptide chain; Genetic code, Degeneracy of the genetic code and Wobble Hypothesis; Inhibitors of protein synthesis; Difference between prokaryotic and eukaryotic translation</p> <p><u>Unit 5: Post Transcriptional Modifications and Processing of Eukaryotic RNA</u></p> <p>Capping and Poly A tail formation in mRNA; Split genes: concept of introns and exons, splicing mechanism, alternative splicing, exon shuffling, and RNA editing, Processing of tRNA</p> <p><u>Unit 6: Gene Regulation</u></p> <p>Regulation of Transcription in prokaryotes: <i>lac</i> operon and <i>trp</i> operon; Regulation of Transcription in eukaryotes: Activators, enhancers, silencer, repressors, miRNA mediated gene silencing, Genetic imprinting</p>

	<p>Mr. Debkumar Sahoo</p>	<p><u>Unit 7: DNA Repair Mechanisms</u></p> <p>Types of DNA repair mechanisms, RecBCD model in prokaryotes, nucleotide and base excision repair, SOS repair</p> <p><u>Unit 8: Molecular Techniques</u></p> <p>PCR, Western and Southern blot, Northern Blot, Sanger DNA sequencing</p>
<p>C11P: Molecular Biology (Lab)</p>	<p>Dr. Sudipta Kumar Ghorai</p>	<p>List of Practical</p> <ol style="list-style-type: none"> 1. Demonstration of polytene and lampbrush chromosome from photograph 2. Isolation and quantification of genomic DNA using spectrophotometer (A260 measurement) 3. Agarose gel electrophoresis for DNA
<p>C12T: Genetics</p>	<p>Dr. Sudipta Kumar Ghorai</p>	<p>Unit 1: Mendelian Genetics and its Extension</p> <p>Principles of inheritance, Incomplete dominance and co-dominance, Epistasis Multiple alleles, Lethal alleles, Pleiotropy, Sex-linked, sex- influenced and sex-limited inheritance, Polygenic Inheritance.</p> <p>Unit 2: Linkage, Crossing Over and Chromosomal Mapping</p> <p>Linkage and Crossing Over, molecular basis of crossing over, Measuring Recombination frequency and linkage intensity using three factor crosses, Interference and coincidence</p> <p>Unit 3: Mutations</p> <p>Types of gene mutations (Classification), Types of chromosomal aberrations (Classification with one suitable example of each), Non-disjunction and variation in chromosome number; Molecular basis of mutations in relation to UV light and chemical mutagens</p>

	Mrs. Sanchita Nayak	<p>Unit 4: Sex Determination Mechanisms of sex determination in <i>Drosophila</i> Sex determination in mammals Dosage compensation in <i>Drosophila</i> & Human</p> <p>Unit 5: Extra-chromosomal Inheritance Criteria for extra chromosomal inheritance, Antibiotic resistance in <i>Chlamydomonas</i>, Kappa particle in <i>Paramecium</i> Shell spiralling in snail</p> <p>Unit 6: Recombination in Bacteria and Viruses Conjugation, Transformation, Transduction, Complementation test in Bacteriophage</p> <p>Unit 7: Transposable Genetic Elements Transposons in bacteria, Ac-Ds elements in maize and P elements in <i>Drosophila</i>, LINE, SINE, Alu elements in humans</p>
C12P: Genetics (Lab)	Dr. Sudipta Kumar Ghorai	<p>List of Practical</p> <ol style="list-style-type: none"> 1. Chi-square analyses 2. Linkage maps based on conjugation 3. Identification of chromosomal aberration in <i>Drosophila</i> and man from photograph 4. Pedigree analysis of some human inherited traits
DSE1T: Reproductive Biology	Mrs. Sanchita Nayak	<p><u>Unit 1: Reproductive Endocrinology</u> Mechanism of action of steroids and glycoprotein hormones. hypothalamo – hypophyseal – gonadal axis, regulation of gonadotrophin secretion in human (male and female) Reproductive system: Development and differentiation of gonads, genital ducts and external genitalia</p> <p><u>Unit 2: Functional anatomy of male reproduction</u> Histoarchitecture of testis in human; Spermatogenesis; Kinetics and hormonal regulation; Androgen synthesis and metabolism; Accessory glands functions</p>

