Egra S.S.B. College
Department of Zoology
B.Sc (MDS & General)
Session - 2023-2024

Sem – I

Paper	Teacher	Detailed Syllabus
MJA1/B1T: Diversity of Animal world	**Mr. Santosh Kumar Bera**	**Unit 1.Animal architecture & the Bauplan concept** Origin of life on Earth: Arrival of simple form from primordial chemicals Complexity of Life: Origin of metazoans; Concept of Cellularity, Body symmetry, Germ layers & Body cavities Sequence & strategies of life cycle: Concept of classification of life cycles, adaptations & relationship between ontogeny & phylogeny
	Mr. Chandan Nandi (CN)	**Unit 2. Basics of systematics & classification** Definition, relationship & utility of Systematics, Taxonomy & Evolution Concept of Biological Classification & Nomenclature, Hierarchical categories recognized by ICZN; Zoological Nomenclature – principles & codes; Six kingdom classification Concept of species & clade
	Mrs. Debasish Maity (D.M)	**Unit 3. Protists** General characteristics and classification of subkingdom Protozoa upto phyla (Levine et.al, 1981) Type study: Plasmodium
	Mr. Debkumar Sahoo (D.S)	**Unit 4. Diversity in nonchordates** General characteristics and classification upto classes: Porifera, Cnidaria, Ctenophora, & Platyhelminthes (Rupert & Barnes, 1994) Special features & structural diversity in sponges with special reference to cell types Special features of cnidarians with reference to polymorphism and division of labour; Reef forming corals & coral reefs

		Affinity of Ctenophora Basic organizations with reference to adaptive radiation in flatworm & roundworms General characteristics and classification of Annelida, Arthropoda, Mollusca & Echinodermata upto class (Rupert & Barnes, 1994) Basic organization & diversity in annelids with special reference to metamerism General characteristics & affinity of Onychophora The emergence of arthropods: Concept of haemocoel; tagmatisation& ecdysis; Adaptive radiations in Crustacea, Chelicerata &Insecta; Basic idea of fossil arthropod - Trilobita& Myriapoda (structural details and phylogeny not needed) Basic organization and diversity in Mollusca with reference to torsion in gastropoda Affinity of Echinodermata
	Mr. Prabad Pratim Pal (P.P.P)	**<u>Unit 5. Diversity in Hemichordata&lower Chordates</u>** Characteristics features of Phylum Hemichordata& Chordata; Concept of Protochordta; Evolutionary status & affinities of Hemichordata **<u>Unit 6. Diversity in vertebrates</u>** Advantages of vertebrates over protochordates & amniotes over anamniotes Classification of Chondrichthyes & Osteichthyes upto subclasses (Romer 1959) General organization of Dipnoi Classification of Amphibia upto order (Duellman & Trueb, 1986) Emergence of land vertebrates Classification of Reptilia upto living order, Aves upto subclasses & Mammalia upto living order (Young, 1981) Features of venomous & non venomous snake, distribution & type of snake venom in India Origin of Birds; Features of living running & flying birds Special features of Monotremes&Marsupials with evolutionary significance; Features of living primates Concept of aquatic, volant,arboreal, cursorial, fossorial adaptations Type study: Cavia

MJA1/B1T: Diversity of Animal world Practical	**Mr. Prabad Pratim Pal**	1. Basic requirements for laboratory work: Knowledge about the parts of microscope with their function & setting of microscope 2. Idea of fixatives & preservatives for preparation to study the museum specimen 3. Study of animals through identification of models, photographs, slides and museum specimens in the laboratory with details on their classification uptophylum/class/subclass/order as indicated in theory, along with biogeography, adaptive features, economic/medical/ecological importance and diagnostic features : □ Amoeba, Euglena, Paramoecium, Plasmodium, Entamoeba, Elphidium, Opalina (at least 5) □ Sycon, Euspongia (bath sponge), Neptune's cup, (at least 1) □ Obelia, Hydra, Aurelia, Physalia, Porpita, Coral, Sea anemone, Sea pen,Beroe (at least 5) □ Fasciola, Teania, Ascaris (at least 2) □ Nereis, Aphrodite, Leech, Tubifex, Earthworm (at least 3) □ Carcinoscorpius, Scorpion, Balanus, Crab, Macrobrachium, Penaeus, Squilla, Eupagurus, Scolopendra, Julus, Termite queen,Silkmoth, Honey bee (three casts), Sitophilus, Tribolium, Lady bird beetle, Locust, Grasshopper, Dragon fly, Stick insect, Mosquito, Lepisma, Belostoma, Daphnia, Cyclops, Argulus, Peripatus (at least 10) □ Chiton, Achatina, Aplysia, Dentalium, Oyster, Mussel, Sepia, Loligo, Octopus (at least 5)

