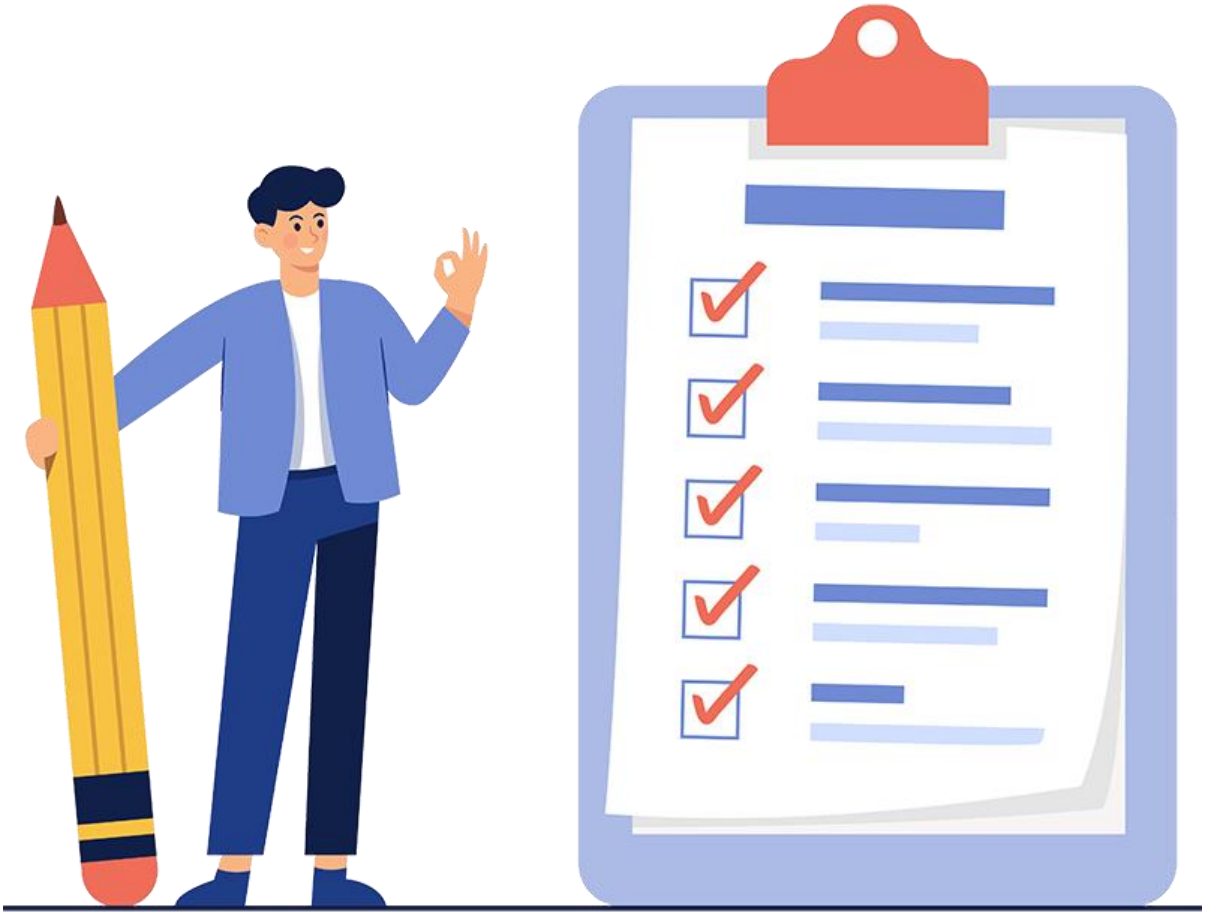
Lesson Plans



LESSON PLAN FOR ODD SEMESTERS

DEPARTMENT OF ZOOLOGY
SOVARANI MEMORIAL COLLEGE

Semester-I Honours

Core Course 1: Non-Chordates I

Theory	Teacher	Hours
Unit 1: Basics of Animal Classification Definitions: Classification, Systematics and Taxonomy; Taxonomic Hierarchy, Taxonomic types Codes of Zoological Nomenclature; Principle of priority; Synonymy and Homonymy; Concept of classification – three kingdom concept of Carl Woese, 1977 and five kingdom concept of Whittaker, 1969	MP	4
Unit 2: Protista and Metazoa General characteristics and Classification up to Classes (according to Levine *et. al.*, 1980)	MP	1
Locomotion in *Euglena*, *Paramoecium* and *Amoeba*; Conjugation in *Paramoecium*.	SB	3
Life cycle and pathogenicity of *Plasmodium vivax* and *Entamoeba histolytica.* Evolution of symmetry and segmentation of Metazoa	MP	2
Unit 3: Porifera General characteristics and Classification up to sub-classes (Ruppert and Barnes, 1994, 6th Ed.); Canal system and spicules in sponges	MP	3
Unit 4: Cnidaria General characteristics and Classification up to sub-classes (Ruppert and Barnes, 1994, 6th Ed.)	MP	1
Metagenesis in *Obelia*; Polymorphism in Cnidaria; Corals and coral reef diversity, Role of symbiotic algae in reef formation. Conservation of coral and coral reefs.	SB	3
Unit 5: Ctenophora General characteristics	MP	1
Unit 6: Platyhelminthes General characteristics and Classification up to sub-classes (Ruppert and Barnes, 1994, 6th Ed.) Life cycle and pathogenicity and control measures of *Fasciola hepatica* and *Taenia*	MP	4
Unit 7: Nematoda General characteristics and Classification up to sub-classes (Ruppert and Barnes, 1994, 6th Ed.), Life cycle, and pathogenicity and control measures of *Ascaris lumbricoides* and *Wuchereria bancrofti*. Parasitic adaptations in helminthes.	MP	4
Practical	**Teacher**	**Hours**
Study of whole mount of *Euglena*, *Amoeba* and *Paramoecium*	SB	2
Identification with reason & Systematic position of *Amoeba*, *Euglena*, *Entamoeba*, *Paramecium*, *Plasmodium*, *Balantidium*, *Vorticella* (from the prepared slides) Identification with reason & Systematic position of *Sycon*, *Poterion* (Neptune's Cup), *Obelia*, *Physalia*, *Aurelia*, *Gorgonia*, *Metridium*, *Pennatula*, *Madrepora*, *Fasciola hepatica*, *Taenia solium* and *Ascaris lumbricoides.*	MP	6
Staining/mounting of any protozoa/helminth from gut of *Periplaneta* sp.	SB	2

Core Course 2: Molecular Biology

Theory	Teacher	Hours
Unit 1: Nucleic Acids Salient features of DNA, Chargaff's Rule, Hypo and Hyperchromic shift. Watson and Crick Model of DNA. RNA types & Function.	SM	3
Unit 2: DNA Replication Prove that replication is Semi-conservative, bidirectional and discontinuous. Mechanism of DNA Replication in Prokaryotes, RNA priming, Replication of telomeres.	SM	5
Unit 3: Transcription Mechanism of Transcription in prokaryotes and eukaryotes, Transcription factors, Difference between prokaryotic and eukaryotic transcription.	SM	5
Unit 4: Translation Genetic code, Degeneracy of the genetic code and Wobble Hypothesis. Mechanism of protein synthesis in prokaryotes.	SM	5
Unit 5: Post Transcriptional Modifications and Processing of Eukaryotic RNA Capping and Poly A tail formation in mRNA; Split genes: concept of introns and exons, splicing mechanism, alternative splicing and RNA editing	SM	3
Unit 6: Gene Regulation Regulation of Transcription in prokaryotes: *lac* operon and *trp* operon; Regulation of Transcription in eukaryotes: Activators, enhancers, silencer, repressors, miRNA mediated gene silencing. Epigenetic Regulation: DNA Methylation, Histone Methylation & Acetylation.	MP	5
Unit 7: DNA Repair Mechanisms Types of DNA repair mechanisms, RecBCD model in prokaryotes, nucleotide and base excision repair, SOS repair	MP	4
Unit 8: Molecular Techniques PCR, Western and Southern blot, Northern Blot	SM	3
Practical	**Teacher**	**Hours**
Demonstration of polytene and lampbrush chromosome from photograph	SM	1
Isolation and quantification of genomic DNA from goat liver.	SM	3
Agarose gel electrophoresis for DNA.	SM	2
Histological staining of DNA and RNA in prepared slides	SM	4

Semester-III Honours

Core Course 5: Chordata

Theory	Teacher	Hours
Unit 1: Introduction to Chordates General characteristics and outline classification of Phylum Chordata (Young, 1981)	MP	1
Unit 2: Protochordata General characteristics and classification of sub-phylum Urochordata and Cephalochordata up to Classes (Young, 1981). Metamorphosis in *Ascidia*. Chordate Features, structure of pharynx and feeding in *Branchiostoma*	MP	4
Unit 3: Agnatha General characteristics and classification of cyclostomes up to order (Young, 1981)	MP	1
Unit 4: Pisces General characteristics and classification up to living sub-classes (Young, 1981); Accessory respiratory organ, Migration in fishes; Parental care in fishes; Swim bladder in fishes.	MP	5
Unit 5: Amphibia General characteristics and classification up to living Orders (Young, 1981); Metamorphosis, Paedomorphosis, Parental care in Amphibia	MP+SM	3
Unit 6: Reptilia General characteristics and classification up to living Orders (Young, 1981); Poison apparatus and Biting mechanism in Snake. Poisonous & Non-Poisonous snake.	MP+SM	3
Unit 7: Aves General characteristics and classification up to living Orders (Young, 1981); Exoskeleton and migration in Birds; Principles and aerodynamics of flight.	MP+TD	3
Unit 8: Mammals General characters and classification up to living Orders (Young, 1981); Exoskeleton derivatives of mammals; Adaptive radiation in mammals with reference to locomotory appendages; Echolocation in Micro chiropterans	MP	4
Practical	**Teacher**	**Hours**
Identification with Reasons a) **Protochordata**: *Balanoglossus, Branchiostoma* b) **Agnatha**: *Petromyzon* c) **Fishes**: *Scoliodon, Sphyrna, Pristis, Torpedo, Mystus, Heteropneustes, Labeo rohita, Exocoetus, Hippocampus, Anabas*, Flat fish d) **Amphibia**: *Necturus, Bufo (Duttaphrynus) melanostictus, Rana (Hoplobatrachus) tigerinus, Hyla, Tylototriton,* Axolotl larva e) **Reptilia**: Chelone, Trionyx, Hemidactylus, Varanus, *Calotes, Chamaeleon, Draco, Vipera, Naja, Hydrophis,* f) **Mammalia**: Bat (Insectivorous and Frugivorous), *Funambulus* (Indian Palm squirrel)	MP	6
Dissection of brain and pituitary – *ex situ*, digestive and Urino-genital system of *Tilapia* Pecten from Fowl head	SB	4
Power point presentation on study of habit, habitat or behaviour of any one animal by student – for internal assessment only	SM	4

