গড়গাঁও মহাবিদ্যালয়

GARGAON COLLEGE

TEACHING PLAN

DEPARTMENT OF ZOOLOGY

JULY 2021 - JUNE 2022

GARGAON COLLEGE
TEACHING PLAN
Course: B. Sc.
Session: 2021-2022

Subject: ZOOLOGY
Name of the Teacher: Dr. Rina Handique
Methods to be applied: Lecture and presentation method along with interaction and discussion.
Teaching Materials: Green & White Board, Chalk Pencil, Marker, Duster, Books, Laptop, Projector.

Odd semester 2021

1st Semester (CBCS)	
Course Code: ZC101T **CORE COURSE I: NON-CHORDATES I: PROTISTS TO PSEUDOCOELOMATES**	
Allotted Unit No	**1**
Unit Name	**Unit 1: Protista, Parazoa and Metazoa**
No. of Class required	19
Detail of the topics to be taught (Classes required)	General characteristics and Classification up to Classes, Structural organization & nutrition of Euglena, Amoeba and Paramecium, Life cycle and pathogenicity of Plasmodium vivax Locomotion and Reproduction in Animal protista (Protozoa) Evolution of symmetry and segmentation of Metazoa
Allotted Unit No	**2**
No. of Tutorials	**1**
Unit Name	**Unit 5: Platyhelminthes**
No. of Class required	12
Detail of the topics to be taught (Classes required)	General characteristics and Classification up to classes, Life cycle and pathogenicity of *Fasciola hepatica* and *Taenia solium*
No. of Tutorials	1
Course Code: ZC102T **CORE COURSE II: PRINCIPLES OF ECOLOGY**	
Allotted Unit No	**1**
Unit Name	**Unit 1: Introduction to Ecology**
No. of class required	6
Detail of the topics to be taught (Classes required)	History of ecology, Autecology and synecology, Levels of organization, Laws of limiting factors, Study of abiotic factors
No. of Tutorials	1
3rd Semester (CBCS)	
Course Code: ZC305T **CORE COURSE V: DIVERSITY OF CHORDATA**	
Unit Name	**Unit 5: Pisces**
No. of Class required	8
Detail of the topics to	General characteristics of Chondrichthyes and Osteichthyes,

be taught (Classes required)	classification up to order Migration, Osmoregulation and Parental care in fishes
No. of Tutorials	1
Course Code: ZC306T CORE COURSE VI: ANIMAL PHYSIOLOGY: CONTROLLING AND COORDINATING SYSTEMS	
Allotted Unit No.	**6**
Unit Name	**Endocrine System**
No. of Class required	6
Detail of the topics to be taught (Classes required)	Histology of endocrine glands - pineal, pituitary, thyroid, parathyroid, pancreas, adrenal;hormones secreted by them and their mechanism of action; Classification of hormones;Regulation of their secretion; Mode of hormone action, Signal transduction pathways for steroidal and non- steroidal hormones; Hypothalamus (neuroendocrine gland) - principa lnuclei involved in neuroendocrine control of anterior pituitary and endocrine system;Placental hormones
No. of Tutorials	1

EVEN SEMESTER-2022

2nd Semester (CBCS)	
Course Code: ZC203T CORE COURSE III NON-CHORDATES II: COELOMATES	
Allotted Unit No	**1**
Unit Name	**Unit 1: Introduction to Coelomates**
No. of Class required	**2**
Detail of the topics to be taught (Classes required)	Evolution of coelom and metamerism
No. of tutorials	**1**

(Dr. Rina Handique)

Head
Department of Zoology
Gargaon College,
Simaluguri, Sivasagar

GARGAON COLLEGE
TEACHING PLAN
Course: B. Sc.
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SESSION: 2021-2022

ODD SEMESTER 2021

Name of the Teacher: Pimily Langthasa
Methods to be applied: Lecture and presentation method along with interaction and discussion.
Teaching Materials: Green & White Board, Chalk Pencil, Marker, Duster, Books, Laptop, and Projector.

1ST SEMESTER (CBCS)	
PAPER TITLE (CODE): NON-CHORDATES I: PROTISTS TO PSEUDOCOELOMATES (CORE COURSE I)	
Allotted Unit No	**2**
Unit Name	**Unit 2:Porifera**
No. of Class required	7
Detail of the topics to be taught (Classes required)	General characteristics (1), Classification up to classes (2) Canal system (2)and spicules in sponges (2)
No. of Tutorials	2
Allotted Unit No	**3**
Unit Name	**Unit 3: Cnideria**
No. of Class required	10
Detail of the topics to be taught (Classes required)	General characteristics (1), Classification up to classes (1), Metagenesis in *Obelia (2)*, Polymorphism in Cnidaria (2) Corals (1) and coral reefs (2)
No. of Tutorials	3
Allotted Unit No	**Unit 4**
Unit Name	**Ctenophora**
No. of Class required	4
Detail of the topics to be taught (Classes required)	General characteristics and Evolutionary significance
No. of Tutorials	0
Allotted Unit No	**Unit 5**
Unit Name	**Platyhelminthes**
No. of Class required	10
Detail of the topics to be taught (Classes required)	General characteristics and Classification up to classes Life cycle and pathogenicity of *Fasciola hepatica* and *Taenia solium*
No. of Tutorials	2
3RD SEMESTER (CBCS)	
CORE COURSE V: DIVERSITY OF CHORDATA	
Allotted Unit No	**Unit10**
Unit Name	**Zoogeography**
No. of lass required	8

