

LESSON PLAN

DEPARTMENT: ZOOLOGY

SEMESTER-I

NAME OF FACULTY: DR. SUMALLYA KARMAKAR & SMT. SUCHONA MITRA CHAKRABORTY

Subject: 4 yr Zoology Hons. (Major): DSCC1 + 4yr Zoology General (Minor): MNI

Paper: Core Course (Cell Biology)-MZOO

Unit / Group / Module / Article	Topics	No of Lecture Planned	Reference Books	Content Delivery Technique	Remarks / Comments (Concerned Teacher)
Unit-1	Plasma membrane	7			
	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 junction, Transport through plasma membrane		1.The Cell : G.M. Cooper	1. Chalk & Talk 2.PDF 3.Reference Notes	Suchona Chakraborty
Unit-2	Cytoplasmic organelles-I	7			
	Basic concepts of ultrastructure of ER, Golgi and Lysosome; Overview of protein sorting; ER morphology, Targeting proteins to ER, The signal hypothesis; insertion of protein into ER membrane, Protein folding and processing in ER, Export of proteins and lipids from ER; Golgi apparatus:	7	2.Cell & Molecular Biology : Karp	1. Chalk & Talk 2.PDF 3.Reference Notes	Suchona Chakraborty

	Morphology, Protein glycosylation with Golgi, Protein sorting and export from Golgi Apparatus; Lysosome: Polymorphism, Lysosomal acid hydrolases, Endocytosis and lysosome formation				
Unit 3	Cytoplasmic organelles- II	5			
	Mitochondria: Structure, Semiautonomous nature, Mitochondrial DNA, Endosymbiotic hypothesis Mitochondrial Respiratory Chain, Chemiosmotic hypothesis and Oxidative Phosphorylation with reference to ATP Synthase and ATP synthesis	3	The Cell: Bruce Alberts	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar
	Peroxisomes: Structure and Functions; Centrosome and its organization	2	The Cell: Bruce Alberts	1. Chalk & Talk method 2. PPT	
Unit 4	Cytoskeleton	4			
	Structure and Types: Microtubules, Actin filaments, and Intermediate filaments; Basic composition and function of ECM; Cell matrix Interactions (Integrins)	4	The Cell: Bruce Alberts	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar
Unit 5	Nucleus	5			
	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.	5	The Cell: Bruce Alberts	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar
Unit 6	NUCLEIC ACIDS	3			
	Structure and composition of DNA; Chargaff's rule; Hypochromic shift; Watson and Crick model of three dimensional structure of DNA; Different forms of DNA-A, B and Z DNA , RNA priming; End replication problem and replication of telomeres in eukaryotes	3	Concepts of Genetics: Klugg and Cuming	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar
Unit-7	DNA REPLICATION	10			
	Meselson-Stahl experiment; DNA Replication in prokaryotes; Enzymes/proteins associated with Replication-Polymerase[I, II& III]; Primase, Helicase, SSB, DNA Ligase; RNA PRIMING; End replication problem and replication of telomeres in Eukaryotes	19	Karp's Cell and Molecular Biology De Robertis Cell and Molecular Biology	PPt PDF Chalk and Talk	Dr. Sumallya Karmakar
Unit 8	Tools and Techniques in Cell Biology	5			
	Animal Cell Culture: Primary cell culture and Cell	2	Karp's Cell and Molecular	1. Chalk & Talk	Dr. Sumallya

	line. Subcellular fractionation and Ultracentrifugation		Biology De Robertis Cell and Molecular Biology	method 2. PPT	Karmakar
	Freeze fracture Replication and Freeze Etching	1			
	Principle of Light Microscope: Bright field, Phase contrast microscope, Fluorescence Microscope with reference to FRET, Principle of SEM & TEM	1			
Practical	Cell Biology Lab	20			
	1. Cell viability study by Trypan Blue Exclusion method	3		Hands-on-Training	Dr. Sumallya Karmakar
	4. Isolation of Bone Marrow Cells from Rat/Mouse and Giemsa Staining	3		Hands-on-Training	
	2. Standardization of Ocular and Stage Micrometer and measurement of cell or microscopic specimen such as <i>Paramecium</i> sp 3. Preparation of squamous epithelial cell with staining	6 2	Modern Approach to Practical Botany: Santra & Maji Practical Zoology: Ghosh K.C., Manna B. An advanced Laboratory Manual of Zoology: Poddar T., Mukhopadhyay S., Das S.K. Practical Zoology: Chatterjee A.K., Chakraborty C.	Hands-on-Training	Suchona Chakraborty