Core Course 6: Animal Physiology – Controlling and Coordinating System

Theory	Teacher	Hours
Unit 1: Tissues Structure, location, classification and functions of epithelial tissue, connective tissue, muscular tissue and nervous tissue	SM	4
Unit 2: Bone and Cartilage Structure and types of bones and cartilages, Ossification	SM	3
Unit 3: Nervous System Structure of neuron, resting membrane potential, Origin of action potential and its propagation across the myelinated and non-myelinated nerve fibres; Types of synapse, Synaptic transmission and Neuromuscular junction	SM	6
Unit 4: Muscular system Histology of different types of muscle; Ultra-structure of skeletal muscle; Molecular and chemical basis of muscle contraction; Characteristics of muscle fibre	SM	4
Unit 5: Reproductive System Histology of mammalian testis and ovary; physiology of mammalian reproduction – menstrual and oestrous cycle	SM	3
Unit 6: Endocrine System Histology and function of thyroid, pancreas and adrenal. Function of pituitary 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; Placental hormones	SB	6
Practical	**Teacher**	**Hours**
Recording of cardiac and simple muscle twitch with electrical stimulation		
Preparation of temporary mounts: Squamous epithelium, Striated muscle fibres and nerve cells	SM	2
Study of permanent slides of Mammalian Skin, Spinal cord, Pancreas, Testis, Ovary, Adrenal, Lung, pyloric stomach, cardiac stomach, Thyroid, small intestine and large intestine of mammal (white rat)	SM	4
Microtomy: Preparation of permanent slide of any five mammalian (Goat/white rat) tissues	SM	3

Core Course 7: Fundamentals of Biochemistry

Theory	Teacher	Hours
Unit 1: Carbohydrates Structure and Biological importance: Monosaccharides, Disaccharides, Polysaccharides; Derivatives of Monosaccharides; Carbohydrate metabolism: Glycolysis, Citric acid cycle, Pentose phosphate pathway, Gluconeogenesis	TD	8
Unit 2: Lipids Structure and Significance: Physiologically important saturated and unsaturated fatty acids, Tri-acylglycerols, Phospholipids, Sphingolipid, Glycolipids, Steroids, Eicosanoids and terpinoids. Lipid metabolism: β-oxidation of fatty acids - a. Palmitic acid {saturated (C 16:0)}, b. Linoleic acid {unsaturated (C 18:2)}; Fatty acid biosynthesis	TD	5
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	TD	8
Unit 4: Nucleic Acids Structure of Purines, Pyrimidines, Nucleosides and Nucleotides; Nucleic Acid Metabolism: Catabolism of adenosine, Guanosine, cytosine and thymine.	TD	2
Unit 5: Enzymes Nomenclature and classification; Cofactors; Specificity of enzyme action; Isozymes; Mechanism of enzyme action; Enzyme kinetics; Derivation of Michaelis-Menten equation, Lineweaver-Burk plot; Factors affecting rate of enzyme-catalyzed reactions; Enzyme inhibition.	TD	8
Unit 6: Oxidative Phosphorylation Redox systems; Mitochondrial respiratory chain, Inhibitors and un-couplers of Electron Transport System	TD	2
Practical	**Teacher**	**Hours**
Qualitative tests for carbohydrates, proteins and lipids	TD	**3**
Qualitative estimation of Urea & Uric acid	TD	**2**
Paper chromatography of amino acids	TD	**1**
Quantitative estimation of water soluble proteins following Lowry Method	TD	**5**

Skill Enhancement Course 1: Apiculture

Theory	Teacher	Hours
Unit 1: Biology of Bees *Apis* and Non-*Apis* Bee species and their identification. General Morphology of *Apis* Honey Bees Social Organization of Bee Colony	SB	2
Unit 2: Rearing of Bees Artificial Bee rearing (Apiary), Beehives – Newton and Langstroth box Bee Pasturage Selection of Bee Species for Apiculture Modern Bee Keeping Equipment Methods of Extraction of Honey (Indigenous and Modern)	SB	4
Unit 3: Diseases and Enemies Bee Diseases and Enemies Control and Preventive measures	SB	4
Unit 4: Bee Economy Products of Apiculture Industry and its Uses – Honey, Bees Wax, Propolis, Pollen etc.	SB	2
Unit 5: Entrepreneurship in Apiculture Bee Keeping Industry – Recent Efforts, Modern Methods in employing artificial Beehives for cross pollination in horticultural gardens	SB	2

Semester-V Honours

Core Course 11: Ecology

Theory	Teacher	Hours
Unit 1: Introduction to Ecology Autecology and synecology, Levels of organization, Laws of limiting factors, Study of Physical factors, The Biosphere.	TD	2
Unit 2: Population Unitary and Modular populations Unique and group attributes of population: Demographic factors, life tables, fecundity tables, survivorship curves, dispersal and dispersion. Geometric, exponential and logistic growth, equation and patterns, r and K strategies Population regulation - density-dependent and independent factors, Population Interactions, Gause's Principle with laboratory and field examples, Lotka-Volterra equation for competition.	TD	10
Unit 3: Community Community characteristics: species diversity, abundance, dominance, richness,Vertical stratification, Ecotone and edge effect; Ecological succession with one example.	TD	5
Unit 4: Ecosystem Types of ecosystem with an example in detail, Food chain: Detritus and grazing food chains, Linear and Y-shaped food chains, Food web, Energy flow, Ecological pyramids and Ecological efficiencies; Nitrogen cycle.	TD	5
Unit 5: Applied Ecology Types & level of biodiversity Mega-diversity countries, Biodiversity Hot spot, Flagship species, Keystone species, Wildlife Conservation (*in situ* and *ex situ* conservation), concept of protected areas. Red data book, Indian wild life act & Schedule. Concept of corridor, advantages and problem of corridor. Threats to survival and conservation strategies for Tiger, Olive ridley, White Rumped Vulture.	TD	6
Practical	**Teacher**	**Hours**
Determination of population density in a natural/hypothetical community by quadrate method and calculation of Shannon-Weiner diversity index for the same community	TD	3
Study of an aquatic ecosystem: Phytoplankton and zooplankton, Measurement of area, temperature, salinity, determination of pH, and Dissolved Oxygen content (Winkler's method), Chemical Oxygen Demand and free CO_2	TD	8
Report on a visit to National Park/Biodiversity Park/Wild life sanctuary/ any place of ecological interest/ ecological uniqueness/ Zoological garden	TD	

Core Course 12: Principles of Genetics

Theory	Teacher	Hours
Unit 1: Mendelian Genetics and its Extension Principles of inheritance, Incomplete dominance and co-dominance, Epistasis, Multiple alleles, Isoallele (White eye mutations), Pseudoallele (Lozenge Locus) & Cis-trans test for allelism, Lethal alleles, Pleiotropy, Penetrance & Expressivity	MP	4
Unit 2: Linkage, Crossing Over and Linkage Mapping Linkage and Crossing, Complete & Incomplete Linkage, Measuring Recombination frequency and linkage map construction using three factor crosses, Interference and coincidence Sex linkage in *Drosophila* (White eye locus) & Human (Haemophilia).	SM	10
Unit 3: Mutations Types of gene mutations (Classification), Types of chromosomal aberrations (Classification with one suitable example from *Drosophila* and Human of each), variation in chromosome number; Non- disjunction of X chromosome in *Drosophila*; Non-disjunction of Human Chromosome 21. Molecular basis of mutations in relation to UV light and chemical mutagens. Mutation detection in *Drosophila* by attached X method. Biochemical mutation detection in *Neurospora*.	MP	6
Unit 4: Sex Determination Mechanisms of sex determination in *Drosophila* and in man; Dosage compensation in *Drosophila* & Human	MP	5
Unit 5: Extra-chromosomal Inheritance Kappa particle in *Paramoecium*, Shell spiralling in snail	MP	2
Unit 6: Genetic Fine Structure Complementation test in Bacteriophage (Benzer's experiment on rII locus)	MP	2
Unit 7: Transposable Genetic Elements IS element in bacteria, Ac-Ds elements in maize and P elements in *Drosophila*, LINE, SINE, Alu elements in humans	MP	4
Practical	**Teacher**	**Hours**
Chi-square analyses for genetic ratio test	SM	**5**
Identification of chromosomal aberration in *Drosophila* and man from photograph	SM	**2**
Pedigree analysis of some inherited traits in animals	SM	**5**