Detail of the topics to be taught (Classes required)	Zoogeographical realms, Theories pertaining to distribution of animals, Plate tectonic and Continental drift theory, distribution of vertebrates in different realms
No. of Tutorials	1
PAPER TITLE (CODE): ANIMAL PHYSIOLOGY: CONTROLLING AND COORDINATING SYSTEM (CORE COURSE VI)	
Allotted Unit No	**1**
Unit Name	**Unit 1: Tissues**
No. of lass required	6
Detail of the topics to be taught (Classes required)	Structure, location, classification and functions of epithelial tissue, connective tissue, muscular tissue and nervous tissue
No. of Tutorials	2
Allotted Unit No	**2**
Unit Name	**Unit 2: Bone and Cartilage**
No. of lass required	6
Detail of the topics to be taught (Classes required)	Structure and types of bones and cartilages (3) Ossification (2), bone growth and resorption (1)
No. of Tutorials	2
Allotted Unit No	**3**
Unit Name	**Unit 3: Nervous System**
No. of Class required	13
Detail of the topics to be taught (Classes required)	Structure of neuron (1), resting membrane potential, Origin of action potential (1) and its propagation across the myelinated and unmyelinated nerve fibers (2); Types of synapse (1), Synaptic transmission (1) and, Neuromuscular junction (2); Reflex action and its types - reflex arc (1); Physiology of hearing (2) and vision (2).
No. of Tutorials	4
Allotted Unit No.	**4**
Unit Name	**Unit 4: Muscle**
No. of Class required	12
Detail of the topics to be taught (Classes required)	Histology of different types of muscle (2); Ultra structure of skeletal muscle (2); Molecular and chemical basis of muscle contraction (4); Characteristics of muscle twitch (1); Motor unit (1), summation and tetanus (2)
No. of Tutorials	3
Allotted Unit No.	**5**
Unit Name	**Unit 5: Reproductive System**
No. of Class required	11
Detail of the topics to be taught (Classes required)	Histology of testis (1) and ovary (2) ; Physiology of male and female reproduction (3); Puberty (1), Methods of contraception in male (2) and female (2)
No. of Tutorials	5
PAPER TITLE (CODE): FUNDAMENTALS OF BIOCHEMISTRY (CCVII)	
Allotted Unit No.	**3**
Unit Name	**Unit 3: Proteins**
No. of Class required	15

Detail of the topics to be taught (Classes required)	Amino acids: Structure, Classification and General properties of α-amino acids (3); Physiological importance of essential and non-essential α-amino acids (2) Proteins: Bonds stabilizing protein structure (2); Levels of organization in proteins ; Denaturation (3); Introduction to simple and conjugate proteins (2) Immunoglobulins: Basic Structure (1), Classes and Function (1), Antigenic Determinants (1)
No. of tutorials	6
Allotted Unit No.	**4**
Unit Name	**Unit 4: Nucleic Acids**
No. of Class required	12
Detail of the topics to be taught (Classes required)	Structure: Purines and pyrimidines (2), Nucleosides, Nucleotides, Nucleic acids (2) Cot Curves: Base pairing, Denaturation and Renaturation of DNA (3), Types of DNA and RNA (2), Complementarity of DNA (1), Hpyo-Hyperchromaticity of DNA (2)
No. of tutorials	4
5th SEMESTER	
CORE COURSE XI: MOLECULAR BIOLOGY	
Allotted Unit No.	**1**
Unit Name	**Unit 1: Nucleic Acids**
No. of Class required	4
Detail of the topics to be taught (Classes required)	Salient features of DNA and RNA (2), Watson and Crick model of DNA (2)
No. of Tutorials	3
Allotted Unit No.	**2**
Unit Name	**Unit 2: DNA Replication**
No. of Class required	12
Detail of the topics to be taught (Classes required)	DNA Replication in prokaryotes and eukaryotes (4), mechanism of DNA replication (3), Semi-conservative, bidirectional and semi-discontinuous replication (3), RNA priming (1), Replication of circular and linear ds-DNA(1)
No. of Tutorials	3
Allotted Unit No.	**3**
Unit Name	**Unit 3: Transcription**
No. of Class required	10
Detail of the topics to be taught (Classes required)	RNA polymerase and transcription Unit (2), mechanism of transcription in prokaryotes and eukaryotes (5), synthesis of rRNA and mRNA (2), transcription factors (1)
No. of Tutorials	2
Allotted Unit No.	**4**
Unit Name	**Unit 4: Translation**
No. of Class required	13
Detail of the topics to be taught (Classes required)	Genetic code, Degeneracy of the genetic code and Wobble Hypothesis (3); Process of protein synthesis in prokaryotes: Ribosome structure and assembly in prokaryotes, fidelity of protein synthesis, aminoacyl tRNA synthetases and charging of tRNA (6); Proteins involved in initiation, elongation and termination of polypeptide chain (2); Inhibitors of protein

	synthesis (1); Difference between prokaryotic and eukaryotic translation (1)
No. of Tutorials	4
Allotted Unit No.	**5**
Unit Name	**Unit 5: Post Transcriptional Modifications and Processing of Eukaryotic RNA**
No. of Class required	8
Detail of the topics to be taught (Classes required)	Structure of globin mRNA (1); Split genes: concept of introns and exons, splicing mechanism, alternative splicing (4), exon shuffling (1), and RNA editing (1), Processing of tRNA (2)
No. of Tutorials	3
Allotted Unit No.	**6**
Unit Name	**Unit 6: Gene Regulation**
No. of Class required	10
Detail of the topics to be taught (Classes required)	Transcription regulation in prokaryotes: Principles of transcriptional regulation with examples from lac operon (4) and trp operon (2); Transcription regulation in eukaryotes: Activators, repressors, enhancers, silencer elements; Gene silencing, Genetic imprinting (4)
No. of Tutorials	4
PAPER TITLE (CODE): PRINCIPLES OF GENETICS	
Allotted Unit No.	**Unit 3: Mutations**
No. of Class required	10
Detail of the topics to be taught (Classes required)	Types of gene mutations (Classification), Types of chromosomal aberrations (Classification, figures and with one suitable example of each), Molecular basis of mutations in relation to UV light and chemical mutagens; Detection of mutations: CLB method, attached *X* method.
No. of tutorials	**3**
Allotted Unit No.	**Unit 4: Sex Determination**
No. of Class required	4
Detail of the topics to be taught (Classes required)	Chromosomal mechanisms of sex determination in Drosophila and Man
No. of tutorials	1
PAPER TITLE (CODE): ANIMAL BEHAVIOUR AND CHRONOBIOLOGY	
Allotted Unit No.	**Unit 1: Introduction to Animal Behavior**
No. of Class required	**7**
Detail of the topics to be taught (Classes required)	Origin and history of Ethology; Brief profiles of Karl Von Frish, Ivan Pavlov, Konrad Lorenz, Niko Tinbergen, Proximate and ultimate causes of behavior.
No. of tutorials	1
Allotted Unit No.	**Unit 2: Patterns of Behaviour**
No. of Class required	**10**
Detail of the topics to be taught (Classes required)	Stereotyped Behaviours (Orientation, Reflexes); Individual Behavioural patterns; Instinct vs. Learnt Behaviour; Associative learning, classical and operant conditioning, Habituation, Imprinting.
No. of tutorials	**3**
Allotted Unit No.	**Unit 3: Social and Sexual Behaviour**
No. of Class required	**14**