LESSON PLAN
DEPARTMENT: ZOOLOGY
SEMESTER I
NAME OF FACULTY: DR. SUCHARITA SAHA, DR. DEBJANI DAS GHOSH

Subject: 4 yr Zoology Hons. (Major): SEC-1

Paper: Skill Enhancement Course (Applied Entomology)-ZOOM

: ZOOM

Planned				After Implementation	
Unit / Group / Module / Article	Topics	No of Lecture Planned	Reference Books	Content Delivery Technique	Remarks / Comments
Unit 1	Basics of Entomology	11	The Insects: Structure and function: Chapman, R.F. A general Textbook of Entomology: Imms, A.D. Textbook of Zoology, Invertebrates: Parker & Haswell	Chalk & Talk method Use of LCD projector PowerPoint presentation Use of Charts, microscopes	
	Morphological adaptation of insects	3			
	Physiological adaptation in cockroach	4			
	General characteristics of Class Insecta and living orders with examples	4			

Unit 2	Medical Entomology	11	Medical Entomology: Hati,A.K. Parasitology: K.D. Chatterjee Noble and Noble: Parasitology: The biology of animal parasites, Chapman: The insects: structure and function etc.	Chalk & Talk Use of Charts, Photographs 3.PDF	Dr. Sucharita Saha
	Concept of vectors: carrier and Biological Vectors	1			
	Biology of <i>Anopheles</i> , <i>Culex</i> and <i>Aedes</i>	2			
	Malaria, Dengue & Filariasis	3			
	Control measures of vectors	1			
	Ticks as causative agents and vectors: Rickettsiosis, Tick-borne encephalitis, General outline of mites and their medical significance <i>Phlebotomus</i> sp.; Characteristics, Biology and mode of transmission of visceral leishmaniasis, control measures	2 1			

Unit-3	Agricultural Entomology	14	Shukla & Upadhyay, Economic Zoology Introduction to Economic Zoology: Sarkar, Kundu, Chaki Elementary Applied Zoology: Debajyoti Chattopadhyay	Chalk & Talk method Use of LCD projector PowerPoint presentation Use of Charts	Dr. Debjani Das Ghosh
	Definition and types of insect pest; EIL, ETL definition & dynamics of EIL	2			
	2. Life cycle, Nature of damage and control measures of pests of major crops	8			
	3. Insect Pest Control 4. IPM	2			
	Unit 4. SERICULTURE: Types of Silk moths with special reference to their scientific names; Geographical distribution, and host plants; Life cycles of Bombyx mori; Structure of Silk gland; Voltinism; Rearing of mulberry silkworm; Reeling and extraction of silk; Mulberry cocoon management; Common diseases and pests of mulberry silkworm and their control measures; Prospects of sericulture in India	5	Shukla & Upadhyay, Economic Zoology Introduction to Economic Zoology: Sarkar, Kundu, Chaki Elementary Applied Zoology: Debajyoti Chattopadhyay	Chalk & Talk method Use of LCD projector PowerPoint presentation Use of Charts	Dr. Debjani Das Ghosh
	Unit 5: Apiculture: Various species of Honeybee; Social organisation and life	5			