		□ Sea star, Brittle star, Antedon, Sea cucumber, Echinus (at least 2) □ Balanoglossus, Ascidia, Branchiostoma, Myxine, Petromyzon □ Scoliodon, Sphyrna, Trigon, Torpedo, Labeorohita, Catla catla, Heteropneustes, Clarias, Exocoetus, Anabas, Sucker fish, Flat fish, Hippocampus(at least 8) □ Uraeotyphlus, Ichthyophis, Necturus, Cryptobranchus, Tylototriton, Hyla, Rhachophorus (at least 5) □ Chelone, Trionyx, Hemidactylus, Varanus, Calotes, Mabuya, Gekko, Chameleo, Draco, Phrynosoma, Ophiosaurus, Bungurus, Naja,Daboia, Amphiesma, Zamenis(Ptyas), Natrix, Hydrophis, Crocodylus, Gavialis (at least 8) □ Pistaculla, Passer, Kingfisher, Spilopelia (spotted dove), Milvus(kite),Black Cormorant, Cacatua, Ploceus, Orthotomus, Copsychus (oriental magpie)Coppersmith Barbet (at least 5) □ Bandicota, Hystrix, Funambulus, Pteropus, Manis, Cavia, Lemur (at least 2) 4. Study of animals in nature – Concept of the use of photographic device, sound recorder, GPS & binocular through demonstration or handling; 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 3. Preparation of key for identification of venomous and non-venomous snakes; Preparation of key on any group (preferably insects, fishes & birds) of different feeding habit – all in form of animal album with photographs & necessary information 5. Assessment of relationship by constructing a cladogram using any five animals belonging to a clade; Comparison & weighting of characters of any two species of animal belonging to same genera or different genera but same family

SKILL ENHANCEMENT COURSES (SEC 1) **Apiculture**	**Mr. Chandan Nandi** **&** **Mr. Debkumar Sahoo**	**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 adult Honeybees.** **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.**

Sem – II		
Paper	**Teacher**	**Detailed Syllabus**
NIL	**NIL**	**NIL**

Sem – III		
Paper	**Teacher**	**Detailed Syllabus**
DSC1CT: Physiology and Biochemistry	**Mr.Debasish Maity** **(D M)**	**DSC1CT: Physiology and Biochemistry** **Unit 1: Nerve and muscle** 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 2: Digestion** Physiology of digestion in the alimentary canal; Absorption of carbohydrates, proteins, lipids **Unit 3: Respiration** Pulmonary ventilation, Respiratory volumes and capacities, Transport of oxygen and carbon dioxide in blood.