Detail of the topics to be taught (Classes required)	Social Behaviour: Concept of Society; Communication and the senses; Altruism; Insects' society with Honey bee as example; Foraging in honey bee and advantages of the waggle dance. Sexual Behaviour: Asymmetry of sex, Sexual dimorphism, Mate choice, Intra-sexual selection (male rivalry), Inter-sexual selection (female choice), Sexual conflict in parental care.
No. of tutorials	**3**
PAPER TITLE (CODE): PRINCIPLES OF GENETICS	
Allotted Unit No.	**Unit**: **1 Introduction**
No. of Class required	4
Detail of the topics to be taught (Classes required)	Concept and scope of biotechnology
No. of Tutorials	
Allotted Unit No.	**Unit: 2 Modern Techniques in Gene Manipulation**
No. of Class required	24
Detail of the topics to be taught (Classes required)	Cloning vectors: Plasmids, Cosmids, Phagemids, Lambda Bacteriophage, M13, BAC, YAC, MAC and Expression vectors (characteristics). Restriction enzymes: Nomenclature, detailed study of Type II. Transformation techniques: Calcium chloride method and electroporation. Construction of genomic and cDNA libraries and screening by colony and plaque hybridization Southern blotting, DNA sequencing: Sanger method Polymerase Chain Reaction, DNA Finger Printing and DNA micro array
No. of Tutorials	4
Allotted Unit No.	**Unit: 3 Genetically Modified Organisms**
No. of Class required	18
Detail of the topics to be taught (Classes required)	Production of cloned and transgenic animals: Nuclear Transplantation, Retroviral Method, DNA microinjection Applications of transgenic animals: Production of pharmaceuticals, production of donor organs, knock out mice. Applications of transgenic plants: insect and herbicide resistant plants.
No. of Tutorials	
Allotted Unit No.	**Unit: 4 Culture Techniques and Applications**
No. of Class required	10
Detail of the topics to be taught (Classes required)	Animal cell culture, expressing cloned genes in mammalian cells, Molecular diagnosis of genetic diseases (Cystic fibrosis, Sickle cell anemia) Recombinant DNA in medicines: Recombinant insulin and human growth hormone, Gene therapy
No. of Tutorials	2

SESSION: EVEN SEMESTER 2022

2nd SEMESTER (CBCS)	
PAPER TITLE (CODE): CELL BIOLOGY (CORE COURSE IV)	
Allotted Unit No	**1**
Unit Name	**Unit 1: Overview of Cells**

No. of lass required	4
Detail of the topics to be taught (Classes required)	Prokaryotic and Eukaryotic cells (3) Virus, Viroids, Mycoplasma, Prions (1)
No. of Tutorials	1
Allotted Unit No	**2**
Unit Name	**Unit 2: Plasma Membrane**
No. of lass required	8
Detail of the topics to be taught (Classes required)	Various models of plasma membrane structure (3) Transport across membranes: Active and Passive transport, Facilitated transport (2), Cell junctions: Tight junctions, Desmosomes, Gap junctions (2)
No. of Tutorials	3
Allotted Unit No	**3**
Unit Name	**Unit 3: Endomembrane System**
No. of Class required	**7**
Detail of the topics to be taught (Classes required)	Structure and Functions: Endoplasmic Reticulum(4), Golgi Apparatus(2), Lysosomes(1)
No. of Tutorials	2
Allotted Unit No.	**4**
Unit Name	**Unit 4: Mitochondria and Peroxisomes**
No. of Class required	9
Detail of the topics to be taught (Classes required)	Mitochondria: Structure (2), Semi-autonomous nature (1), Endosymbiotic hypothesis (2), Mitochondrial Respiratory Chain (2), Chemi-osmotic hypothesis(1), Peroxisomes(1)
No. of Tutorials	Nil
Allotted Unit No.	**5**
Unit Name	**Unit 5: Cytoskeleton**
No. of Class required	4
Detail of the topics to be taught (Classes required)	Structure and Functions: Microtubules, Microfilaments and Intermediate filaments (4)
No. of Tutorials	Nil
Allotted Unit No.	**6**
Unit Name	**Unit 6: Nucleus**
No. of Class required	9
Detail of the topics to be taught (Classes required)	Structure of Nucleus (2) Nuclear envelope, Nuclear pore complex, Nucleolus (2) Chromatin: Euchromatin and Hetrochromatin (2) packaging (nucleosome) (3)
No. of Tutorials	3
4th SEMESTER (CBCS)	
PAPER TITLE (CODE): ANIMAL PHYSIOLOGY: LIFE SUSTAINING SYSTEMS (CORE COURSE IX)	
Allotted Unit No	**2**
Unit Name	**Physiology of Respiration**
No. of Class required	**15**

Detail of the topics to be taught (Classes required)	Histology of trachea and lung (3); Mechanism of respiration (2), pulmonary ventilation; Respiratory volumes and capacities (2); Respiratory pigments(1), Transport of oxygen and carbon dioxide in blood(3); Dissociation curves and the factors influencing it (2); Carbon monoxide poisoning (1); Control of respiration (1)
No. of tutorials	5
Allotted Unit No	**3**
Unit Name	**Renal Physiology**
No. of Class required	8
Detail of the topics to be taught (Classes required)	Structure of kidney (1) and its functional unit (2); Mechanism of urine formation (3); Regulation of water balance (1); Regulation of acid-base balance (1)
No. of tutorials	3
PAPER TITLE (CODE): BIOCHEMISTRY OF METABOLIC PROCESSES (CORE COURSE X)	
Allotted Unit No	**4**
Unit Name	**Unit 4: Protein Metabolism**
No. of Class required	10
Detail of the topics to be taught (Classes required)	Catabolism of amino acids (2): Transamination, Deamination, Urea cycle (4); Fate of C-skeleton of Glucogenic and Ketogenic amino acids (4)
No. of tutorials	2
Allotted Unit No	**5**
Unit Name	**Unit 5: Oxidative Phosphorylation**
No. of Class required	10
Detail of the topics to be taught (Classes required)	Redox systems (2); Review of mitochondrial respiratory chain (3), Inhibitors and un-couplers of Electron Transport System (3)
No. of tutorials	**2**
6th SEMESTER (CBCS)	
PAPER TITLE (CODE): DEVELOPMENTAL BIOLOGY	
Allotted Unit No	**1: Introduction**
No. of Class required	**4**
Detail of the topics to be taught (Classes required)	Historical perspective and basic concepts: Phases of development, Cell-Cell interaction, Pattern formation, Differentiation and growth, Differential gene expression, Cytoplasmic determinants and asymmetric cell division
No. of tutorials	**1**
Allotted Unit No	**Unit 2: Early Embryonic Development**
No. of Class required	**28**
Detail of the topics to be taught (Classes required)	Gametogenesis (1), Spermatogenesis (2), Oogenesis (2); Types of eggs (2), Egg membranes (1); Fertilization (External and Internal): Changes in gametes, Blocks to polyspermy (6); Planes and patterns of cleavage (2); Types of Blastula (2); Fate maps (including Techniques) (2); Early development of frog and chick up to gastrulation (6); Embryonic induction and organizers (2)