	cycle of Honeybee; Modern method of Beekeeping; Newton Box; Apiculture products and their uses; Extraction of Honey and composition of Honey; Diseases and their control measures			
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Practical	Applied Entomology				
	Dissection and temporary mounting of mouthparts of Cockroach and Mosquito	6	The Insects: Structure and function: Chapman, R.F. A general Textbook of Entomology: Imms, A.D. Medical Entomology: Hati,A.K.	Hands on training	DR. SUCHARITA SAHA, DR. DEBJANI DAS GHOSH
	2. Methods of collection, preservation and identification of economically important insects	2	Practical Zoology: Ghosh K.C., Manna B.		
	3. Identification of Insect pests	4	An advanced Laboratory Manual of Zoology: Poddar T., Mukhopadhyay S., Das S.K. Practical Zoology: Chatterjee A.K., Chakraborty C. Collection, preservation and identification of insects: Dr. A.K. Ghosh		
	5. Identification and medical significance of insects <i>Aedes</i> sp, <i>Culex</i> sp, <i>Anopheles</i> sp, <i>Musca</i> sp	4	Practical Zoology: Ghosh K.C., Manna B. An advanced Laboratory Manual of Zoology: Poddar T., Mukhopadhyay S., Das S.K. Practical Zoology: Chatterjee A.K., Chakraborty C. Medical Entomology: Hati,A.K.	Chalk & Talk method Use of preserved specimens, permanent slides, Charts & microscopes	DR. SUCHARITA SAHA,

4. Life History stages of <i>Apis</i> sp. and <i>Bombyx mori</i>	02	Practical Zoology: Ghosh K.C., Manna B. An advanced Laboratory Manual of Zoology: Poddar T., Mukhopadhyay S., Das S.K. Practical Zoology: Chatterjee A.K., Chakraborty C.	Chalk & Talk method Use of preserved specimens, permanent slides, Charts & microscopes	DR. DEBJANI DAS GHOSH
6. Accomplish any one from the following: a. visit to Agricultural field b. visit to any sericulture farm c. visit to an apiary d. visit to any rural/urban health centre 7. LNB	05			DR. DEBJANI DAS GHOSH OR DR.SUCHARITA SAHA

LESSON PLAN

DEPARTMENT: ZOOLOGY

SEMESTER-I

NAME OF FACULTY: DR. SUMALLYA KARMAKAR & SMT. SUCHONA MITRA CHAKRABORTY

Subject: 4 yr Zoology General (Minor): MN-I + 3yr Zoology General (MDC): CC1

Paper: Core Course (Cell Biology)- MZOO & MZOO MDC

Unit / Group / Module / Article	Topics	No of Lecture Planned	Reference Books	Content Delivery Technique	Remarks / Comments (Concerned Teacher)
Unit-1	Plasma membrane	7			
	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 junction, Transport through plasma membrane		1.The Cell : G.M. Cooper	1. Chalk & Talk 2.PDF 3.Reference Notes	Suchona Chakraborty
Unit-2	Cytoplasmic organelles-I	7			
	Basic concepts of ultrastructure of ER, Golgi and Lysosome; Overview of protein sorting; ER morphology, Targeting proteins to ER, The signal hypothesis; insertion of protein into ER membrane, Protein folding and processing in ER, Export of proteins and lipids from ER; Golgi apparatus: Morphology, Protein glycosylation with Golgi, Protein sorting and export from Golgi Apparatus; Lysosome: Polymorphism, Lysosomal acid hydrolases,		2.Cell & Molecular Biology : Karp	1. Chalk & Talk 2.PDF 3.Reference Notes	Suchona Chakraborty