	Mr. Prabad Pratim Pal	**<u>Unit 4: Excretion</u>** Structure of nephron, Mechanism of Urine formation, Counter-current Mechanism **<u>Unit 5: Cardiovascular system</u>** Composition of blood, Hemostasis, Structure of Heart, Origin and conduction of the cardiac impulse,Cardiac cycle **<u>Unit 6: Reproduction and Endocrine Glands</u>** 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
	Mr. Debkumar Sahoo	**Unit 7: Carbohydrate Metabolism** Glycolysis, Krebs Cycle, Pentose phosphate pathway, Gluconeogenesis, Glycogen metabolism, Review of electron transport chain **Unit 8: Lipid Metabolism** Biosynthesis and β oxidation of palmitic acid **Unit 9: Protein metabolism** Transamination, Deamination and Urea cycle **Unit 10: Enzymes** Introduction, Mechanism of action, Enzyme kinetics, inhibition and regulation
DSC1CP: Physiology and Biochemistry (Practical):	**Mr.Debkumar Sahoo (DS)**	1. Preparation of hemin and hemochromogen crystals. 2. Study of permanent histological sections of mammalian pituitary, thyroid,pancreas, adrenal gland. 3. Study of permanent slides of spinal cord, duodenum, liver, lung, kidney, bone,cartilage. 4. Qualitative tests to identify functional groups of carbohydrates in given solutions (Glucose, Fructose, Sucrose, Lactose). 5. Estimation of total protein in given solutions by Lowry's method. 6. Study of activity of salivary amylase under optimum conditions

SECT: Apiculture	**Mr. Debkumar Sahoo**	**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) **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 **Unit 5: Entrepreneurship in Apiculture** Bee Keeping Industry – Recent Efforts, Modern Methods in employing artificial. Beehivesfor cross pollination in horticultural gardens

Sem – IV		
Paper	**Teacher**	**Detailed Syllabus**
DSC-1D (CC-4): Genetics and Evolutionary Biology	**Mr. Prabad Pratim Pal**	**DSC1DT: Genetics and Evolutionary Biology** **Unit 1: Introduction to Genetics** Mendel's work on transmission of traits, Genetic Variation, Molecular basis of genetic information **Unit 2: Mendelian Genetics and its Extension** Principles of Inheritance, Chromosome theory of inheritance, Incomplete dominance and codominance, Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, sex linked inheritance,extra-chromosomal inheritance **Unit 3: Linkage, Crossing Over and Chromosomal Mapping** 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 **Unit 4: Mutations** Chromosomal Mutations: Deletion; Duplication; Inversion; Translocation; Aneuploidyand Polyploidy; Gene mutations: Induced versus Spontaneous mutations, Back versus Suppressor mutations,
	Mrs. Sanchita Nayak	**Unit 5: Sex Determination** Chromosomal mechanisms, dosage compensation **Unit 6: History of Life** Major Events in History of Life **Unit 7: Introduction to Evolutionary Theories** Lamarckism, Darwinism, Neo-Darwinism **Unit 8: Direct Evidences of Evolution** Types of fossils, Incompleteness of fossil record, Dating of fossils, Phylogeny of horse
	Mr. Debkumar Sahoo (DS)	**Unit 9: Processes of Evolutionary Change** Organic variations; Isolating Mechanisms; Natural selection (Example: Industrial melanism); Types of natural selection (Directional, Stabilizing, Disruptive), Artificialselection **Unit 10: Species Concept** Biological species concept (Advantages and Limitations); Modes of speciation (Allopatric,Sympatric) **Unit 11: Macro-evolution** Macro-evolutionary Principles (example: Darwin's Finches) **Unit 12: Extinction** Mass extinction (Causes, Names of five major extinctions, K-T extinction in detail), Roleof extinction in evolution

DSC1DP: Genetics and Evolutionary Biology (Practical)	**Mr. Debkumar Sahoo (DS)**	1. Study of Mendelian inheritance and gene interactions (Non- Mendelianinheritance) using suitable examples. Verify the results using Chi-square test. 2. Study of Linkage, recombination, gene mapping using the data. 3. Study of Human Karyotypes (normal and abnormal). 4. Study of fossil evidences from plaster cast models and pictures 5. Study of homology and analogy from suitable specimens/ pictures 6. Charts: a. Phylogeny of horse with diagrams/ cut outs of limbs and teeth of horseancestors b. Darwin's Finches with diagrams/ cut outs of beaks of different species 7. Visit to Natural History Museum and submission of report
SEC2T: Aquarium Fish Keeping	**Mr. Debkumar Sahoo (DS) & Prabad Pratim Pal**	**Unit1: Introduction to Aquarium Fish Keeping** The potential scope of Aquarium Fish Industry as a Cottage Industry, Exotic and Endemic species of Aquarium Fishes **Unit 2: Biology of Aquarium Fishes** 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 **Unit 3: Food and feeding of Aquarium fishes** Use of live fish feed organisms. Preparation and composition of formulated fish feeds **Unit 4: Fish Transportation** Live fish transport - Fish handling, packing and forwarding techniques. **Unit 5: Maintenance of Aquarium** General Aquarium maintenance – budget for setting up an Aquarium Fish Farm as a Cottage Industry
C10P: Immunology Lab	**Mr. Santosh Kumar Bera (SKB)**	**List of Practical** 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