No. of tutorials	**6**
Allotted Unit No	**Unit 3: Late Embryonic Development**
No. of Class required	**8**
Detail of the topics to be taught (Classes required)	Fate of Germ Layers; Extra-embryonic membranes in birds; Implantation of embryo in humans, Placenta (Structure, types and functions of placenta)
No. of tutorials	**4**
Allotted Unit No	**Unit 4: Post Embryonic Development**
No. of Class required	**12**
Detail of the topics to be taught (Classes required)	Metamorphosis: Changes in amphibians and insects; Regeneration: Modes of regeneration, epimorphosis, morphallaxis and compensatory regeneration (with one example each); Ageing: Concepts and Theories
No. of tutorials	**2**
Allotted Unit No	**Unit 5: Implications of Developmental Biology**
No. of Class required	**8**
Detail of the topics to be taught (Classes required)	Teratogenesis: Teratogenic agents and their effects on embryonic development; *In vitro* fertilization, Stem cell (ESC), Amniocentesis
No. of tutorials	1
CORE COURSE XIV: EVOLUTIONARY BIOLOGY	
Allotted Unit No	**Unit 1:**
No. of Class required	7
Detail of the topics to be taught (Classes required)	Life's Beginnings: Chemogeny, RNA world, Biogeny, Origin of photosynthesis, Evolution of eukaryotes
No. of tutorials	**0**
Allotted Unit No	**Unit 2:**
No. of Class required	4
Detail of the topics to be taught (Classes required)	Historical review of evolutionary concept: Lamarckism, Darwinism, Neo- Darwinism
No. of tutorials	0
Allotted Unit No	**Unit 3:**
No. of Class required	10
Detail of the topics to be taught (Classes required)	Evidences of Evolution: Fossil record (types of fossils, transitional forms, geological time scale, evolution of horse, three domains of life, neutral theory of molecular evolution, molecular clock ,example of globin gene family
No. of tutorials	3
Allotted Unit No	**Unit 4:**
No. of Class required	5
Detail of the topics to be taught (Classes required)	Sources of variations: Heritable variations and their role in evolution
No. of tutorials	1
Allotted Unit No	**Unit 5:**
No. of Class required	14
Detail of the topics to be taught (Classes required)	Basic concept of Population genetics: Hardy-Weinberg Law (statement and derivation of equation, application of law to human Population); Evolutionary forces upsetting H-W equilibrium; Natural selection (concept of fitness, mechanism of working, types of selection, density-

	dependent selection, heterozygous superiority, kin selection, adaptive resemblances, sexual selection. Genetic Drift (mechanism, founder's effect, bottleneck phenomenon; Role of Migration and Mutation in changing allele frequencies
No. of tutorials	2
DSE : IMMUNOLOGY	
Allotted Unit No	**Unit 1: Overview of Immune System**
No. of Class required	10
Detail of the topics to be taught (Classes required)	Historical perspective of Immunology, Early theories of Immunology, Cells and organs of the Immune system
No. of tutorials	0
Allotted Unit No	Unit 2: Innate and Adaptive Immunity
No. of Class required	13
Detail of the topics to be taught (Classes required)	Anatomical barriers, Inflammation, Cell and molecules involved in innate immunity, Adaptive immunity (Cell mediated and humoral), Passive: Artificial and natural Immunity, Active: Artificial and natural Immunity, Immune dysfunctions (brief account of autoimmunity with reference to Rheumatoid Arthritis and tolerance, AIDS).
No. of tutorials	2

Department of Zoology
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Simaluguri

Dr. Rina Handique
HoD
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GARGAON COLLEGE
TEACHING PLAN
Course: B. Sc.
Session: Odd semester 2021

Subject: ZOOLOGY
Name of the Teacher: Dr. Rashmi Dutta
Methods to be applied: Lecture and presentation method along with interaction and discussion.
Teaching Materials: Green & White Board, Chalk Pencil, Marker, Duster, Books, Journal, Newspaper, Magazine, Periodicals, Laptop, Projector.

Paper Title (Code): Principle of Ecology (CCII)	
Allotted Unit No	1
Unit Name	**Unit 1: Introduction to Ecology**
No. of Class required	**6**
Detail of the topics to be taught (Classes required)	History of ecology, Autecology and synecology (1) Levels of organization, Laws of limiting factors (2) Study of abiotic factors;(3)
No. of Tutorials	2
Allotted Unit No	2
Unit Name	**Unit 2: Population**
No. of Class required	**18**
Detail of the topics to be taught (Classes required)	Unitary and Modular populations (1) Unique and group attributes of population (1) Density, natality, mortality (1), life tables, fecundity tables, survivorship curves, age ratio, sex ratio, dispersal and dispersion (2) Exponential and logistic growth, equation and patterns (2) r and K strategies (1) Population regulation - density-dependent and independent factors (2) Population interactions (1) Gause's Principle with laboratory and field examples (3) Lotka-Volterra equation for competition and Predation (3) functional and numerical responses; (1)
No. of Tutorials	4
Allotted Unit No	3
Unit Name	**Unit 3: Community**
No. of class required	**8**
Detail of the topics to be taught (Classes required)	Community characteristics: species richness, dominance, diversity, abundance, vertical stratification (4) Ecotone and edge effect; (1) Ecological succession with Hydrosere (2) Theories pertaining to climax community (1)
No. of Tutorials	3
Allotted Unit No	**4**
Unit Name	**Unit 4: Ecosystem**
No. of Class required	**10**
Detail of the topics to be taught (Classes required)	Types of ecosystems with one example in detail (Forest ecosystem), (2) Food chain: Detritus and grazing food chains, Linear and Y-shaped food chains, Food web, (2) Energy flow through the ecosystem, (2) Ecological pyramids and Ecological efficiencies (1) Nutrient and biogeochemical cycle with Nitrogen cycle as an example (2) Human modified ecosystem (1)
Alloted Unit No	**5**
Unit Name	**Unit 5: Applied Ecology**
No. of class required	**4**
Detail of the topics to be taught (Classes required)	Concept of wildlife conservation (Usefulness, causes and consequences of degradation) (2) Management strategies (2)
No. of tutorials	**1**
Paper Title (Code): DIVERSITY OF CHORDATA (CCV)	
Allotted Unit No	**1**
Unit Name	**Unit 1: Introduction to Chordates**