	Endocytosis and lysosome formation				
Unit 3	Cytoplasmic organelles- II	5			
	Mitochondria: Structure, Semiautonomous nature, Mitochondrial DNA, Endosymbiotic hypothesis Mitochondrial Respiratory Chain, Chemiosmotic hypothesis and Oxidative Phosphorylation with reference to ATP Synthase and ATP synthesis	3	The Cell: Bruce Alberts	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar
	Peroxisomes: Structure and Functions; Centrosome and its organization	2	The Cell: Bruce Alberts	1. Chalk & Talk method 2. PPT	
Unit 4	Cytoskeleton	4			
	Structure and Types: Microtubules, Actin filaments, and Intermediate filaments; Basic composition and function of ECM; Cell matrix Interactions (Integrins)	4	The Cell: Bruce Alberts	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar
Unit 5	Nucleus	5			
	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.	5	The Cell: Bruce Alberts	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar
Unit 6	NUCLEIC ACIDS	3			
	Structure and composition of DNA; Chargaff's rule; Hypochromic shift; Watson and Crick model of three dimensional structure of DNA; Different forms of DNA-A, B and Z DNA , RNA priming; End replication problem and replication of telomeres in eukaryotes	3	Concepts of Genetics: Klugg and Cuming	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar
Unit-7	DNA REPLICATION	10			
	Meselson-Stahl experiment; DNA Replication in prokaryotes; Enzymes/proteins associated with Replication-Polymerase[I, II& III]; Primase, Helicase, SSB, DNA Ligase; RNA PRIMING; End replication problem and replication of telomeres in Eukaryotes	19	Karp's Cell and Molecular Biology De Robertis Cell and Molecular Biology	PPt PDF Chalk and Talk	Dr. Sumallya Karmakar
Unit 8	Tools and Techniques in Cell Biology	5			
	Animal Cell Culture: Primary cell culture and Cell line. Subcellular fractionation and Ultracentrifugation	2	Karp's Cell and Molecular Biology De Robertis Cell and	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar

			Molecular Biology		
	Freeze fracture Replication and Freeze Etching	1			
	Principle of Light Microscope: Bright field, Phase contrast microscope, Fluorescence Microscope with reference to FRET, Principle of SEM & TEM	1			
Practical	Cell Biology Lab	20			
	1. Cell viability study by Trypan Blue Exclusion method	3		Hands-on-Training	Dr. Sumallya Karmakar
	4. Isolation of Bone Marrow Cells from Rat/Mouse and Giemsa Staining	3		Hands-on-Training	
	2. Standardization of Ocular and Stage Micrometer and measurement of cell or microscopic specimen such as <i>Paramoecium</i> sp 3. Preparation of squamous epithelial cell with staining	6 2	Modern Approach to Practical Botany: Santra & Maji Practical Zoology: Ghosh K.C., Manna B. An advanced Laboratory Manual of Zoology: Poddar T., Mukhopadhyay S., Das S.K. Practical Zoology: Chatterjee A.K., Chakraborty C.	Hands-on-Training	Suchona Chakraborty

LESSON PLAN
DEPARTMENT: ZOOLOGY

SEMESTER-I

NAME OF FACULTY: DR. SUCHARITA SAHA, DR. DEBJANI DAS (GHOSH), DR. SUMALLYA KARMAKAR &

Subject: Zoology Gen. (MDC): SEC- G

Paper: Skill Enhancement Course (Applied Zoology)-MZOO MDC

Planned				After Implementation	
Unit / Group / Module / Article	Topics	No of Lecture Planned	Reference Books	Content Delivery Technique	Remarks / Comments
Unit I	Agricultural Entomology	6	Economic Zoology: Shukla & Upadhyay Introduction to Economic Zoology: Sarkar, Kundu, Chaki Elementary Applied Zoology: Debajyoti Chattopadhyay	Chalk & Talk method PowerPoint presentation Use of Charts	
	Concept of insect pest, EIL, ETL	1			
	Life cycle, Nature of damage and control measures of pests of major crops	3			
	Insect Pest Control	2			
Unit II	Sericulture	8	A.Sukla: A handbook of Economic Zoology, Chaki, Kundu and Sarkar: Introduction	Photographs Chalk and talk Study materials	Dr. Debjani Das Ghosh

	Types of silk moths, geographical distribution, host plants	2	to economic Zoology,		
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	Life cycle of <i>B.mori</i> , silk gland, composition of silk, uses of silk	2	3.Chaudhuri: Economic Zoology etc.		
	Rearing, extraction, reeling of mulberry silk	2			
	Silkworm diseases, pests and their control	2			
Unit III	Apiculture	7			
	Various domesticated species of Honey bee	2			
	Social organization and life cycle	1			
	Modern method of bee keeping	1			
	Parasites and diseases and control	2			
	Bee economy	1			