Discipline Specific Elective A1: Parasitology

Theory	Teacher	Hours
Unit 1: Introduction to Parasitology Brief introduction of Parasitism, Parasite, Parasitoid and Vectors (mechanical and biological vector); Host parasite relationship	SM	1
Unit 2: Parasitic Protists Study of Morphology, Life Cycle, Prevalence, Epidemiology, Pathogenicity, Diagnosis, Prophylaxis and Treatment of *Giardia intestinalis*, *Trypanosoma gambiense*, *Leishmania donovani*	SM	3
Unit 3: Parasitic Platyhelminthes Study of Morphology, Life Cycle, Prevalence, Epidemiology, Pathogenicity, Diagnosis, Prophylaxis and Treatment of *Schistosoma haematobium*, *Taenia solium*	SM	2
Unit 4: Parasitic Nematodes Study of Morphology, Life Cycle, Prevalence, Epidemiology, Pathogenicity, Diagnosis, Prophylaxis and Treatment of *Ascaris lumbricoides*, *Ancylostoma duodenale*, *Wuchereria bancrofti*, Nematode plant interaction.	SM	4
Unit 5: Parasitic Arthropods Biology, importance and control of ticks: Soft tick (*Ornithodoros)*, Hard tick (*Ixodes*), mites (*Sarcoptes*), Lice (*Pediculus*), Flea (*Xenopsylla*) and Bug (*Cimex*). Parasitoid.	SM	6
Unit 6: Parasite Vertebrates Cookicutter Shark, Hood Mocking bird, Vampire bats their parasitic behaviour and effect on host.	SM	3
Practical	**Teacher**	**Hours**
Study of life stages of *Giardia intestinalis*, *Trypanosoma gambiense*, *Leishmania donovani*, *Plasmodium vivax*, *Plasmodium falciparum* through permanent slides/micro photographs	SM	1
Study of adult and life stages of *Schistosoma haematobium*, *Taenia solium* through permanent slides/micro photographs	SM	1
Study of adult and life stages of *Ancylostoma duodenale* through permanent slides/micro photographs.	SM	1
Study of monogenea from the gills of fresh/marine fish [Gills can be procured from fish market as by product of the industry]	SM	3
Study of nematode/cestode parasites from the intestines of Poultry bird [Intestine can be procured from poultry/market as a by-product] & Goat.	SM	3
Submission of a brief report on parasitic vertebrates	SM	

Discipline Specific Elective B1: Endocrinology

Theory	Teacher	Hours
Unit 1: Introduction to Endocrinology General idea of Endocrine systems, Classification, Characteristic and Transport of Hormones, Neuro-secretions and Neuro-hormones: Examples and Functions	SB	3
Unit 2: Hypothalamo-Hypophyseal Axis Structure and functions of hypothalamus and Hypothalamic nuclei Regulation of neuroendocrine glands, Feedback mechanisms, Hypothalamo-Hypophyseal-Gonadal Axis. Structure of pituitary gland, Hormones and their functions, Hypothalamo-hypophyseal portal system	SB	6
Unit 3: Peripheral Endocrine Glands Structure, Hormones and Functions of Thyroid gland, Parathyroid, Adrenal, Pancreas, Ovary and Testis. Disorders of endocrine glands (*Diabetes mellitus* type I & Type II; Graves' Disease).	SB	6
Unit 4: Regulation of Hormone Action Mechanism of action of steroidal, non-steroidal hormones with receptors (cAMP, IP3-DAG), Calcium and Glucose homeostasis in mammals. Bioassays of hormones using RIA & ELISA, Oestrous cycle in rat and menstrual cycle in human.	SB	6
Unit 5. Non Mammalian Vertebrate Hormone Functions of Prolactin in Fishes, Amphibia & Birds Function of Melanotropin in Teleost fishes, Amphibians and Reptiles.	SB	4
Practical	**Teacher**	**Hours**
Dissect and display of Endocrine glands in laboratory bred rat.	SB	5
Study of the permanent slides of all the endocrine glands	SB	2
Tissue fixation, embedding in paraffin, microtomy and slide preparation of any endocrine gland	SB	-
H-E staining of Histological slides	SB	5

Semester-I General

Core Course 1: Animal Diversity

Theory	Teacher	Hours
Unit 1: Kingdom Protista - General characters and classification up to classes (Levine et. al., 1980); Locomotory Organelles and locomotion in *Amoeba* and *Paramecium*	**MP**	**2**
Unit 2: Phylum Porifera - General characters and classification up to classes (Ruppert and Barnes, 1994, 6th Ed.); Canal System in *Sycon*	**MP**	**2**
Unit 3: Phylum Cnidaria - General characters and classification up to classes (Ruppert and Barnes, 1994, 6th Ed.); Metagenesis in *Obelia*	**SM**	**2**
Unit 4: Phylum Platyhelminthesm - General characters and classification up to classes (Ruppert and Barnes, 1994, 6th Ed.); Life history of *Taenia solium*	**TD**	**2**
Unit 5: Phylum Nematoda - General characters and classification up to classes (Ruppert and Barnes, 1994, 6th Ed.); Life history of *Ascaris lumbricoides* and its adaptation	**TD**	**2**
Unit 6: Phylum Annelida - General characters and classification up to classes (Rupert and Barnes, 1994, 6th Ed.); Metamerism in Annelida	**MP**	**2**
Unit 7: Phylum Arthropoda - General characters and classification up to classes (Ruppert and Barnes, 1994, 6th Ed.); Eye in Cockroach, Metamorphosis in Lepidoptera	**SM**	**3**
Unit 8: Phylum Mollusca - General characters and classification up to classes (Ruppert and Barnes, 1994, 6th Ed.); Respiration in *Pila*	**SB**	**2**
Unit 9: Phylum Echinodermata - General characters and classification up to classes (Ruppert and Barnes, 1994, 6th Ed.); Water- vascular system in Asteroidea	**SM**	**2**
Unit 10: Protochordates - General Characters ; Pharynx and feeding mechanism in *Amphioxus*	**MP**	**2**
Unit 11: Agnatha - General features of Agnatha and classification of cyclostomes up to classes (Young, 1981)	**MP**	**1**
Unit 12: Pisces - General features and Classification up to sub-classes (Young, 1981); Osmoregulation in Fishes	**SB**	**2**
Unit 13: Amphibia - General features and Classification up to living classes (Young, 1981); Parental care	**TD**	**2**
Unit 14: Reptilia - General features and Classification up to living classes (Young, 1981); Poisonous and non- poisonous snakes, Biting mechanism	**SB**	**3**
Unit 15: Aves - General features and Classification up to living sub-classes (Young, 1981); Flight adaptations in birds	**TD**	**2**
Unit 16: Mammalia - Classification up to living sub-classes (Young, 1981); Hair, Horn & Antler, Nail & claw	**SB**	**2**
Practical	**Teacher**	**Hours**
Identification with reasons of the following specimens: *Amoeba, Euglena, Paramecium, Sycon, Obelia, Aurelia, Metridium, Taenia solium, Ascaris lumbricoides* (Male and female), *Aphrodite, Nereis, Hirudinaria, Palaemon, Cancer, Limulus, Apis, Chiton, Dentalium, Unio, Sepia, Octopus, Echinus, Cucumaria* and *Antedon, Balanoglossus, Branchiostoma, Petromyzon, Torpedo, Labeo rohita, Exocoetus, Salamandra, Hyla, Chelone, Hemidactylus, Chamaeleon, Draco, Vipera, Naja*, Bat, *Funambulus*	MP	**10**
Key for Identification of poisonous and non-poisonous snakes	**SM**	**1**
Study of anatomy of digestive system, salivary gland, mouth parts of *Periplaneta*, Study of reproductive system of female cockroach	**SB**	**8**
An "animal album" containing photographs, cut outs, with appropriate write up about the above mentioned taxa. Different taxa/ topics may be given to different sets of students for this purpose	**ALL**	**-**

Semester-III General

Core Course 3: Physiology and Biochemistry

Theory	Teacher	Hours
Unit 1: Nerve and muscle Structure of a neuron, resting membrane 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	SM	4
Unit 2: Digestion Physiology of digestion in the alimentary canal; Absorption of carbohydrates, proteins, lipids	SM	3
Unit 3: Respiration Pulmonary ventilation, Transport of Oxygen and carbo-di-oxide	SM	3
Unit 4: Cardio-vascular system Composition of blood, Structure of Heart, Origin and conduction of the cardiac impulse, cardiac cycle	SM	3
Unit 5: Excretion Structure of nephron, Mechanism of Urine formation; Counter-current Mechanism	SM	3
Unit 6:Reproduction and Endocrine Glands Physiology of male reproduction: Histology of testis, hormonal control of spermatogenesis; Physiology of female, reproduction: Histology of ovary, hormonal control of menstrual cycle. Structure and function of pituitary, thyroid, pancreas and adrenal	SM	5
Unit 7: Carbohydrate Metabolism Glycolysis, Kreb's cycle, Glycogenesis, Electron Transport Chain	TD	4
Unit 8: Lipid metabolism Beta oxidation of Palmitic acid {saturated (C 16:0)} and Linoleic acid {unsaturated (C 18:2)}	TD	2
Unit 9: Protein Metabolism Transamination, Deamination, Urea cycle	TD	3
Unit 10. Enzyme Enzyme Classification, factors affecting enzyme action, Inhibition	TD	2
Practical	**Teacher**	**Hours**
Study of permanent histological sections of mammalian pituitary, thyroid, pancreas, adrenal gland	SM	2
Study of permanent histological sections of mammalian duodenum, liver, lung, kidney	SM	2
Qualitative test for carbohydrate samples	TD	2

Skill Enhancement Course A1: Apiculture

Theory	Teacher	Hours
Unit 1: Biology of Bees Classification and Biology of Honey Bees Social Organization of Bee Colony	SB	2
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	SB	4
Unit 3: Diseases and Enemies Bee Diseases and Enemies Control and Preventive measures	SB	4
Unit 4: Bee Economy Products of Apiculture Industry and its Uses – Honey, Bees Wax, Propolis, Pollen etc.	SB	2
Unit 5: Entrepreneurship in Apiculture Bee Keeping Industry – Recent Efforts, Modern Methods in employing artificial Beehives for cross pollination in horticultural gardens	SB	2