No. of lass required	2
Detail of the topics to be taught (Classes required)	General characteristics and outline classification of Chordates (2)
No. of Tutorials	Nil
Allotted Unit No	**2**
Unit Name	**Unit 2: Protochordata**
No. of lass required	
Detail of the topics to be taught (Classes required)	General characteristics of Hemichordata (1) Urochordata and Cephalochordata (2) Study of larval forms in protochordates; (2) Retrogressive metamorphosis in Urochordata (1)
No. of Tutorials	2
Allotted Unit No	3
Unit Name	**Unit 3: Origin of Chordata**
Detail of the topics to be taught (Classes required)	Dipleurula concept and the Echinoderm theory of origin of chordates; (1) Advanced features of vertebrates over Protochordata (1)
No. of Tutorials	2
Allotted Unit No.	**4**
Unit Name	**Unit 4: Agnatha**
No. of Class required	**2**
Detail of the topics to be taught (Classes required)	General characteristics and classification of cyclostomes up to class (2)
No. of Tutorials	Nil
Allotted Unit No.	**5**
Unit Name	**Unit 5: Pisces**
No. of Class required	7
Detail of the topics to be taught (Classes required)	General characteristics of Chondrichthyes and Osteichthyes (2) classification up to order (2) Migration, Osmoregulation and (1) Parental care in fishes (2)
No. of Tutorials	1
Allotted Unit No.	**6**
Unit Name	**Unit 6: Amphibia**
No. of Class required	**4**
Detail of the topics to be taught (Classes required)	Origin of *Tetrapoda* (Evolution of terrestrial ectotherms) (1) General characteristics and classification up to order (1) Parental care in Amphibians (2)
No. of Tutorials	2
Allotted Unit No.	**7**
Unit Name	**Unit 7: Reptilia**
No. of Class required	**6**
Detail of the topics to be taught (Classes required)	General characteristics and classification up to order (3) Affinities of *Sphenodon* (1) Poison apparatus and (1) Biting mechanism in snakes (1)
No. of Tutorials	**2**
Allotted Unit No.	**8**
Unit Name	**Unit 8: Aves**
No. of class required	**10**
Detail of the topics to be taught (Classes required)	General characteristics and classification up to order (3) *Archaeopteryx*—a connecting link (1) Principles and aerodynamics of flight, (2) Flight adaptations (2) and Migration in birds (2)
No. of Tutorials	**2**
Allotted Unit No.	**9**
Unit Name	**Unit 9: Mammals**
No. of Class required	**6**
Detail of the topics to be taught (Classes required)	General characters and classification up to order; (2) Affinities of Prototheria (1) Adaptive radiation with reference to locomotory appendages (3)
No. of Tutorials	**3**
Allotted Unit No.	**10**
Unit Name	**Unit 10: Zoogeography**
No. of Class required	**7**

Detail of the topics to be taught (Classes required)	Zoogeographical realms (2) Theories pertaining to distribution of animals (2) Plate tectonic and Continental drift theory (1) distribution of vertebrates in different realms (2)
No. of Tutorials	**2**
Paper Title (Code): FUNDAMENTALS OF BIOCHEMISTRY (CCVII)	
Allotted Unit No.	**1**
Unit Name	Unit 1: Carbohydrates
No. of Class required	5
Detail of the topics to be taught (Classes required)	Structure and Biological importance of carbohydrates (1) Monosaccharides (1) Disaccharides (1) Polysaccharides and Glycoconjugates (2)
No. of Tutorials	2
Allotted Unit No.	**2**
Unit Name	**Unit 2: Lipids**
No. of Class required	6
Detail of the topics to be taught (Classes required)	Structure and Significance of Lipids (3) Physiologically important saturated and unsaturated fatty acids (1) Tri-acylglycerols, Phospholipids, Glycolipids, Steroids (2)
No. of Tutorials	2
Allotted Unit No.	**5**
Unit Name	**Unit 5: Enzymes**
No. of Class required	15
Detail of the topics to be taught (Classes required)	Nomenclature and classification of Enzyme (1) Cofactors; Specificity of enzyme action (2) Isozymes (1) Mechanism of enzyme action; Enzyme kinetics (3) Factors affecting rate of enzyme-catalyzed reactions (1) Derivation of Michaelis Menten equation (1) Concept of Km and Vmax (1) Lineweaver-Burk plot (1) Multi-substrate reactions (1) Enzyme inhibition (1) Allosteric enzymes and their kinetics (1) Regulation of enzyme action (1)
No. of tutorials	**5**
Paper Title (Code): Principle of Genetics (XII)	
Allotted Unit No.	1
Unit Name	Unit 1: Mendelian Genetics and its Extension
No. of Class required	10
Detail of the topics to be taught (Classes required)	Principles of inheritance, (3) Incomplete dominance and co-dominance (1) Multiple alleles, Lethal alleles, Epistasis, Pleiotropy (4) Sex-linked, sex- influenced and sex-limited characters inheritance. (2)
No. of Tutorials	3
Allotted Unit No.	2
Unit Name	Unit 2: Linkage, Crossing Over and Chromosomal Mapping
No. of Class required	11
Detail of the topics to be taught (Classes required)	Linkage and crossing over, (1) Cytological basis of crossing over, (2) Molecular mechanisms of crossing over including models of recombination, (3) Recombination frequency as a measure of linkage intensity, (1) Two factor and three factor crosses, (2) Interference and coincidence (1) Somatic cell hybridization (1)
No. of Tutorials	3
Allotted Unit No.	3
Unit Name	**Unit 3: Mutations**
No. of Class required	8
Detail of the topics to be taught (Classes required)	Types of gene mutations (Classification), (2) Types of chromosomal aberrations (2) (Classification, figures and with one suitable example of each), Molecular basis of mutations in relation to UV light and chemical mutagens (2) Detection of mutations: CLB method, attached *X* method (2)
No. of Tutorials	2