Unit IV	Vermiculture Scope of vermiculture, habit categories of earthworm, methodology of vermicomposting, containers for culturing, raw materials required, preparation of bed, environmental pre-requisites, feeding, harvesting and storage of vermicompost, advantages of vermicomposting, diseases and pests of earthworm	7	Lekshmy , M.S. and Santhi, R. Vermitechnology. Saras Publication. ISBN:9789382459323	Chalk and talk Link share Study materials	Dr. Sucharita Saha
Unit V	Aquaculture 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	8	Pandey, K. and Shukla,J.P. (2013). Fish and Fisheries, Rastogi Publications Saha,S., Mandal,M.and Das, M. (2024). Concept of Aquaculture Theory and Practical, Techno World, Kolkata		
Unit VI	Livestock Management Dairy: Introduction to common dairy animals: Types of Cattle breeds and their distribution in India; Exotic	7	Economic Zoology: Shukla & Upadhyay		Dr. Sumallya Karmakar

	cattle breeds; Principles and methods of breeding – inbreeding, outbreeding, crossbreeding; Artificial insemination and MOET; 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.				
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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	6	1.Economic Zoology: Shukla & Upadhyay		Dr. Sumallya Karmakar
Practical	Applied zoology	20	A.Sukla: A handbook of economic Zoology Chaki, Kundu and Sarkar: Introduction to economic Zoology Chaudhuri: Economic Zoology etc.	Photographs, chalk and talk and study materials	Dr. Debjani Das (Ghosh)
	Identification of various castes of honey bee, life cycle stages of <i>Bombyx mori</i>	4			
	Identification of life stages of <i>Kerria lacca</i>	1		Photographs, chalk and talk and study materials	Dr. Sumallya Karmakar
	Identification of earthworms used in vermiculture	2		Photographs, chalk and talk and study materials	Dr. Sucharita Saha
	Identification of ectoparasites of Poultry birds	1		Photographs, chalk and talk and study materials	Dr. Sumallya Karmakar

	2. Identification of the following fish and prawn specimens (specimen characters only): <i>Labeo rohita</i> , <i>Catla catla</i> , <i>Cirrhinus mrigala</i> , <i>Cyprinus carpio</i> , <i>L. bata</i> , <i>Penaeus monodon</i> , <i>Macrobrachium rosenbergi</i>	4	Ghosh, K.C., Manna, B.-- Practical Zoology, NCBA	Chalk and talk Jar specimen display	Dr. Sucharita Saha
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	3. Collection of any two pests and submission of specimens along with a report on its identifying features, life cycle, nature of damage and control: <i>Sitophilus oryzae</i> , <i>Tribolium Castaneum</i> , <i>Nilaparvata lugens</i> , <i>Anomis sabulifera</i> and <i>Lucinodes orbonalis</i>	8	Economic Zoology: Shukla & Upadhyay Review papers & journals available at Internet and Research Institutes	Chalk & Talk method PowerPoint presentation Use of Charts, microscopes	Dr.Debjani Das Ghosh
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LESSON PLAN
DEPARTMENT: ZOOLOGY