	<p>Mr. Debasish Maity</p>	<p><u>Unit 3: Functional anatomy of female reproduction</u> Histoarchitecture of ovary in human; Oogenesis; Kinetics and hormonal regulation; Steroidogenesis and secretion of ovarian hormones; Reproductive cycles (human) and their regulation, fertilization; Hormonal control of implantation; Hormonal regulation of gestation, pregnancy diagnosis, foeto – maternal relationship; Mechanism of parturition and its hormonal regulation; Lactation and its Regulation</p> <p><u>Unit 4: Reproductive Health</u> Infertility in male and female: causes, diagnosis and management Assisted Reproductive Technology: sex selection, sperm banks, frozen embryos, in vitro fertilization Modern contraceptive technologies</p>
<p>DSE1P: Reproductive Biology (Lab)</p>	<p>Mr. Debasish Maity</p>	<ol style="list-style-type: none"> 1. Study of animal house: set up and maintenance of animal house, breeding techniques, care of normal and experimental animals. 2. Examination of vaginal smear rats from live animals. 3. Tissue fixation, embedding in paraffin, microtomy and slide preparation of any endocrine gland 4. Examination of histological sections from photomicrographs/ permanent slides of rat/human: testis, epididymis and accessory glands of male reproductive systems; Sections of ovary, fallopian tube, uterus (proliferative and secretory stages), cervix and vagina. 5. Sperm count and sperm motility in rat

DSE2T: Animal Biotechnology	Dr. Sudipta Kumar Ghorai	<p><u>Unit 1: Introduction</u> Organization of prokaryotic and eukaryotic genome, Concept of genomics</p> <p><u>Unit 2: Molecular Techniques in Gene manipulation</u> Cloning vectors: Plasmids, Cosmids, Phagemids, Lambda Bacteriophage, M13, BAC, YAC, MAC and Expression vectors (characteristics). Restriction enzymes: Nomenclature, detailed study of Type II. Transformation techniques: Calcium chloride method and electroporation. Construction of genomic and cDNA libraries and screening by colony and plaque hybridization Southern, Northern and Western blotting DNA sequencing: Sanger method Polymerase Chain Reaction, DNA Finger Printing and DNA micro array</p>
	Mr. Prabodh Pratim Pal	<p><u>Unit 3: Genetically Modified Organisms</u> Production of cloned and transgenic animals: Nuclear Transplantation, Retroviral Method, DNA microinjection. Applications of transgenic animals: Production of pharmaceuticals, production of donor organs, knock out mice</p> <p><u>Unit 4: Culture Techniques and Applications</u> Animal cell culture, expressing cloned genes in mammalian cells, Molecular diagnosis of genetic diseases (Cystic fibrosis, Sickle cell anemia)</p>
DSE2P: Animal Biotechnology (Lab)	Dr. Sudipta Kumar Ghorai	<ol style="list-style-type: none"> 1. Genomic DNA isolation from E. coli 2. Plasmid DNA isolation (pUC 18/19) from E. coli 3. Restriction digestion of plasmid DNA. 4. Construction of circular and linear restriction map from the data provided. 5. Calculation of transformation efficiency from the data provided. 6. To study following techniques through photographs <ol style="list-style-type: none"> a. Southern Blotting b. Northern Blotting c. Western Blotting d. DNA Sequencing (Sanger's Method) e. PCR f. DNA fingerprinting 7. Project report on animal cell culture