Semester-V General

Discipline Specific Elective A1: Applied Zoology

Theory	Teacher	Hours
Unit I: Host & Parasite Relationship Type of Host, Types of Parasites, Other types of Relations	SM	1
Unit 2: Epidemiology of Diseases Transmission, Prevention and Control of Tuberculosis and Typhoid	SM	1
Unit 3: Parasitic Protozoa Life History and pathogenicity of *Entamoeba histolytica*, *Plasmodium vivax* and *Trypanosoma gambiense*	SM	3
Unit 4: Parasitic Helminthes Life History and pathogenicity of *Alcylostoma duodenale, Wuchereria bancrofti*	SM	2
Unit 5: Insect of Economic Importance Biology, Control and Damage caused by *Heliocoverpa armigera, Pyrilla perpusilla, Sytophilus oryzae* and *Tribolium casteneum*.	MP	4
Unit 6: Insect of Medical Importance Medical Importance and control of *Anopheles*	MP	1
Unit 7: Animal Husbandry Preservation and artificial insemination in cattle; Induction of early puberty and synchronization of oestrus in cattle	MP	3
Unit 8: Poultry Farming Principles of poultry breeding, Management of breeding stock and broilers, Processing and preservation of eggs	MP	3
Unit 9: Fish Technology Genetic improvements in aquaculture industry; Induced breeding and transportation of fish seed	SB	2
Practical	**Teacher**	**Hours**
Study of *Plasmodium vivax, Entamoeba histolytica, Trypanosoma gambiense, Ancylostoma duodenale* and *Wuchereria bancrofti* and their life stages through permanent slides/photomicrographs or specimens	SM	2
Study of arthropod vectors associated with human diseases: *Pediculus, Culex, Anopheles, Aedes*	MP	1
Study of insect damage to different plant parts/stored grains through damaged products/photographs	MP	2
Identifying feature and economic importance of *Helicoperva; Heliothis armigera,Papilio demoleus*, *Pyrilla perpusilla*, *Callosobruchus chinensis, Sitophilus oryzae* and *Tribolium castaneum*	MP	4
Visit to poultry farm or animal breeding centre. Submission of visit report		
Maintenance of freshwater aquarium(demonstration only)		

LESSON PLAN FOR EVEN SEMESTERS

DEPARTMENT OF ZOOLOGY

SOVARANI MEMORIAL COLLEGE

Semester-II Honours

Core Course 3: Non-Chordates II - Coelomates

Theory	Teacher	Hours
Unit 1: Introduction Evolution of coelom	**MP**	**1**
Unit 2: Annelida General characteristics and Classification up to classes (Ruppert and Barnes, 1994) Excretion in Annelida through nephridia; Metamerism in Annelida.	**MP**	**5**
Unit 3: Arthropoda General characteristics and Classification up to classes (Ruppert and Barnes, 1994); Insect Eye (Cockroach only). Respiration in Prawn and Cockroach; Metamorphosis in Lepidopteran Insects; Social life in Termite	**SM**	**8**
Unit 4: Onychophora General characteristics and Evolutionary significance	**MP**	**1**
Unit 5: Mollusca General characteristics and Classification up to classes (Ruppert and Barnes, 1994); Nervous system in *Pila sp*. Torsion in Gastropoda. Feeding and respiration in *Pila* sp.	**MP+SB**	**5**
Unit 6: Echinodermata General characteristics and Classification up to classes (Ruppert and Barnes, 1994); Watervascular system in *Asterias*. Echinoderm larva and affinities with chordates	**MP+SM**	**4**
Unit 7: Hemichordata General characteristics of phylum Hemichordata. Relationship with non-chordates and chordates	**MP**	**2**
Practical		
1. Study of following specimens: *a)* Annelids - *Aphrodite, Nereis, Chaetopterus,* Earthworm, *Hirudinaria* b) Arthropods - *Limulus, Palaemon, Balanus, Eupagurus, Scolopendra, Peripatus,* Silkworm-life history stages, Termite – members of a colony and Honey bee – members of the colony *c)* Molluscs - *Dentalium, Patella, Chiton, Pila, Achatina, Pinctada, Sepia, Octopus, Nautilus* *d)* Echinoderms - *Asterias, Ophiura, Clypeaster, Echinus, Cucumaria* and *Antedon* 2. Anatomy study: Nervours system, Reproductive system (Male & female), Mouth parts & Salivary apparatus in *Periplaneta* sp.	**MP+SB**	**15**

Core Course 4: Cell Biology

Theory	Teacher	Hours
Unit 1: Plasma Membrane Ultra-structure and composition of Plasma membrane: Fluid mosaic model, Transport across membrane - Active and Passive transport, Facilitated transport, Cell junctions: Tight junctions, Gap junctions, Desmosomes	**SM**	**4**
Unit 2: Cytoplasmic organelles I Structure and Functions: Endoplasmic Reticulum, Golgi Apparatus, Lysosomes; Protein sorting and mechanisms of vesicular transport	**TD**	**6**
Unit 3: Cytoplasmic organelles II Mitochondria: Structure, Semi-autonomous nature, Endosymbiotic hypothesis Mitochondrial Respiratory Chain, Chemiosmotic hypothesis; Peroxisomes: Structure and Functions Centrosome (Kinetochore and centromeric DNA): Structure and Functions	**TD**	**6**
Unit 4: Cytoskeleton	**SM**	**2**

Type, structure and functions of cytoskeleton; Accessory proteins of microfilament & microtubule		
Unit 5: Nucleus Nuclear envelope, Nuclear pore complex, Nucleolus; Chromatin: Euchromatin and Heterochromatin and packaging (nucleosome)	**SM**	**2**
Unit 6: Cell Cycle Cell cycle and its regulation, Cancer (Concept of oncogenes and tumor suppressor genes with special reference to p53, Retinoblastoma and Ras. Process of Proto-oncogene activation	**MP**	**5**
Unit 7: Cell Signalling Cell signalling transduction pathways; Types of signalling molecules and receptors (Classification and Example only): RTK & JAK/STAT. Apoptosis	**MP**	**4**
Practical		
1. Preparation of temporary stained squash of onion/arum root tip to study various stages of mitosis 2. Study of various stages of meiosis from grasshopper testis **3.** Preparation of permanent slide to show the presence of Barr body in human female blood cells/cheek cells. **4.** Preparation of permanent slide to demonstrate: a) DNA by Feulgen reaction **b)** Cell viability study by Trypan Blue staining	**SM+TD**	**15**

LESSON PLAN FOR EVEN SEMESTERS

DEPARTMENT OF ZOOLOGY
SOVARANI MEMORIAL COLLEGE

Semester-II General

Core Course 2: Comparative Anatomy & Developmental Biology

Theory	Teacher	Hours
Unit 1: Integumentary System Derivatives of integument with respect to glands in Birds & Mammals	**MP**	**2**
Unit 2: Digestive System Stomach and Dentition	**SM**	**2**
Unit 3: Respiratory System Brief account of Gills, lungs, air sacs and swim bladder	**SM**	**3**
Unit 4: Circulatory System Evolution of heart and aortic arches	**MP**	**3**
Unit 5: Urino-genital System Succession of kidney, Evolution of urino-genital ducts	**MP**	**7**
Unit 6: Early Embryonic Development Gametogenesis: Spermatogenesis and oogenesis with respect to mammals. Fertilization: Sea-Urchin; Early development of frog; structure of mature egg and its membranes, patterns of cleavage, fate map, up to formation of gastrula; types of morphogenetic movements; Fate of germ layers	**SB**	
Unit 7: Late Embryonic Development Placenta types and function; Metamorphic events in frog life cycle and its hormonal regulation	**SB**	**5**
Practical		
1. Osteology: Limb bones, girdle and vertebra of Pigeon & Guineapig, Mammalian skulls: One herbivorous; Guinea pig and one carnivorous; Dog. 2. Larval stages: Veliger, Nauplius, Trochophore, Mysis. 3. Study of the different types of placenta- histological sections through photomicrographs. 4. Developmental stages of chick embryo: 24 Hrs., 48 Hrs, 72 Hrs., 96 Hrs.	**MP+SB**	**15**

LESSON PLAN FOR EVEN SEMESTERS

DEPARTMENT OF ZOOLOGY

SOVARANI MEMORIAL COLLEGE

Semester-IV Honours

Core Course 8: Comparative Anatomy of Vertebrates

Theory	Teacher	Hours
Unit 1: Integumentary System Structure, function and derivatives of integument in amphibian, birds and mammals	**MP**	**5**
Unit 2: Digestive System Comparative anatomy of stomach; dentition in mammals	**MP**	**3**
Unit 3: Respiratory System Respiratory organs in fish, birds and mammals	**MP**	**3**
Unit 4: Circulatory System General plan of circulation, Comparative account of heart and aortic arches	**MP**	**4**
Unit 5: Urinogenital System Succession of kidney in different vertebrate groups; evolution of urino-genital ducts	**MP**	**3**
Unit 6: Nervous system and sense organs Comparative account of brain in vertebrates; cranial nerves; olfactory and auditory receptors in vertebrates	**MP**	**4**
Unit 7: Skeletal system Overview of axial and appendicular skeleton – limbs, girdles of pigeon; jaw suspension in mammals	**MP**	**4**
Practical		
1. Study of placoid, cycloid and ctenoid scales through permanent slides/photographs 2. Study of disarticulated skeleton of toad, Pigeon, Guineapig (limb bones, vertebrae, limb and girdle) 3. Comparative study of heart and brain, with the help of model/picture 4. Identification of skulls: Pigeon, one herbivore (Guineapig) and one carnivore (Dog) animal	**MP**	**15**

Core Course 9: Animal Physiology: Life Sustaining System

Theory	Teacher	Hours
Unit 1: Physiology of Digestion Physiological Zonation and function of gastro-intestinal tract; Mechanical and chemical digestion of food, absorption of Carbohydrates, Lipids and Proteins in Human	**SM**	**5**
Unit 2: Physiology of Respiration 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 in human	**SM**	**5**
Unit 3: Physiology of Circulation Structure of haemoglobin; Blood clotting system; Haematopoiesis; Basic steps and its regulation; Blood groups; ABO and Rh factor in human	**SM**	**4**
Unit 4: Physiology of Heart Coronary Circulation, Structure and working of conducting myocardial fibres, Origin and conduction of cardiac impulses; Cardiac Cycle and cardiac output in human	**SM**	**4**
Unit 5: Thermoregulation & Osmoregulation Thermal regulation in camel and polar bear, Osmoregulation in fresh water and marine fishes	**SM**	**3**
Unit 6: Renal Physiology Structure of Kidney and its functional unit, Mechanism of urine formation, Regulation of acid-base balance in human	**SM**	**4**
Practical		
1. Determination of ABO Blood group 2. Estimation of haemoglobin using Sahli's haemoglobin meter	**SM**	**12**