SEMESTER-I

NAME OF FACULTY: DR. SUCHARITA SAHA, DR. DEBJANI DAS (GHOSH), DR. SUMALLYA KARMAKAR

Subject: Zoology : IDC-1

Paper: Interdisciplinary Course (Animal Biology)-ZOOD

Planned				After Implementation	
Unit / Group / Module / Article	Topics	No of Lecture Planned	Reference Books	Content Delivery Technique	Remarks / Comments
Unit 1	Animal Diversity	10	Chaki, K.C., Kundu, G. and Sarkar, S. (2005). Introduction to General Zoology, New Central Book Agency (P) Ltd. Vol-1, Chapter-1.	Chalk and talk Link share	Dr. Sucharita Saha
	Phylum Characters and examples of Cnidaria, Ctenophora, Mollusca and Echinodermata	5			
	Phylum Characters and examples of Platyhelminthes, Nematelminthes, Annelida, Arthropoda, Chordata	5	Introduction to General Zoology: Vol I & II: Sarkar, Kundu, Chaki	Chalk & Talk method Use of Charts, preserved specimens	Dr. Patralekha Mukhopadhyay
Unit 2	Genetics	12			Dr. Sumallya Karmakar

	Mendelian Principles and Laws of inheritance Linkage and Recombination basic Concepts Sex Determination with reference to Drosophila [only genic balance theory] Chromosomal Aberration [Structural and Numerical]		Snustad D P, Simmons MJ. 2009. Principles of Genetics. V Edition. John Wiley and Sons Inc Strickberger M. W – Genetics; Macmillan	Chalk & Talk method	
Unit 3	Biodiversity and Wildlife	10			
	Biodiversity: Definition, Types and Value Indices (Shannon and Simpson)	1 2	Sharma,P.D. (2001). Ecology and Environment. Rastogi Publications https://www.worldwildlife.org/page	Chalk and talk Link share	Dr. Sucharita Saha
	3.Conservation :in-situ and ex-situ 4.Conservation priority: Hotspot, Megadiversity, sensitive ecosystem	3 3	1.G.K Saha and S Majumdar:Threatened mammals of India, G.K Saha and S Majumdar:Wildlife Biology, Wilson:Biodiversity, Sidhi and Ehlich: Conservation Biology for all etc	Photographs Chalk and talk Study materials	Dr. Debjani Das (Ghosh)
	5.Indigenous knowledge and PBR:Basic concept	1	https://Byjus.com/free-ias-prep/peoples-biodiversity-register-pbr-upsc-notes/		Dr. Sucharita Saha

Unit 4	Insect vectors	8			
	Concept of vector:Biological and mechanical vectors with examples	2	Noble and Noble: Parasitology: The biology of animal parasites Chapman: The insects: structure and function etc.	Photographs Chalk and talk Study materials	Dr. Debjani Das(Ghosh)
	2.Disease cycle & Reservoir Concept	1	Medical Entomology: Hati,A.K. Introduction to General Zoology: Vol II: Sarkar, Kundu, Chaki	Chalk & Talk method Use of Charts, preserved specimens	
	3.Life cycle, control, role as vector of <i>Anopheles</i> and <i>Aedes</i>	5			
Unit 5	Laboratory techniques and Instrumentation	5			
	Basics of Light Microscopy	2	Raghava, N. and Rabindra ,P.R. Biophysical methods tools and techniques in Biology, Part-1 Microscopy. Notion Pres	Chalk and talk Link share	Dr. Sucharita Saha
	2.Principles and Application of Colorimetry	2	ABSORPTIOMETRY AND “COLORIMETRIC ANALYSIS”:H.N.Wison	Hands on experiment and reference materials	Dr. Debjani Das (Ghosh)
	3.Principles and Application of Ultracentrifugation	1			Dr. Sumallya Karmakar

Practical	Animal Biology	20	
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	1.Karyotype analysis of Klinefelter, Down,Turner, Edward & Patau Syndrome	2	Concepts of Genetics	Photographs, chalk and talk and study materials	Dr. Sumallya Karmakar
	2.Identification of specimens: <i>Amoeba, Paramoecium, Sycon, Neptune's cup, Taenia,Ascaris, Nereis, Pheretima, Penaeus, Macrobrachium, Musca, Anopheles, Culex,Pila, Lamellidens, Asterias</i>	8	Practical Zoology: Ghosh K.C., Manna B. An advanced Laboratory Manual of Zoology: Poddar T., Mukhopadhyay S., Das S.K. Practical Zoology: Chatterjee A.K., Chakraborty C.	Chalk & Talk method Use of Charts, preserved specimens, permanent slides, microscopes	Dr. Sucharita Saha
	Identification of different Ecosystems through photographs: Marine ecosystem, Mangrove ecosystem, Lake ecosystem, rainforest ecosystem, Desert ecosystem, Grassland ecosystem	6	Books on Biodiversity Review papers & journals available at Internet	Chalk & Talk method Use of photographs	Dr. Debjani Das (Ghosh)