<p>C13T: Developmental Biology</p>	<p>Mr. Debajyoti Pradhan</p>	<p>Unit 1: Introduction Basic concepts: Phases of Development, Cell cell interaction, Differentiation and growth, Differential gene expression.</p> <p>Unit 2: Early Embryonic Development 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> <p>Unit 3: Late Embryonic Development Fate of Germ Layers; Extra-embryonic membranes in birds; Implantation of embryo in humans, Placenta (Structure, types and functions of placenta).</p>
	<p>Mrs. Sanchita Nayak</p>	<p>Unit 4: Post Embryonic Development Development of brain and Eye in Vertebrate. Regeneration: Modes of regeneration, epimorphosis, morphallaxis and compensatory regeneration (with one example each).</p> <p>Unit 5: Implications of Developmental Biology 8 Class Teratogenesis: Teratogenic agents and their effects on embryonic development; In vitro fertilization, Stem cell (ESC), Amniocentesis.</p>

<p>C13P: Developmental Biology Lab</p>	<p>Mr. Debajyoti Pradhan</p>	<p>List of Practical</p> <ol style="list-style-type: none"> 1. Study of whole mounts of developmental stages of chick through permanent slides: Primitive streak (13 and 18 hours), 21, 24, 28, 33, 36, 48, 72, and 96 hours of incubation (Hamilton and Hamburger stages). 2. Study of the developmental stages and life cycle of <i>Drosophila</i> from stock culture. 3. Study of different sections of placenta (photomicrograph/ slides). 4. Project report on <i>Drosophila</i> culture/chick embryo development.
<p>C14T: Evolutionary Biology</p>	<p>Mr. Debajyoti Pradhan & Prabad Pratim Pal</p>	<p>Unit-1: Life's Beginnings: Chemogeny, RNA world, Biogeny, Origin of photosynthesis, evolution of eukaryotes.</p> <p>Unit-2: Historical review of Evolutionary concepts, Lamarckism, Darwinism and Neo Darwinism.</p> <p>Unit-3: Geological time scale, Fossil records of Hominids (from <i>Australopithacus</i> to <i>Homo sapiens</i>), evolution of horse. Neutral theory of molecular evolution, Molecular clock.</p> <p>Unit-4: Sources of variations: Heritable variations and their role in evolution.</p> <p>Unit-5: Population genetics: Hardy-Weinberg Law (statement and derivation of equation, application Of law to biallelic Population); Evolutionary forces upsetting H-W equilibrium; Natural selection (concept of fitness, types of selection, selection coefficient, mode of selection heterozygous superiority).Genetic Drift mechanism (founder's effect, bottleneck phenomenon). Role of Migration and Mutation in changing allele frequencies.</p> <p>Unit-6: Species concept, Isolating mechanisms, modes of speciation. Adaptive radiation /macroevolution (exemplified by Galapagos finches).</p> <p>Unit-7: Extinctions, Back ground and mass extinctions (causes and effects), detailed example of K-T extinction.</p> <p>Unit-8: Origin and Evolution of Man, Unique Hominin characteristics contrasted with primate characteristic Molecular analysis of human origin.</p> <p>Unit-9: Phylogenetic trees, Construction & interpretation of Phylogenetic tree using parsimony, Convergent & Divergent evolution.</p>

<p>C14P: Evolutionary Biology Lab</p>	<p>Dr. Sudipta Kumar Ghorai</p>	<p>List of Practical</p> <ol style="list-style-type: none"> 1. Study of fossils from models/ pictures 2. Study of homology and analogy from suitable specimens 3. Study and verification of Hardy-Weinberg Law by chi square analysis 4. Graphical representation and interpretation of data of height/ weight of a sample of 100 humans in relation to their age and sex.
<p>DSE3T: Endocrinology</p>	<p>Mr. Debajyoti Pradhan</p>	<p>Unit-1: Introduction to Endocrinology General idea of Endocrine systems, Classification, Characteristic and Transport of Hormones, Neurosecretions and Neurohormones</p> <p>Unit-2: Epiphysis, Hypothalamo-hypophysial Axis</p> <p>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, Feedback mechanisms Structure of pituitary gland, Hormones and their functions, Hypothalamo-hypophysial portal system, Disorders of pituitary gland.</p> <p>Unit-3: Peripheral Endocrine Glands Structure, Hormones, Functions and Regulation of Thyroid gland, Parathyroid, Thymus, Adrenal, Pancreas, Ovary and Testis. Hormones in homeostasis, Disorders of endocrine glands</p> <p>Unit-4: Regulation of Hormone Action</p> <p>Mechanism of action of steroidal, non-steroidal hormones with receptors. Bioassays of hormones using RIA & ELISA. Estrous cycle in rat and menstrual cycle in human. Multifaceted role of Vasopressin & Oxytocin. Hormonal regulation of parturition.</p>