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<tr><th colspan="3">Sem – V</th></tr>
<tr><th>Paper</th><th>Teacher</th><th>Detailed Syllabus</th></tr>
<tr><td rowspan="3">DSE1T: Applied Zoology</td><td>Mr. Debasish Maity</td><td>Unit 1: Introduction to Host-parasite Relationship
Host, Definitive host, Intermediate host, Parasitism, Symbiosis, Commensalism,Reservoir, Zoonosis

Unit 2: Epidemiology of Diseases
Transmission, Prevention and control of diseases: Tuberculosis, typhoid

Unit 3: Rickettsiae and Spirochaetes
Brief account of Rickettsia prowazekii, Borrelia recurrentis and Treponema pallidum

Unit 4: Parasitic Protozoa
Life history and pathogenicity of Entamoeba histolytica, Plasmodium vivax and Trypanosoma gambiense</td></tr>
<tr><td>Mrs. Sanchita Nayak</td><td>Unit 5: Parasitic Helminthes
Life history and pathogenicity of Ancylostoma duodenale and Wuchereria bancrofti

Unit 6: Insects of Economic Importance
Biology, Control and damage caused by Helicoverpa armigera, Pyrilla perpusilla and Papilio demoleus, Callosobruchus chinensis, Sitophilus oryzae and Tribolium castaneum

Unit 7: Insects of Medical Importance
Medical importance and control of Pediculus humanus corporis, Anopheles, Culex, Aedes,Xenopsylla cheopis</td></tr>
<tr><td>Mr. Prabad Pratim Pal</td><td>Unit 8: Animal Husbandry
Preservation and artificial insemination in cattle; Induction of early puberty andsynchronization of estrus in cattle

Unit 9: Poultry Farming
Principles of poultry breeding, Management of breeding stock and broilers, Processing andpreservation of eggs

Unit 10: Fish Technology
Genetic improvements in aquaculture industry; Induced- breeding and transportation offish seed</td></tr>
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DSE1P: Applied Zoology (Practical)	**Mrs. Sanchita Nayak & Mr. Debasish Maity**	1. Study of *Plasmodium vivax*, *Entamoeba histolytica, Trypanosoma gambiense, Ancylostoma duodenale* and *Wuchereria bancrofti* and their life stages through permanent slides/photomicrographs or specimens. *2.* Study of arthropod vectors associated with human diseases: *Pediculus, Culex,Anopheles, Aedes* and *Xenopsylla.* 3. Study of insect damage to different plant parts/stored grains through damaged products/photographs. *4.* Identifying feature and economic importance of *Helicoverpa* (*Heliothis*) *armigera*, *Papilio demoleus*, *Pyrilla perpusilla, Callosobruchus chinensis, Sitophilus oryzae* and *Tribolium castaneum* 5. Visit to poultry farm or animal breeding centre. Submission of visit report 6. Maintenance of freshwater aquarium
SEC-3: Medical Diagnostics	**Mr. Debasish Maity**	**SEC3T:Medical Diagnostcs** **Unit 1: Introduction to Medical Diagnostics and its Importance** **Unit 2: Diagnostics Methods Used for Analysis of Blood** Blood composition, Preparation of blood smear and Differential Count (D.C) using Leishman's stain, Platelet count using haemocytometer, Erythrocyte Sedimentary Rate (E.S.R), Packed Cell Volume (P.C.V.)
	Mrs. Sanchita Nayak	**Unit 3: Diagnostic Methods Used for Urine Analysis** Urine Analysis: Physical characteristics; Abnormal constituents **Unit 4:Non-infectious Diseases** Causes, types, symptoms, complications, diagnosis and prevention of Diabetes (Type I andType II), Hypertension (Primary and secondary), Testing of blood glucose using Glucometer/Kit **Unit 5: Infectious Diseases** Causes, types, symptoms, diagnosis and prevention of Tuberculosis and Hepatitis **Unit 6: Tumours** Types (Benign/Malignant), Detection and metastasis; Medical imaging: X-Ray of Bone fracture, PET, MRI and CT Scan (using photographs).