LESSON PLAN

DEPARTMENT OF ZOOLOGY

SEMESTER-III

NAME OF FACULTY: DR. SUMALLYA KARMAKAR & DR. DEBJANI DAS GHOSH

Subject: Zoology Hons. (Major): DSCC-3

Paper: Core Course (Genetics) - ZOOM

Unit / Group / Module / Article	Topics	No of Lecture Planned	Reference Books	Content Delivery Technique	Remarks / Comments (Concerned Teacher)
Unit 1	Chromosome	4			
	Structural organization of Chromosomes; Polytene, Lampbrush and Satellite chromosomes; Human Karyotyping.	4	1. Concepts of Genetics: Klug and Cumming 2. iGenetics-Russel	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar
Unit 2	Allele concept	8			
	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	8	1. Concepts of Genetics: Klug and Cumming 2. iGenetics-Russel 3. Principles of Genetics, 7th Edition, Snustad and Simmons.	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar
Unit 3	Genetic Fine Structure	2			
	Complementation test in Bacteriophage (Benzer's experiment on rII locus)	2	1. iGenetics-Russel	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar
Unit 4	Linkage, Crossing over and linkage mapping	10			
	Linkage and Crossing over; Complete and Incomplete Linkage;	10	1. Concepts of Genetics: Klug and Cumming	1. Chalk & Talk method	Dr. Sumallya Karmakar

	Holliday model of recombination; Linkage map construction using three point crosses; Sex linkage in Drosophila (White eye locus) & Human (Haemophilia)		2. iGenetics-Russel 3. Principles of Genetics, 7th Edition, Snustad and Simmons.	2. PPT	
Unit 5	Mutations & Chromosomal aberrations	10			
	Types of gene mutations (Substitution and Frameshift); Types of chromosomal aberrations (Structural and Numerical); Non-disjunction of X chromosome in Drosophila, Nondisjunction 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	10	1. Concepts of Genetics: Klug and Cumming 2. iGenetics-Russel 3. Principles of Genetics, 7th Edition, Snustad and Simmons.	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar
Unit 6	Extra-chromosomal inheritance	2			
	Kappa particle in Paramoecium, Shell spiralling in snail	2	1. Concepts of Genetics: Klug and Cumming	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar
Unit 7	Transposable Genetic elements	4			
	IS element in bacteria; Ac-Ds elements in maize; P elements in Drosophila; LINE, SINE, Alu elements in human	4	1. Principles of Genetics, 7th Edition, Snustad and Simmons.	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar
Unit 8	Quantitative Genetics	4			
	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)	4	1. Genetics-Benjamin A Pierce 7 th Edition	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar
Practical	Chi-Square Test	5			
	Test for Goodness of fit – Mendelian		Problems on Genetics, Molecular	1. Chalk & Talk	Dr. Sumallya Karmakar

	monohybrid and di-hybrid ratios, *Epistatic ratios; Contingency Chi-Square Test		Genetics and Evolutionary Genetics, 2nd Revised edition, P.K. Banerjee	method	
	Chromosomal Aberration	5			
	Identification of Chromosomal aberration in <i>Drosophila</i> (Deletion, Duplication, Inversion and Translocation) and Human (Karyotype of Down Syndrome, Turner Syndrome, Patau Syndrome, Edward Syndrome and Klinefelter Syndrome) from photograph.		Materials provided by UG BoS University of Calcutta	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar
	Pedegree Analysis	5	Ghosh Manna-Prac.Book., P.Banerjee-Prac. Book		Dr. Debjani Das Ghosh
	Study of Cell Cycle	5			
	Temporary squash preparation of Grasshopper testis to study various stages of meiosis.		Podar, T., Mukherjee, S., Das, S.K. (2003). An Advanced Laboratory Manual Of Zoology	Hands-on-Training	Dr. Sumallya Karmakar