Allotted Unit No.	4
Unit Name	**Unit 4: Sex Determination**
No. of Class required	2
Detail of the topics to be taught (Classes required)	Chromosomal mechanisms of sex determination in Drosophila and Man (2)
No. of Tutorials	Nil
Allotted Unit No.	**5**
Unit Name	**Unit 5: Extra-chromosomal Inheritance**
No. of Class required	4
Detail of the topics to be taught (Classes required)	Criteria for extra-chromosomal inheritance, (1) Antibiotic resistance in *Chlamydomonas*, (1) Mitochondrial mutations in *Saccharomyces*, (1) Infective heredity in *Paramecium* and Maternal effects (1)
No. of Tutorials	2
Allotted Unit No.	**6**
Unit Name	**Unit 6: Polygenic Inheritance**
No. of Class required	3
Detail of the topics to be taught (Classes required)	Polygenic inheritance with suitable examples; (1) simple numericals based on it (2)
No. of Tutorials	Nil
Allotted Unit No.	**7**
Unit Name	**Unit 7: Recombination in Bacteria and Viruses**
No. of Class required	3
Detail of the topics to be taught (Classes required)	Conjugation, Transformation, Transduction, (2) Complementation test in Bacteriophage (1)
No. of Tutorials	1
Allotted Unit No.	8
Unit Name	Unit 8: Transposable Genetic Elements
No. of Class required	4
Detail of the topics to be taught (Classes required)	Transposons in bacteria (1) Ac-Ds elements in maize and P elements in *Drosophila*, Transposons in humans (3)
No. of Tutorials	1
Paper Title (Code): **BIOLOGY OF INSETA (DSEII)**	
Allotted Unit No.	**1**
Unit Name	**Unit I: Introduction of Insects**
No. of Class required	**4**
Detail of the topics to be taught (Classes required)	General Features of Insects (1) Distribution and Success of Insects on the Earth (3)
No. of Tutorials	1
Allotted Unit No.	**2**
Unit Name	**Unit II: Insect Taxonomy**
No. of Class required	**4**
Detail of the topics to be taught (Classes required)	Basis of insect classification; (1) Classification of insects up to orders (3)
No. of Tutorials	1
Allotted Unit No.	**3**
Unit Name	**Unit III: General Morphology of Insects**
No. of Class required	**9**

Detail of the topics to be taught (Classes required)	External Features; Head – Eyes, Types of antennae, (2) Mouth parts w.r.t. feeding habits (1) Thorax: Wings and wing articulation, (2) Types of Legs adapted to diverse habitat (2) Abdominal appendages and genitalia (2)
No. of Tutorials	2
Allotted Unit No.	**4**
Unit Name	**Unit IV: Physiology of Insects**
No. of Class required	**13**
Detail of the topics to be taught (Classes required)	Structure and physiology of Insect body systems – Integumentary System, (2) Digestive system, (1) Excretory system, (1) Circulatory system, (1) Respiratory system, (3) endocrine system and (1) reproductive system. (1) Sensory receptors and nervous system (2) Growth and metamorphosis (1)
No. of Tutorials	4
Allotted Unit No.	**5**
Unit Name	**Unit V: Insect Society**
No. of Class required	**5**
Detail of the topics to be taught (Classes required)	Group of social insects and their social life (2) Social organization and social behaviour (w.r.t. any one example) (3)
No. of Tutorials	1

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TEACHING PLAN
Course: B. Sc.
Session: Even semester 2022

Subject: ZOOLOGY
Name of the Teacher: Dr. Rashmi Dutta
Methods to be applied: Lecture and presentation method along with interaction and discussion.
Teaching Materials: Green & White Board, Chalk Pencil, Marker, Duster, Books, Journal, Newspaper, Magazine, Periodicals, Laptop, Projector.

Paper Title (Code): NON-CHORDATES II: COELOMATES (Core Course III)	
Allotted Unit No	1
Unit Name	**Unit 1: Introduction to Coelomates**
No. of Class required	5
Detail of the topics to be taught (Classes required)	Evolution of coelom and metamerism (3) Theory of Metamerism (1) Theory of Coelom (1)
No. of tutorials	2
Allotted Unit No	2
Unit Name	**Unit 2: Annelida**
No. of Class required	5
Detail of the topics to be taught (Classes required)	General characteristics and Classification up to classes (3) Excretion in Annelida (2)
No. of tutorials	1
Allotted Unit No	3
Unit Name	**Unit 3: Arthropoda**
No. of Class required	10
Detail of the topics to be taught (Classes required)	General characteristics and Classification up to classes (3) Vision and Respiration in Arthropoda (3) Metamorphosis in Insects (1) Social life in bees and termites (3)
No. of tutorials	3
Allotted Unit No	4
Unit Name	**Unit 4: Onychophora**
No. of Class required	3
Detail of the topics to be taught (Classes required)	General characteristics and (1) Evolutionary significance (2)
No. of tutorials	Nil
Allotted Unit No	5
Unit Name	**Unit 5: Mollusca**
No. of Class required	8
Detail of the topics to be taught (Classes required)	General characteristics and (1) Classification up to classes (1) Respiration in Mollusca (1) Torsion and detorsion in Gastropoda (2) Pearl formation in bivalves (1) Evolutionary significance of trochophore larva (2)
No. of tutorials	2
Allotted Unit No	6
Unit Name	**Unit 6: Echinodermata**
No. of Class required	
Detail of the topics to be taught (Classes required)	General characteristics and (1) Classification up to classes (1) Water-vascular system in Asteroidea (1) Larval forms in Echinodermata (2) Affinities with Chordates (1)