3. Identification of blood cells from human blood 4. Preparation of haemin crystals and haemochromogen crystals 5. Identification of blood cells from cockroach haemolymph **6.** Demonstration of blood pressure by digital meter		

Core Course 10: Immunology

Theory	**Teacher**	**Hours**
Unit 1: Overview of Immune System Introduction – concept of health and disease; Cells and organs of the Immune system	**TD**	**2**
Unit 2: Innate and Adaptive Immunity Anatomical barriers, Inflammation, Cell and molecules involved in innate immunity, Adaptive immunity (Cell mediated and humoral).	**TD**	**5**
Unit 3: Antigens Antigenicity and immunogenicity, Immunogens, Adjuvants and haptens, Factors influencing immunogenicity, B and T-Cell epitopes	**TD**	**5**
Unit 4: Immunoglobulins Structure and functions of different classes of immunoglobulins, Antigen-antibody interactions, Immunoassays (ELISA and RIA), Monoclonal antibody production	**TD**	**2**
Unit 5: Major Histocompatibility Complex Structure and functions of MHC molecules. Structure of T cell Receptor and its signalling, T cell development & selection	**TD**	**5**
Unit 6: Cytokines Types, properties and functions of cytokines.	**TD**	**1**
Unit 7: Complement System Components and pathways of complement activation.	**TD**	**2**
Unit 8: Hypersensitivity Gell and Coombs' classification and brief description of various types of hypersensitivities.	**TD**	**2**
Unit 9: Vaccines Various types of vaccines. Active & passive immunization (Artificial and natural).	**TD**	**2**
Practical		
1. Demonstration of lymphoid organs (by picture). 2. Histological study of Bursa fabricius, spleen, thymus and lymph nodes through slides/ 3. Photographs **4.** Demonstration of ELISA	**TD**	**8**

Skill Enhancement Course (SEC)-B1: Aquarium Fish Keeping

Theory	**Teacher**	**Hours**
Unit 1: Introduction to Aquarium Fish Keeping The potential scope of Aquarium Fish Industry as a Cottage Industry, Exotic and Endemic species of Aquarium Fishes	**SB**	**2**
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	**SB**	**5**
Unit 3: Food and feeding of Aquarium fishes Use of live fish feed organisms. Preparation and composition of formulated fish feeds, Aquarium fish as larval predator	**SB**	**4**
Unit 4: Fish Transportation Live fish transport - Fish handling, packing and forwarding techniques.	**SB**	**3**
Unit 5: Maintenance of Aquarium General Aquarium maintenance – budget for setting up an Aquarium Fish Farm as a Cottage Industry	**SB**	**3**

LESSON PLAN FOR EVEN SEMESTERS

DEPARTMENT OF ZOOLOGY

SOVARANI MEMORIAL COLLEGE

Semester-IV General

Core Course 4: Genetics and Evolutionary Biology

Theory	Teacher	Hours
Unit 1: Mendelian Genetics and its Extension Principles of Inheritance, Chromosome theory of inheritance, Incomplete dominance and codominance, Multiple alleles, lethal alleles, sex linked inheritance in *Drosophila* (White eye locus) & Human (Thalassemia).	**SM**	**5**
Unit 2: Linkage, Crossing Over Linkage and crossing over, Complete & Incomplete Linkage, Recombination frequency as a measure of linkage intensity. Holiday Model	**SM**	**4**
Unit 3: Mutation Chromosomal mutation, Deletion, duplication, inversion, translocation, aneuploidy, gene mutation, induced mutation, types & example	**SM**	**4**
Unit 4: Sex determination Genic Balance theory and dosage compensation in *Drosophila*.	**MP**	**4**
Unit 5: Origin of Life Chemical Origin of life	**SM**	**1**
Unit 6: Evolutionary Theories Lamarckism, Darwinism, Neo-Darwinism.	**SM**	**2**
Unit 7: Process of Evolutionary changes Isolating mechanism, Natural Selection.	**SM**	**2**
Unit 8: Speciation Sympatric, Allopatric, Parapatric	**SM**	**2**
Practical		
1. Verification of Mendelian Ratio using Chi square test. **2.** Identification of Human Aneuploidy using photo graph of karyotype. **3.** Phylogeny of horse with diagram of limb and skull. **4.** Study and identification of Darwin Finches from photographs. **5.** Visit to natural history museum and submission of report.	**SM** **SM** **SM** **SM** **SB+TD**	**15**

Skill Enhancement Course (SEC)-B2: Aquarium Fish Keeping

Theory	Teacher	Hours
Unit 1: Introduction to Aquarium Fish Keeping The potential scope of Aquarium Fish Industry as a Cottage Industry, Exotic and Endemic species of Aquarium Fishes	**SB**	**2**
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	**SB**	**5**
Unit 3: Food and feeding of Aquarium fishes Use of live fish feed organisms. Preparation and composition of formulated fish feeds	**SB**	**4**
Unit 4: Fish Transportation Live fish transport - Fish handling, packing and forwarding techniques.	**SB**	**3**
Unit 5: Maintenance of Aquarium General Aquarium maintenance – budget for setting up an Aquarium Fish Farm as a Cottage Industry	**SB**	**3**

LESSON PLAN FOR EVEN SEMESTERS

DEPARTMENT OF ZOOLOGY
SOVARANI MEMORIAL COLLEGE

Semester-VI Honours
Core Course 13: Developmental Biology

Theory	Teacher	Hours
Unit 1: Early Embryonic Development Gametogenesis: Spermatogenesis, Oogenesis (sea urchin & mammal); Types of eggs, Egg membranes; Fertilization in sea urchin and mammal; Planes and patterns of cleavage; Types of Blastula [frog and chick]; Fate map in chick embryo, fate mapping using vital dye and radioactive technique; Gastrulation in frog and chick; Embryonic induction and organizers in *Xenopus* (Spemann & Mangold's experiment)	**MP**	**12**
Unit 2: Late Embryonic Development Extra-embryonic membranes in Chick; Implantation of embryo in humans, Placenta (Structure, types and functions of placenta)	**MP**	**6**
Unit 3: Post Embryonic Development Development of brain and Eye in Chick. Molecular Induction in Brain and Eye development.	**MP**	**4**
Unit 4: Implications of Developmental Biology *In vitro* fertilization (IVF), Stem cell: Concept of potency, types, markers and applications of stem cell therapy in bone marrow transplantation and cartilage regeneration	**MP**	**5**
Practical	**Teacher**	**Hours**
1. Study of whole mounts of developmental stages of chick embryo through permanent slides: 24, 48, and 96 hours of incubation 2. Study of the developmental stages and life cycle of *Drosophila* 3. Study of different sections of placenta (photomicropgraph/ slides) 4. Identification of Invertebrate larva through slides/ photographs of Phylum Annelida, Arthropoda, Mollusca and Echinodermata	**MP+SB**	**10**

Core Course 14: Evolutionary Biology

Theory	Teacher	Hours
Unit 1: Origin of Life (Chemical basis), RNA world hypothesis	**SM**	**2**
Unit 2: Historical review of Evolutionary concepts: Lamarkism, Darwinism and Neo Darwinism	**SM**	**2**
Unit 3: Geological time scale, Fossil: types and age determination by Carbon dating, Evolution of horse	**SM**	**4**
Unit 4: Natural Selection: Modes with Examples	**SM**	**2**
Unit 5: Species concept, Isolating mechanisms, modes of speciation; Speciation by chromosome rearrangement in *Drosophila*. Adaptive radiation/macroevolution (exemplified by Galapagos finches).	**SM**	**5**
Unit 6: Origin and Evolution of Man, Unique Hominid characteristics contrasted with primate characteristic	**SM**	**2**
Unit 7:	**TD**	**6**

Population genetics: Hardy-Weinberg Law; factors disrupting H-W equilibrium (Genetic Drift, Migration and Mutation and Selection in changing allele frequencies (only derivations required). Simple problems related to estimation of allelic and gene frequencies.		
Unit 8: Extinction, back ground and mass extinctions, detailed example of K-T extinction	**TD**	**2**
Unit 9: Phylogenetic trees, construction and interpretation of Phylogenetic tree using parsimony, convergent and divergent evolution.	**TD**	**5**
Practical	**Teacher**	**Hours**
1. Study of fossils from models/ pictures: Dickinsonia, Paradoxides (Trilobita), Asteroceras (Ammonoid), Pentremites (Blastoid Echinoderm), Ichthyosaur, Archaeopteryx, Cynodont. 2. Study of homology and analogy from suitable specimens. 3. Phylogenetic trees, Construction & interpretation of Phylogenetic tree using parsimony, Construction of dendrogram following principles of phenetics & cladistics from a data table.	**TD** **TD** **TD**	**10**

Discipline Specific Elective – A1: Animal Cell Biotechnology

Theory	**Teacher**	**Hours**
Unit 1: Introduction Concept and Scope of Biotechnology	**TD**	**1**
Unit 2: Techniques in Gene manipulation Recombinant DNA technology, Restriction endonucleases. Cloning Vectors & their features: Plasmids, Phage vectors, Cosmids, Phagemids, BAC, YAC, and HAC. Shuttle and Expression Vectors. Construction of Genomic libraries and cDNA libraries Transformation techniques: Cloning in bacteria and detection technique of clone	**TD**	**10**
Unit 3: Animal cell Culture Basic techniques in animal cell culture and organ culture, Primary Culture and Cell lines, Culture media – Natural and Synthetic, Stem cells, Cryopreservation of cultures. Agarose and Polyacrylamide Gel Electrophoresis, Southern, Northern and Western blotting, Polymerase chain reaction: Allele specific, RAPD & RT PCR.	**SM**	**10**
Unit 4: Fermentation Different types of Fermentation: Submerged & Solid state; batch, Fed batch & Continuous; Stirred tank, Air Lift, Fixed Bed and Fluidized. Downstream Processing: Filtration, centrifugation, extraction, chromatography, spray drying and lyophilization.	**SM**	**5**
Unit 5: Application in Health Hybridoma technology, Production of recombinant Proteins: Insulin and growth hormones.	**TD**	**2**
Practical	**Teacher**	**Hours**
1. Packing and sterilization of glass and plastic wares for cell culture. 2. Preparation of culture media. 3. Preparation of genomic DNA from E. coli/animals/ human. 4. Plasmid DNA isolation (pUC 18/19) and DNA quantitation using agarose gel electrophoresis (by using lambda DNA as standard). 5. Techniques: Western Blot, Southern Hybridization, DNA Fingerprinting, PCR, DNA Microarrays (By Photograph).	**SM** **SM** **SM+TD** **SM+TD** **SM**	**15**