Sem – VI		
Paper	**Teacher**	**Detailed Syllabus**
DSE2T: Reproductive Biology	**Mr. Debasish Maity**	**Unit 1: Reproductive Endocrinology** Gonadal hormones and mechanism of hormone action, steroids, glycoprotein hormones, and prostaglandins, hypothalamo – hypophyseal – gonadal axis, regulation of gonadotrophin secretion in male and female; Reproductive System: Development and differentiation of gonads, genital ducts, external genitalia, mechanism of sex differentiation. **Unit 2: Functional anatomy of male reproduction** Outline and histological structure of male reproductive system in rat and human; Testis: Cellular functions, germ cell, system cell renewal; Spermatogenesis: kinetics and hormonal regulation; Androgen synthesis and metabolism; Epididymal function and spermmaturation; Accessory glands functions; Sperm transportation in male tract
	Mrs. Sanchita Nayak	**Unit 3: Functional anatomy of female reproduction** Outline and histological structure of female reproductive system in rat and human; Ovary: folliculogenesis, ovulation, corpus luteum formation and regression; Steroidogenesis and secretion of ovarian hormones; Reproductive cycles (rat and human) and their regulation, changes in the female tract; Ovum transport in the fallopian tubes; Sperm transport in the female tract, 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 **Unit 4: Reproductive Health** Infertility in male and female: causes, diagnosis and management; Assisted Reproductive Technology: sex selection, sperm banks, frozen embryos, in vitro fertilization, ET, EFT, IUT, ZIFT, GIFT, ICSI, PROST; Modern contraceptive technologies; Demographic terminology used in family planning

DSE2P: Reproductive Biology (Practical)	**Mrs. Sanchita Nayak & Mr. Debasish Maity**	1. Study of animal house: set up and maintenance of animal house, breedingtechniques, care of normal and experimental animals. 2. Examination of vaginal smear rats from live animals. 3. Surgical techniques: principles of surgery in endocrinology. Ovarectomy,hysterectomy, castration and vasectomy in rat. 4. Examination of histological sections from photomicrographs/ permanent slides ofrat/human: testis, epididymis and accessory glands of male reproductive systems; Sections of ovary, fallopian tube, uterus (proliferative and secretory stages),cervix and vagina. 5. Human vaginal exfoliate cytology. 6. Sperm count and sperm motility in rat Study of modern contraceptive devices
SEC4T: Sericulture	**Mr. Prabad Pratim Pal**	**Unit 1: Introduction** Sericulture: Definition, history and present status; Silk route, Types of silkworms, Distribution and Races, Exotic and indigenous races, Mulberry and non-mulberry Sericulture **Unit 2: Biology of Silkworm** Life cycle of *Bombyx mori*, Structure of silk gland and secretion of silk **Unit 3: Rearing of Silkworms** 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 andstorage of cocoons **Unit 4: Pests and Diseases** Pests of silkworm: Uzi fly, dermestid beetles and vertebrates, Pathogenesis of silkworm diseases: Protozoan, viral, fungal and bacterial. Control and prevention of pests anddiseases **Unit 5: Entrepreneurship in Sericulture** Prospectus of Sericulture in India: Sericulture industry in different states, employment, potential in mulberry and non-mulberry sericulture. Visit to various, sericulture centres.