No. of tutorials	2
Paper Title (Code): COMPARATIVE ANATOMY OF VERTEBRATES (CORE COURSE VIII)	
Allotted Unit No	1
Unit Name	**Unit 1: Integumentary System**
No. of Class required	7
Detail of the topics to be taught (Classes required)	Structure of Integument in Vertebrates, (3) functions of Integuments in Vertebrates and (2) Derivatives of integument (2)
No. of tutorials	2
Allotted Unit No	2
Unit Name	**Unit 2: Skeletal System**
No. of Class required	9
Detail of the topics to be taught (Classes required)	Overview of axial and appendicular skeleton of different Vertebrates (4) Jaw suspensorium in Vertebrates, (3) Visceral arches in Different Vertebrates (2)
No. of tutorials	3
Allotted Unit No	3
Unit Name	**Unit 3: Digestive System**
No. of Class required	5
Detail of the topics to be taught (Classes required)	Alimentary canal of Different Vertebrates (1) and associated glands, (2) dentition of Vertebrates (2)
No. of tutorials	2
Allotted Unit No	4
Unit Name	**Unit 4: Respiratory System**
No. of Class required	7
Detail of the topics to be taught (Classes required)	Skin of Vertebrates (2) Gills of Vertebrates (1) Lungs of Vertebrates (1) and air sacs of Vertebrates (1) Accessory respiratory organs of Vertebrates (2)
No. of tutorials	2
Allotted Unit No	5
Unit Name	**Unit 5: Circulatory System**
No. of Class required	5
Detail of the topics to be taught (Classes required)	General plan of circulation of Vertebrates (3) evolution of heart and aortic arches of Vertebrates (2)
No. of tutorials	1
Allotted Unit No	6
Unit Name	**Unit 6: Urinogenital System**
No. of Class required	6
Detail of the topics to be taught (Classes required)	Succession of kidney of Vertebrates (2) Evolution of urinogenital ducts of Vertebrates (3) Types of mammalian uteri (1)
No. of tutorials	2
Allotted Unit No	7
Unit Name	**Unit 7: Nervous System**
No. of Class required	7
Detail of the topics to be taught (Classes required)	Comparative account of brain of Vertebrates (2) Autonomic nervous system of Vertebrates (2) Spinal cord of Vertebrates (2) Cranial nerves in mammals (1)
No. of tutorials	2
Allotted Unit No	8
Unit Name	**Unit 8: Sense Organs**
No. of Class required	4
Detail of the topics to be taught (Classes required)	Classification of receptors (2) Brief account of visual and (1) auditory receptors in man (1)
No. of tutorials	1
Paper Title (Code): ANIMAL PHYSIOLOGY: LIFE SUSTAINING SYSTEMS (CORE COURSE IX)	

Allotted Unit No	1
Unit Name	**Unit 1: Physiology of Digestion**
No. of Class required	12
Detail of the topics to be taught (Classes required)	Structural organization and (1) functions of gastrointestinal tract and associated glands (2) Mechanical and chemical digestion of food (2) Absorptions of carbohydrates (1) Absorption of lipids, (1) Absorption of proteins, (1) Absorption of water, (1) Absorption of minerals and vitamins (1) Hormonal control of secretion of enzymes in Gastrointestinal tract (2)
No. of tutorials	5
Allotted Unit No	4
Unit Name	**Unit 4: Blood**
No. of Class required	14
Detail of the topics to be taught (Classes required)	Components of blood and their functions (2) Structure and functions of haemoglobin (1) Haemostasis: Blood clotting system, (3) Kallikrein-Kinninogen system, (2) Complement system & Fibrinolytic system, (3) Haemopoiesis (1) Blood groups: Rh factor, (1) ABO and MN blood group (1)
No. of tutorials	3
Allotted Unit No	5
Unit Name	**Unit 5: Physiology of Heart**
No. of Class required	14
Detail of the topics to be taught (Classes required)	Structure of mammalian heart (2) Coronary circulation (2) Structure and working of conducting myocardial fibres (2) Origin and conduction of cardiac impulses (1) Cardiac cycle; (2) Cardiac output and its regulation, (1) Frank-Starling Law of the heart, (1) nervous and chemical regulation of heart rate (1) Electrocardiogram (1) Blood pressure and its regulation (1)
No. of tutorials	5
Paper Title (Code): BIOCHEMISTRY OF METABOLIC PROCESSES (Core Course X)	
Allotted Unit No	1
Unit Name	**Unit 1: Overview of Metabolism**
No. of Class required	10
Detail of the topics to be taught (Classes required)	Catabolism *vs* Anabolism, (1) Compartmentalization of metabolic pathways, (1) Shuttle systems and membrane transporters; (2) ATP as "Energy Currency of cell" (1) coupled reactions; (1) Use of reducing equivalents and cofactors;(2) Intermediary metabolism and regulatory mechanisms (2)
No. of tutorials	3
Allotted Unit No	2
Unit Name	**Unit 2: Carbohydrate Metabolism**
No. of Class required	10
Detail of the topics to be taught (Classes required)	Sequence of reactions and regulation of glycolysis, (4) Citric acid cycle, (2) Phosphate pentose pathway (1) Gluconeogenesis (1) Glycogenolysis and (1) Glycogenesis (1)
No. of tutorials	5
Allotted Unit No	3
Unit Name	**Unit 3: Lipid Metabolism**
No. of Class required	10
Detail of the topics to be taught (Classes required)	β-oxidation and (2) omega -oxidation of saturated fatty acids with even and odd number of carbon atoms; (4) Biosynthesis of palmitic acid; (3) Ketogenesis (1)
No. of tutorials	4
Paper Title (Code): DEVELOPMENTAL BIOLOGY (CORE COURSE XIII)	

Allotted Unit No	1
Unit Name	**Unit 1: Introduction**
No. of Class required	10
Detail of the topics to be taught (Classes required)	Historical perspective and basic concepts: (1) Phases of development, Cell-Cell interaction, (2) Pattern formation, (2) Differential gene expression, (2) Cytoplasmic determinants and (1) asymmetric cell division (2)
No. of tutorials	4
Allotted Unit No	3
Unit Name	**Unit 3: Late Embryonic Development**
No. of Class required	7
Detail of the topics to be taught (Classes required)	Fate of Germ Layers; (2) Extra-embryonic membranes in birds; (2) Implantation of Embryo in humans, (1) Placenta (Structure, types and functions of placenta) (2)
No. of tutorials	2
Allotted Unit No	4
Unit Name	**Unit 4: Post Embryonic Development**
No. of Class required	7
Detail of the topics to be taught (Classes required)	Metamorphosis: Changes, (1) hormonal regulations in amphibians and insects; (2) epimorphosis (1) morphallaxis and (1) compensatory regeneration (with one example each); (1) Ageing: Concepts and Theories (1)
No. of tutorials	2
Allotted Unit No	5
Unit Name	**Unit 5: Implications of Developmental Biology**
No. of Class required	6
Detail of the topics to be taught (Classes required)	Teratogenesis: Teratogenic agents and their effects on embryonic-development (2) *In vitro* fertilization, (2) Stem cell (ESC), (1) Amniocentesis (1)
No. of tutorials	2
Paper Title (Code): EVOLUTIONARY BIOLOGY (CORE COURSE XIV)	
Allotted Unit No	**1**
Unit Name	**Unit 1: Life's Beginnings**
No. of Class required	12
Detail of the topics to be taught (Classes required)	Chemogeny (4) RNA world (2) Biogeny (1) Origin of photosynthesis, (2) Evolution of eukaryotes (3)
No. of tutorials	5
Allotted Unit No	**2**
Unit Name	**Unit 2: Historical review of evolutionary concept**
No. of Class required	7
Detail of the topics to be taught (Classes required)	Lamarckism, (2) Darwinism, (3) Neo Darwinism (2)
No. of tutorials	3
Allotted Unit No	**3**
Unit Name	**Unit 3: Evidences of Evolution:**
No. of Class required	14
Detail of the topics to be taught (Classes required)	Fossil record (types of fossils, transitional forms (2) geological time scale, (3) evolution of horse (3) three domains of life, (2) neutral theory of molecular evolution, (2) molecular clock (1) example of globin gene family (1)
No. of tutorials	3
Allotted Unit No	**4**
Unit Name	**Unit 4: Sources of variations:**
No. of Class required	3
Detail of the topics to be taught (Classes required)	Heritable variations and their role in evolution (3)