Discipline Specific Elective – B2: Fish and Fisheries

Theory	Teacher	Hours
Unit 1: Introduction and Classification Feeding habit, habitat and manner of reproduction. Classification of fish (upto Subclasses) (Romar, 1959)	**SB**	**2**
Unit 2: Morphology and Physiology Types of fins and their modifications; Locomotion in fish; 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; Electric organ, Bioluminescence	**SB**	**6**
Unit 3: Fisheries Inland Fisheries; Marine Fisheries; Fishing crafts and Gears; Depletion of fisheries resources; Application of remote sensing and GIS in fisheries; Fisheries law and regulations	**SB**	**5**
Unit 4: 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-products	**SB**	**8**
Unit 5: Fish in research Transgenic fish Zebra fish as a model organism in research	**SB**	**2**
Practical	**Teacher**	**Hours**
1. Morphometric and meristic characters of fishes 2. Identification of *Petromyzon, Myxine, Pristis, Exocoetus, Hippocampus, Gambusia, Labeo, Heteropneustes, Anabas* 3. Study of different types of scales (through permanent slides/ photographs). 4. Study of crafts and gears used in Fisheries (Photoghaphs) 5. Water quality criteria for Aquaculture: Assessment of pH, alkalinity, Salinity. 6. Study of air breathing organs in *Channa*, *Heteropneustes*, *Anabas* and *Clarias* 7. Project Report on a visit to any fish farm/ pisciculture unit/Zebrafish rearing Lab.	**SB+TD**	**15**

LESSON PLAN FOR EVEN SEMESTERS

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Semester-VI General
DSE-B2: Ecology and Wild Life Biology

Theory	Teacher	Hours
Unit 1: Introduction to Ecology Ecosystem, Autecology and synecology, Levels of organization, Laws of limiting factors, Study of Physical factors, The Biosphere.	**SM**	**2**
Unit 2: Population Attributes of population: Life tables, fecundity tables, survivorship curves, dispersal and dispersion. Geometric, exponential and logistic growth, equation and patterns, Population regulation: density-dependent and independent factors	**TD**	
Unit 3: Community Community characteristics: species diversity, abundance, dominance, richness, Vertical stratification, Ecotone and edge effect.	**TD**	
Unit 4: Ecosystem Types of ecosystem with an example in detail, Food chain: Detritus and grazing food chains, Linear and Y-shaped food chains, Food web, Energy flow through the ecosystem, Ecological pyramids and Ecological efficiencies	**SM**	**5**
Unit 5: Wild Life Wildlife Conservation (in-situ and ex-situ conservation)**:** Necessity for wildlife conservation; National parks & sanctuaries, Tiger conservation - Tiger reserves in India; Management challenges in Tiger reserve	**SM**	**3**
Practical	**Teacher**	**Hours**
1. Identification of flora, mammalian fauna, avian 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. Study of an aquatic ecosystem: Phytoplankton and zooplankton, Measurement of area, temperature, salinity, determination of pH, and Dissolved Oxygen content (Winkler's method), Chemical Oxygen Demand and free CO_2	**SM+TD**	

LESSON PLAN FOR EVEN SEMESTERS

DEPARTMENT OF ZOOLOGY

SOVARANI MEMORIAL COLLEGE

Semester-I

Core Course-1: Cell Biology (Major +MDC)

Theory	Teacher	Hours
Unit 1: Plasma Membrane **Structure of the Plasma Membrane:** Lipid Bilayer (Phospholipids and Cholesterol), Peripheral and Integral Membrane proteins, Glycolipids and Glycoproteins (*basic concept of Glycocalyx*), Fluid Mosaic Model with special reference to Lipid rafts, Mobility of membrane lipids (FRAP assay) and Mobility of Membrane Proteins (Frye-Edidin Experiment); Cell-cell junctions; Transport through plasma membrane.	SM	6
Unit 2: Cytoplasmic organelles I **Basic concepts on Ultrastructure of ER, Golgi and Lysosome;** **Overview of Protein sorting;** **ER** Morphology, Targeting proteins to ER, The Signal hypothesis; Insertion of proteins into ER membrane, Protein folding and processing in ER, Export of proteins and lipids from ER; **Golgi Apparatus;** Morphology, Protein glycosylation within Golgi, Protein sorting and export from Golgi apparatus; **Mechanism of Vesicular Transport:** Cargo selection, coat proteins and vesicle budding, Vesicle fusion; **Lysosome:** Polymorphism**,** Lysosomal acid hydrolases, Endocytosis and lysosome formation.	TD	6
Unit 3: Cytoplasmic organelles II **Mitochondria:** Structure, Semi-autonomous nature, Mitochondrial DNA, Endosymbiotic hypothesis Mitochondrial Respiratory Chain, Chemiosmotic hypothesis and Oxidative Phosphorylation with reference to ATP Synthase and ATP synthesis **Peroxisomes:** Structure and Functions; **Centrosome and its organization**	TD	5
Unit 4: Cytoskeleton Structure and Types: Microtubules, Actin filaments, and Intermediate filaments; Basic composition and function of ECM; Cell matrix Interactions(Integrins)	SM	3
Unit 5: Nucleus Nuclear envelope, nuclear pore complex (transport not included), Kinetochore and centromeric DNA; Chromatin and levels of its packaging. Euchromatin & Heterochromatin, Position effect variegation. Chromatin remodeling complex.	SM	4
Unit 6: Cell Cycle **Cell Cycle:** Phases of the eukaryotic cell cycle, Protein Kinases and Cell cycle regulation, MPF, Growth factors and regulation of G1-Cdks, S phase and regulation of DNA replication, DNA damage checkpoints; **Cell Death:** Caspases, Bcl-2 family, Intrinsic (Death receptors) and Extrinsic Pathway (apoptosome); **Cancer:** Basic Concept of Protooncogene [Ras] & Tumor suppressor genes [Rb and p53] Different ways of activation of a protooncogene to Oncogene.	MP	8
Unit 7: Cell Signalling **Signalling system:** Modes of cell-cell signalling; Types of Signalling molecules **Signalling receptors**: Types and example with special reference to regulation of G protein, Adenyl cyclase-cAMP, Enzyme linked Receptors: RTK (ras-raf) and JAK/STAT	MP	5
Unit 8: Tools and Techniques in Cell Biology Animal Cell Culture: Primary cell culture and Cell line. Subcellular fractionation and Ultracentrifugation. Freeze fracture Replication and Freeze Etching Principle of Light Microscope: Bright field, Phase contrast microscope, Fluorescence Microscope with reference to FRET, Principle of SEM & TEM. Cryofixation and use of frozen specimen; Specimen Preparation for Electron Microscopy	TD & SM	8

Practical	Teacher	Hours
1. Cell viability study by Trypan Blue Exclusion method. 2. Standardization of Ocular and Stage Micrometer and Measurement of cell or microscopic specimen such as *Paramoecium* sp. 3. Preparation of squamous epithelial cell with staining. 4. Isolation of Bone Marrow Cells from Rat/Mouse and Giemsa Staining. Laboratory Note book	TD SM SM TD	2 2 2 5

SEC-1: Applied Entomology (Major)

Theory	Teacher	Hours
Unit 1: Basics of Entomology **Insect diversity and adaptation:** Morphological adaptation of insects: Head and antenna; Mouthparts of honey bee and cockroach; Thorax and thoracic appendages- legs and wings [General concept]. **Physiological adaptation in cockroach:** Digestive system: Alimentary canal and digestive glands, digestion; Respiratory organs and mechanism of gaseous exchange; Sense organs compound eyes, chemoreceptors. **General Characteristics of Class Insecta and living orders with examples:** Orthoptera, Dictyoptera, Anoplura, Hemiptera, Coleoptera, Lepidoptera, Diptera, Hymenoptera, Siphonaptera (Imms, A.D. 1938)	SM	8
Unit 2: Medical Entomology **Concept of Vectors:** Mechanical and biological vectors, modes of transmission; Biological vector and disease cycle. **Biology of *Anopheles, Culex* and *Aedes:*** Study of mosquito borne diseases- Malaria, Dengue, and Filariasis; control of mosquitoes. **Biology of *Musca domestica*:** Disease relationship; control of house fly. Biology and systematics of Bed bug *Cimex lectularius*; disease relationship; Control of Bed Bug.	TD	3
Unit 3: Agricultural Entomology Concept of insect pest; Economic Injury Level (EIL), Economic Threshold Level (ETL), Dynamics of EIL; Pests of major crops (Life cycle, Nature of damage and control measures): Pests of Paddy, *Scirpophaga incertulus*; Pests of Jute, *Anomis sabulifera;* Pests of brinjal, *Leucinodes orbonalis*; Stored grain pest, *Sitophilus oryzae*; Invasive insect pests of India and their consequences. Insect Pest control: Chemical, Mechanical, Cultural and Biological control measures; Integrated Pest Management (IPM)	MP	7
Unit 4: Sericulture Types of Silk Moths with special reference to their scientific name, geographical distribution, and host plants. Life cycle of *Bombyx mori*; Structure of Silk Gland; Voltinism,Rearing of mulberry silkworm; Reeling and extraction of silk; Mulberry cocoon management; Mulberry plant types and cultivation; Common diseases and pests of mulberry silkworm and their control measures;Prospects of Sericulture in West Bengal; employment potential in sericulture.	SB	5
Unit 5: Apiculture Various domesticated species of Honeybee; Social organization and life cycle of Honeybee; Modern method of Beekeeping: Newton Box and Langstroth Box; extraction of honey and composition of honey; Pests, Parasites and Diseases and their control measures; Bee-economy: Apiculture products and their uses.	SB	5
Practical	**Teacher**	**Hours**
1. Dissection and temporary mounting of Antennae and mouth parts of Cockroach, and Mosquito 2. Methods of collection, preservation, and identification of economically important insects. 3. Identification of following insect pests (Order, family and specimen characters only): *Scirpophaga incertulus; Sitophilus oryzae*; *Callosobruchus chinensis, Leucinodes orbonalis*; *Anomis sabulifera; Pyrilla perpusilla.*	SB & TD MP MP	4 1 3