<p>DSE3P: Endocrinology Lab</p>	<p>Mr. Debajyoti Pradhan</p>	<p>List of Practical</p> <ol style="list-style-type: none"> 1. Dissect and display of Endocrine glands in laboratory bred rat. 2. Study of the permanent slides of all the endocrine glands 3. Tissue fixation, embedding in paraffin, microtomy and slide preparation of any endocrine gland 4. Estimation of plasma level of any hormone using ELISA. 5. Designing of primers of any hormone.
<p>DSE4T: Wild Life Conservation and Management</p>	<p>Dr. Sudipta Kumar Ghorai & Chandan Nandi</p>	<p>Unit-1: Introduction to Wild Life Values of wild life - positive and negative; Conservation ethics; Importance of conservation; Causes of depletion; World conservation strategies.</p> <p>Unit-2: Evaluation and management of wild life</p> <p>Habitat analysis, Physical parameters: Topography, Geology, Soil and water Biological Parameters: food, cover, forage, browse and cover estimation. Standard evaluation procedures: remote sensing and GIS.</p> <p>Unit-3: Management of habitats</p> <p>Setting back succession; Grazing logging; Mechanical treatment; Advancing the successional process; Cover construction; Preservation of general genetic diversity Restoration of degraded habitats.</p> <p>Unit-4: Population estimation</p> <p>Population density, Natality, Birth rate, Mortality, fertility schedules and sex ratio computation; Faecal analysis of ungulates and carnivores; Pug marks and census method.</p> <p>Unit-5: Aims and objectives of wildlife conservation</p> <p>Wildlife conservation in India – through ages; different approaches of wildlife conservation; modes of conservation; in-situ conservation and ex-situ conservation: necessity for wildlife conservation.</p>

		<p>Unit-6: Management planning of wild life in protected areas Estimation of carrying capacity; Eco tourism / wild life tourism in forests; Concept of climax persistence; Ecology of perturbation.</p> <p>Unit-7: Man and Wildlife</p> <p>Causes and consequences of human-wildlife conflicts; mitigation of conflict –an overview; Management of excess population.</p> <p>Unit-8: Protected areas</p> <p>National parks & sanctuaries, Community reserve; Important features of protected areas in India; Tiger conservation - Tiger reserves in India; Management challenges in Tiger reserve.</p>
<p>DSE4P: Wild Life Conservation and Management Lab</p>	<p>Mr. Santosh Kumar Bera</p>	<p>List of Practical</p> <ol style="list-style-type: none"> 1. Identification of flora, mammalian fauna, avian fauna, herpeto-fauna. 2. Demonstration of basic equipment needed in wildlife studies use, care and maintenance (Compass, Binoculars, Spotting scope, Range Finders, Global Positioning System, Various types of Cameras and lenses). 3. Familiarization and study of animal evidences in the field; Identification of animals through pug marks, hoof marks, scats, pellet groups, nest, antlers, etc. 4. Demonstration of different field techniques for flora and fauna. 5. PCQ, ten tree method, Circular, Square & rectangular plots, Parker's 2 Step and other methods for ground cover assessment, Tree canopy cover assessment, Shrub cover assessment. 6. Trail / transect monitoring for abundance and diversity estimation of mammals and bird (direct and indirect evidences).