No. of tutorials	1
Allotted Unit No	**5**
Unit Name	**Unit 5: Basic concept of Population genetics:**
No. of Class required	**20**
Detail of the topics to be taught (Classes required)	Hardy-Weinberg Law (statement and derivation of equation, application of law to human Population); Evolutionary forces upsetting H-W equilibrium; (5) Natural selection (concept of fitness, mechanism of working, types of selection, (3) density dependent selection (1) heterozygous superiority (1) kin selection (2) adaptive resemblances, (1) sexual selection. (1) Genetic Drift (mechanism, founder's effect, bottleneck phenomenon) (3) Role of Migration and (1) Mutation in changing allele frequencies (2)
No. of tutorials	5
Allotted Unit No	**6**
Unit Name	**Unit 6: Product of evolution:**
No. of Class required	7
Detail of the topics to be taught (Classes required)	Micro evolutionary changes (inter-population variations, clines, races (2) Species concept, (1) Isolating mechanisms, (1) modes of speciation— allopatric, sympatric, Adaptive radiation / (2) macroevolution (exemplified by Galapagos finches) (1)
No. of tutorials	2
Allotted Unit No	**7**
Unit Name	**Unit 7: Extinctions**
No. of Class required	5
Detail of the topics to be taught (Classes required)	Back ground of Extinctions and mass extinctions (causes and effects), (4) detailed example of K-T extinction (1)
No. of tutorials	2
Allotted Unit No	**8**
Unit Name	**Unit 8: Origin and evolution of man**
No. of Class required	8
Detail of the topics to be taught (Classes required)	Origin and Evolution of Man (2) Unique hominin characteristics contrasted with primate Characteristics (2) primate phylogeny from *Dryopithecus* leading to *Homo sapiens* (2) molecular analysis of human origin (2)
No. of tutorials	2
Allotted Unit No	**9**
Unit Name	**Unit 9: Phylogenetic trees**
No. of Class required	7
Detail of the topics to be taught (Classes required)	Phylogenetic trees (2) Multiple sequence alignment, (2) construction of phylogenetic trees (2) interpretation of trees (1)
No. of tutorials	2
Paper Title (Code): IMMUNOLOGY (DSE 3)	
Allotted Unit No	**1**
Unit Name	**Unit 1: Overview of Immune System**
No. of Class required	6
Detail of the topics to be taught (Classes required)	Historical perspective of Immunology, (1) Early theories of Immunology (2) Cells and organs of the Immune system (3)
No. of tutorials	2
Allotted Unit No	2
Unit Name	**Unit 2: Innate and Adaptive Immunity**
No. of Class required	17
Detail of the topics to be taught (Classes required)	Anatomical barriers, (1) Inflammation, (1) Cell and molecules involved in innate immunity, (2) Adaptive immunity (Cell mediated and humoral), (3) Passive: Artificial and natural Immunity, (2) Active: Artificial and natural Immunity, (2) Immune dysfunctions (1) brief account of autoimmunity (1) with reference to Rheumatoid Arthritis and tolerance, (2) AIDS (2)

No. of tutorials	4
Allotted Unit No	**3**
Unit Name	**Unit 3: Antigens**
No. of Class required	8
Detail of the topics to be taught (Classes required)	Antigenicity and immunogenicity, (2) Immunogens, Adjuvants and haptens, (2) Factors influencing immunogenicity (2) B and T-Cell epitopes (2)
No. of tutorials	3
Allotted Unit No	4
Unit Name	**Unit 4: Immunoglobulins**
No. of Class required	13
Detail of the topics to be taught (Classes required)	Structure and functions of different classes of immunoglobulins (2) Antigen- antibody interactions (3) Immunoassays (ELISA and RIA) (3) Polyclonal sera (2) Hybridoma technology (1) Monoclonal antibodies in therapeutics and diagnosis (2)
No. of tutorials	3
Allotted Unit No	**5**
Unit Name	**Unit 5: Major Histocompatibility Complex**
No. of Class required	5
Detail of the topics to be taught (Classes required)	Structure and functions of MHC molecules (2) Endogenous and exogenous pathways of antigen processing and presentation (3
No. of tutorials	1
Allotted Unit No	**6**
Unit Name	**Unit 6: Cytokines**
No. of Class required	4
Detail of the topics to be taught (Classes required)	Properties and functions of cytokines (2) Therapeutics Cytokines (2)
No. of tutorials	1
Allotted Unit No	**7**
Unit Name	**Unit 7: Complement System**
No. of Class required	5
Detail of the topics to be taught (Classes required)	Complement System (2) Components and pathways of complement activation (3)
No. of tutorials	1
Allotted Unit No	**8**
Unit Name	**Unit 8: Vaccines**
No. of Class required	3
Detail of the topics to be taught (Classes required)	Vaccines (1) Various types of vaccines (2).
No. of tutorials	1
Paper Title (Code): FISH AND FISHERIES (DSE 4)	
Allotted Unit No	**1**
Unit Name	**UNIT 1: Introduction and Classification:**
No. of Class required	9
Detail of the topics to be taught (Classes required)	General description of fish; (1) Account of systematic classification of fishes (up to classes); (3) Classification based on feeding habit, (2) habitat and manner of reproduction. (3)
No. of tutorials	3
Allotted Unit No	**2**
Unit Name	**UNIT 2: Morphology and Physiology:**
No. of Class required	26
Detail of the topics to be taught (Classes required)	Types of fins and their modifications (2) Locomotion in fishes (2) Hydrodynamics (1) Types of Scales (1) Use of scales in Classification and determination of age of fish (2) Gills and gas exchange (2) Swim Bladder: Types and role in Respiration (2) buoyancy (1)

	Communication in teleosts (2) Reproductive strategies (special reference to Indian fishes) (2) Electric organs (2) Bioluminiscience (2) Mechanoreceptors (2) Schooling (1) Parental care (1) Migration (1)
No. of tutorials	**6**

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