4. Life history stages of *Apis* sp and *Bombyx mori*. 5. Identification and medical significance of following insects (adults) through permanent slides/photographs: *Aedes* sp., *Culex* sp., *Anopheles* sp. [for mosquito, larvae and both sexes of adults], *Musca* sp., *Phlebotomus* sp., *Cimex* sp., *Pediculus humanus capitis*, *Xenopsylla* sp. 6. Visits to **any one place of applied entomological significance** (submission of a field report): a) Agricultural field/ forest for on spot study of pests and damage caused. b) Any Sericulture farm for studying grainage and rearing activities c) Visit to an apiary to study various activities o Apiculture d) Any rural or urban health centre to study various aspects of vector surveillance	SB TD	2 2

SEC-G: Applied Zoology (MDC)

Theory	**Teacher**	**Hours**
Unit I: Agricultural Entomology Pest- definition and types (major and minor pests with example); Lifecycle, nature of damage and control of Pests: *Scirpophaga incertulus* of paddy,*Anomis sabulifera* of Jute, *Bandicoota*– stored house pest; Insect Pest control: Chemical, Mechanical, Cultural and Biological control measures; Integrated Pest Management (IPM).	MP	6
Unit II: Sericulture Types of Silkworms with special reference to their scientific name, geographical distribution and host plants; *Bombyx mori*: Silk gland, Composition of silk, Uses of silk; Lifecycle; Rearing, Extraction and Reeling of mulberry silk; Silkworm diseases, pests and their control.	SB	5
Unit III: Apiculture Various domesticated species of Honeybee; Social organization of Honeybee; Bee keeping: Langstroth Box for rearing of honey bee, Extraction and processing of honey; Composition of honey, apiculture by products and their uses; Pests and Diseases of bees and their control measures	SB	5
Unit IV: Vermiculture Scope of Vermiculture; Habit categories of earthworms; methodology of vermicomposting: containers for culturing, raw materials required, preparation of bed, environmental prerequisites, feeding, harvesting and storage of vermicompost; Advantages of vermicomposting; Diseases and pests of earthworms.	SB	4
Unit V: Aquaculture Principles, definition and scope; Prawn culture: Penaeid and Palaemonid features with examples; Semi-intensive method of prawn culture; Application of prawn culture; Difference between major and minor carps with examples; Composite fish farming: General concepts, advantages and disadvantages; Induced breeding: method and advantages; Integrated fish farming.	SB	4
Unit VI: Live Stock Management Dairy: Introduction to common dairy animals: Types of Cattle breeds and their distribution in India; Exotic cattle breeds; Artificial insemination and MOET in breeding; Cattle feed: Roughage and Concentrate; dairy by products, preservation and uses. Dairy pathology and vaccination programme. Poultry: Types of breeds (fowl) with features and examples; Rearing method: Deep litter system; feed formulation for chicks; poultry by products with economic importance; Diseases of poultry and their control measures.	MP	
Unit VII: Lac Culture Life cycle, host plants and strains of Lac insect; Lac cultivation: Local practice, improved practice, propagation of Lac insect, inoculation period, harvesting of Lac; Lac composition, processing, products and uses; Natural enemies of lac insect and their management	MP	
Practical	**Teacher**	**Hours**
List of Practical 1. Identification of various castes of Honey bee, life stages of *Bombyx mori*, various life stages of *Kerria lacca*, various earthworm species used in vermiculture and ectoparasites of Poultry birds	MP + SB	

2. Identification of the following fish and prawn specimens (Specimen characters only): *Labeo rohita, L. bata, Catla catla, Cirrhinus mrigela, Cyprinus carpio, Penaeus monodon, Macrobrachium rosenbergi* 3. Collection of any two pests and submission of specimen it along with a small report on its identifying features, life cycle, nature of damage and control: *Sitophilus oryzae, Tribolium castaneum, Nilaparvata lugens, Anomis sabulifera* and *Leucinodes orbonalis* 4. Visit to any one of the following and submission of report on the visit a) Apiary b) Freshwater fish farm c) Any agricultural field d) Poultry farm e) Sericulture farm f) Lac culture farm		

Part-I, Semester-I
IDC-1: Animal Biology
IDC-1-TH

Unit 1: Animal Diversity Phylum Characters and example: [Non-chordates-Porifera, Cnidaria, Ctenophora, Platyhelminthes, Nematoda, Annelida, Arthropoda, Mollusca and Echinodermata]; Chordata	SB
Unit 2: Genetics 1. Mendelian Principles and Laws of inheritance 2. Linkage and Recombination basic Concepts 3. Sex Determination with reference to *Drosophila* [only genic balance theory] 4. Chromosomal Aberration [Structural and Numerical]	SM
Unit 3: Biodiversity and Wildlife 1. Biodiversity: Definition, types and value 2. Biodiversity: Indices [Shannon & Simpson] 3. Conservation: *in situ* and *ex situ* [outline idea] 4. Conservation Priority: Hotspot, Megadiversity, Sensitive Ecosystem 5. Indigenous Knowledge and PBR: Basic Concepts	MP
Unit 4: Insect Vectors 1. Concept of Vector: Biological and Mechanical Vectors with examples 2. Disease cycle & Reservoir Concept 3. Major Vectors: Mosquito (*Anopheles* sp. & *Aedes* sp.) Life cycle, control, role as vector.	TD
Unit 5: Laboratory techniques and Instrumentation 1. Basics of Light Microscopy 2. Principles and Application of Colorimetry 3. Principles and application of Ultracentrifugation	SM

IDC-1-P

List of Practical 1. Karyotype analysis of Klinefelter, Down, Turner, Edward & Patau Syndrome 2. Identification (Phylum and specimen characters): *Amoeba, Paramoecium, Sycon, Neptune's Cup, Taenia, Ascaris, Nereis, Pheretima, Pila, Lamelledens, Penaeus, Macrobrachium, Musca, Anopheles, Culex, Asterias*. 3. One Local-Outdoor Trip for Biodiversity Studies.	SM

LESSON PLAN FOR EVEN SEMESTERS

DEPARTMENT OF ZOOLOGY

SOVARANI MEMORIAL COLLEGE

Semester-II

Core Course-2: Biochemistry Theory (Major +MDC)

Theory	Teacher	Hours
Unit 1: Carbohydrates Structure, classification and properties of Monosaccharides (aldose and ketose), Disaccharides, Polysaccharides; Isomerism of monosaccharides (D and L, optical isomers, furanose and pyranose, α and β anomers, epimers); Reducing and non – reducing sugars. Physiological importance of Monosaccharides, Disaccharides, Polysaccharides	**TD**	
Unit 2: Proteins **Amino acids:** Structure, Classification, General and Electro chemical properties of α-amino acids; Essential and non-essential amino acids; **Structures of Protein:** Primary, secondary, tertiary and quaternary) of protein, Classification of proteins.	**SM**	
Unit 3: Lipids **Classification of lipids**; Saturated and unsaturated fatty acids, essential and non – essential fatty acids. **Structure and formation of Triglyceride**.; Iodine number and saponification number of fats.	**TD**	
Unit 4: Enzymes **Nomenclature, classification and properties**; Cofactors and coenzymes, Effect of Temperature, pH, substrate concentration, enzyme concentration on enzyme action, Isozymes and Proenzyme, Mechanism of enzyme action (Lock and key model, Induced fit model). **Enzyme kinetics**: Derivation of Michaelis-Menten equation with its significance, Lineweaver-Burk plot and its significance. Enzyme inhibition – competitive, non- competitive, allosteric / feedback and its effect on Vmax and Km	**SM**	
Unit 5: Carbohydrates Metabolism Glycolysis, Citric acid cycle, Pentose phosphate pathway, Gluconeogenesis from lactate and glycerate, Glycogenesis and Glycogenolysis. (Pathways with name of enzymes and significance)	**TD**	
Unit 6: Protein Metabolism Transamination, Deamination and its types (Pathways with name of enzymes and significance) Fate of C-skeleton of Glucogenic and Ketogenic amino acids.	**TD**	
Unit 7: Lipid Metabolism β-oxidation of fatty acids - a. Palmitic acid {saturated (C 16:0)}, b. Linoleic acid {unsaturated (C 18:2)}; Fatty acid biosynthesis	**TD**	
Unit 8: Nucleic acid Metabolism Degradation of purine; Purine Salvage pathway and significance.	**TD**	
Unit 7: Free radicals and Antioxidants Concept of free radicals and antioxidants with examples.	**TD**	
Practical	**Teacher**	**Hours**
Group – A: Qualitative tests for carbohydrates, proteins and lipids a) For carbohydrate (Glucose, Fructose, Maltose, Sucrose, Starch) – Molisch test, Barfoed test, Benedict test, Fehling test, Seliwanoff test, Hydrolysis test for sucrose, Iodine test b) For Protein (Albumin, Gelatine, Peptone) –Biuret test, Million's test, Xanthoproteic test, Ninhydrin test c) For lipid – Grease spot test **Group – B**: **Colorimetric estimation of the following** a) Protein by Lowry's method b) Activity of amylase **LNB**	**TD + SM**	

SEC-2: Aquaculture Theory (Major)

Theory	Teacher	Hours
Unit 1: Basics of Idea of Fish Biology Qualities of Cultivable fish, Indigenous and Exotic	**SB**	
Unit 2: Sustainable Aquaculture System Sustainable Aquaculture Culture System: Extensive, Semi intensive, Extensive Water quality in culture ponds and factors controlling water quality. Preparation and Management of Fish Culture Ponds in Composite Fish Culture Cage Culture, Pen Culture, Raceways. Flow through system. Biofloc. Cold water fishery. Jeol Fishery. Sewage fed fishery. Mariculture with special emphasis on sea weed culture. (Basic concept) Induced Breeding of Carps. Synthetic Hormones in Hypophysation. Management of Fin Fish Hatcheries. Glass Jar Hatchery, Chinese Hatchery.	**MP**	
Unit 3: Recent Advancement of Aquaculture Aquarium Fisheries; Preparation and Management of Fish Aquarium; Biology of Common Ornamental Fish: Guppy, Swordtail, Angel, Blue morph fish. Anemone fish, Butterfly fish, Molly. **Fish Nutritional Requirements:** Feed Formulations and Preparation of Compound Diets. **Capture Fishery:** Fishing Crafts and Gears, Post harvesting Technology. Fish Transport and Marketing. Fish Preservation and By-products. **Fish Biotechnology:** Transgenic Fish, Sex Reversal in Fish. Aquaponics, Application of GIS and Remote Sensing in Fisheries, Fishery Laws and Regulations.	**SB**	
Unit 4: Fin Fish pathology Name of Infective Disease. Causative Agents, Symptoms, Control. Bacteria- Dropsy, Fin and Tail rot. Protozoa- White Spot Disease; Fungal-Saprolegniasis; Ectoparasite-Gyrodactylosis, Dactylogyrosis. Virus- Rhabdovirus	**SB**	
Unit 5: Applied Aquaculture **Breeding Techniques in Shrimps and Prawns:** Eyestalk Ablation in Shrimp and Salinity shock in Prawns. Techniques of Artificial Pearl Culture.	**SB**	
Practical	**Teacher**	**Hours**
1. **Identification of different fish species using Meristic characters. (Systematic position, specimen characters)** *Rohu, Catla, Cirrhinus, Puntius, Amblypharyngodon, Channa punctatus, Lates, Mystus, Notopterus, Cyprinus, Hypophthalmichthys, Ctenopharyngodon, Oreochromis niloticus, Oreochromis mossambicus Anabas, Clarias, Heteropneustes, Mugil, Macrobrachium, Penaeus.* 2. **Visit to** nearby fish market and identification of economically important fishes, survey on market economy and preparation of report on it. 3. **LNB**	**SB + SM**	

Part-II, Semester-III

Paper Name: Genetics

Major (ZOOM) Paper Code: CC3-TH [75 Marks] CU Away Centre Exam

Unit 1: Chromosome Structural organization of Chromosomes; Polytene, Lampbrush and Satellite chromosomes; Human Karyotyping.	MP
Unit 2: Allele concept Epistasis, Multiple alleles (ABO blood group in human), Isoallele (White eye mutations in *Drosophila*), Pseudoallele (Lozenge Locus in *Drosophila*) & Cis-trans test for allelism, Lethal alleles, Pleiotropy, Penetrance & Expressivity	MP
Unit 3: Genetic Fine Structure Complementation test in Bacteriophage (Benzer's experiment on rII locus)	
Unit 4: Linkage, Crossing over Linkage and Crossing over; Complete and Incomplete Linkage; Holliday model of recombination; Linkage map construction using three point crosses; Sex linkage in *Drosophila* (White eye locus) & Human (Haemophilia)	SM
Unit 5: Mutations & Chromosomal aberrations Types of gene mutations (Substitution and Frameshift); Types of chromosomal aberrations (Structural and Numerical); Non-disjunction of X chromosome in *Drosophila*, Non-disjunction of human chromosome 21; Molecular basis of mutations induced by UV light and chemical mutagens; mutation detection in *Drosophila* by attached X and CLB method; Biochemical mutation detection in *Neurospora*	MP
Unit 6: Extra-chromosomal inheritance Kappa particle in *Paramoecium*, Shell spiralling in snail	MP
Unit 7: Transposable Genetic elements IS element in bacteria; Ac-Ds elements in maize; P elements in *Drosophila*; LINE, SINE, Alu elements in human	MP
Unit 8: Quantitative Genetics Concept of quantitative traits (Examples – Kernel colour in wheat, Ear length in Corn); Polygenic inheritance; Heritability – Concept and types (Broad sense heritability and Narrow sense heritability)	MP

Genetics Practical

Major (ZOOM) Paper Code: CC3-P [25 Marks] CU Away Centre Exam

1. **Chi-Square Test** - Test for Goodness of fit – Mendelian monohybrid and di-hybrid ratios, Epistatic ratios; Contingency Chi-Square Test	SM
2. **Identification of Chromosomal aberration in *Drosophila*** (Deletion, Duplication, Inversion and Translocation) and **Human** (Karyotype of Down Syndrome, Edwards Syndrome, Patau Syndrome, Klinefelter Syndrome, and Turner Syndrome) from photograph.	SM
3. **Pedigree Analysis** of some inherited traits in Human (Autosomal, X-linked and Y-linked).	SM
4. Temporary squash preparation of Grasshopper testis to study various stages of meiosis.	
5. LNB	

Part-II, Semester-III

Paper Name: Cells and Tissue Structure

Major (ZOOM) Paper Code: CC4-TH [75 Marks] CU Away Centre Exam
MDC (MZOO) Paper Code: CC3-TH [75 Marks] CU Away Centre Exam

Unit 1: Stain, Dye and Histochemistry Difference between stain and dye. Components and classification of dye. Principle and chemistry of PAS and Feulgen reaction.	TD
Unit 2: Epithelial Tissue Salient features; Classification with location and diagram (based on structure and functions) Glandular epithelium in details. Cell polarity – Apical domain and modifications; Lateral domain. **Clinical correlation:** Epithelial metaplasia.	SM
Unit 3: Connective Tissue Salient features with respect to cell types and fibers; Classification. Structure and function with diagram of Adipose tissue – brown fat and white fat Areolar tissue (diagram, location, components, and their functions); Bone tissue (cell types, extra cellular matrix and ossification with diagram); Cartilage tissue (structure, types with location and diagram); Blood tissue (composition with function) Brief idea on epithelial membrane: cutaneous membrane, mucous membrane **Clinical correlation** with respect to bone tissue: Osteoarthritis and Osteoporosis	SM
Unit 4: Muscle tissue Salient features. Types based on function and striations. Ultrastructure of skeletal muscle. Features of single unit and multiunit smooth muscle, cardiac muscle. Difference between white muscle fiber and red muscle fiber. **Clinical correlation:** Duchene muscular dystrophy.	SM
Unit 5: Nervous Tissue Salient features; Structure of neurons and types based on origin, myelin sheath and processes; Neuroglia and functions; **Clinical correlation:** Multiple sclerosis	SM
Unit 6: Tissue repair **Steps of tissue (skin as an example) repair:** 1. Inflammation 2. Organization 3. Regeneration and/ or Fibrosis. **Factors affecting it:** 1. Type of tissue 2. Type of injury. 3. Adequacy of blood supply. 4. State of health. 5. Age.	TD

Cells and Tissue Structure Practical

Major (ZOOM) Paper Code: CC4-P [25 Marks] CU Away Centre Exam
MDC (MZOO) Paper Code: CC3-P [25 Marks] CU Home Centre Exam

1. **Preparation, staining and mounting of the following:** a. Epithelial tissue from vaginal smear of rat using methylene blue. b. Connective tissue from blood film of rat using Giemsa. c. Muscle tissue from thigh muscle of cockroach using methylene blue. 2. **Identification** with reasons the following mammalian histological sections – lung, liver, stomach, kidney. 3. **Tissue preparation**, block making and sectioning of any organ of rat/mice. 4. **LNB**	SM & TD

Part-II, Semester-III

Paper Name: Poultry Farming and Animal Husbandry

Major (ZOOM) Paper Code: SEC-3-TH [75 Marks] CU Away Centre Exam MCQ

Unit 1: Common Breeds of Fowl and their Characteristics American Class, Asiatic Class, Mediterranean Class, English Class, Indigenous breeds. Commercial strains of chickens: Broiler, Layer, Grower	**MP**
Unit 2: Rearing methods in Poultry Housing and Equipment Essential of good housing; housing requirements; Poultry equipment (egg collector, incubator, chick cage); Housing systems: Free range system, Semi intensive system, Folding unit system, Deep litter system, Cage system (battery).	**MP**
Unit 3: Poultry nutrition Nutrition, Feed formulation for chicks	**MP**
Unit 4: Diseases of Poultry and their control measures Viral disease, Parasitic disease, Fungal disease and their control	**MP**
Unit 5: Poultry market in India Size, growth and trends; poultry market opportunity and challenges	**MP**
Unit 6: Animal Husbandry: Important cattle breed and their characteristics Cattle breeds in India, Cattle population, Milch breeds, Dual purpose breeds, Draught breed, Cross breed cattle strain	**SB**
Unit 7: Livestock feeds Cattle feed – Roughage and Concentrate	**SB**
Unit 8: Breeding program: Artificial insemination and MOET in cattle.	**SB**
Unit 9: Dairying Composition of Milk, Dairy products, National Dairy Development Board and Operation Flood Program.	**SB**
Unit 10: Dairy Pathology Viral disease, bacterial disease, and parasitic disease and control	**SB**

Poultry Farming and Animal Husbandry Practical

Major (ZOOM) Paper Code: SEC-3-P [25 Marks] CU Away Centre Exam

1. **Identification of following poultry breeds** (only coloured photograph): Plymouth rock, Rhode Island red, New Hampshire, Cochin, Brahma, Leghorn, Cornish, Aseel, Kadaknath, Chittagong. 2. **Identification of following cattle breeds** (only coloured photograph): Sahiwal, Red Sindhi, Gir, Malvi, Hariana, Tharparkar, Jersey. 3. Visit to a poultry farm or animal husbandry and make a report on that study. 4. LNB	**MP + SB**