LESSON PLAN

DEPARTMENT OF ZOOLOGY

SEMESTER-III

NAME OF FACULTY: Dr. Sucharita Saha, Dr. Debjani Das (Ghosh) and Smt Suchona Chakraborty

Subject: Zoology Hons. (Major): DSCC4

Paper: Core Course (Cell and Tissue Structure) - ZOOM

Planned				After Implementation	
Unit / Group / Module / Article	Topics	No of Lecture Planned	Reference Books	Content Delivery Technique	Remarks / Comments (Concerned Teacher)
Unit-1	Stain, Dye and Histochemistry Difference between Stain and Dye. Components and Classification of Dye. Principle and Chemistry of PAS and Feulgen reaction	08	Conn's Biological stains; RW SABNIS: Handbook of biological stains and Dyes	PPT, chalk and talk and study materials	Dr. Debjani Das Ghosh
Unit -2	Epithelial Tissue Salient features, Classification with location and diagrams (based on structure and functions); Glandular epithelium in details. Cell-polarity, Apical domain and modifications; Lateral domain. Clinical correlation; Epithelial metaplasia	08	1.A textbook of Histology by Bloom & Fawcett 2.A Textbook of histology by JP Gunasegaran 3.Principle of physiology by Debasis Pramanik 4. Medical Physiology by Guyton	1.Class lecture 2.PDF 3.Reference Notes	Suchona Chakraborty

Unit-3	Connective tissue: salient features with respect to cell types and fibres: Classification; Structure and functions with diagram of adipose tissues--brown fat and white fat Areolar tissue (diagram, location, components and their functions) ; Bone tissue;(cell types, extracellular 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	14	1.A textbook of Histology by Bloom & Fawcett 2.Medical Physiology by Guyton	Chalk and talk Study materials	Dr. Sucharita Saha
Unit-4	Muscle tissue: Salient features, Types based on function and striations, Ultrastructure of skeletal muscles; Features of single unit and multiunit smooth muscles, cardiac muscle. Difference between white and red muscle fibres Clinical correlation: Duchene muscular dystrophy	05	1.A textbook of Histology by Bloom & Fawcett 2.Medical Physiology by Guyton		Suchona Chakraborty
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	05	Review of Medical Physiology by Gannong	chalk and talk and study materials	Dr. Sucharita Saha
Unit-6	Steps of tissue repair: Inflammation, Organization, Regeneration and or Fibrosis Factors affecting it:	02	"Fundamentals of Inflammation" edited by Peter A. Ward, Charles N. Serhan, and Derek W. Gilroy.	PPT, chalk and talk and study materials	Dr. Debjani Das Ghosh

	1. Type of tissue , 2. Type of injury, 3. Adequacy of blood supply, 4. State of Health and 5. Age				
CC-4-P (Practical)	Preparation, staining and mounting Epithelial tissue from vaginal smear of rat using methylene blue	04	Practical Zoology by Das Poddar	Hands on training, microscopic observation	Suchona Chakraborty
	Connective tissue from blood film of rat using Giemsa	04	1. Practical Zoology by Ghosh Manna 2. Practical Zoology by Das Poddar	Hands on training, microscopic observation	Suchona Chakraborty
	Muscle tissue from thigh muscle of cockroach using methylene blue	04		Hands on training, microscopic observation	Dr. Sucharita Saha
	Identification with reasons the following mammalian histological sections: Lung, Liver, Stomach, Kidney	04	Ghosh-Manna: Practical book	Microscopic identification and photographs would be provided	Dr. Debjani Das ghosh
	Tissue preparation, block making and sectioning of any organ of rat/mice.	04	Hands on training	Hands on training on microtomy	Dr. Debjani Das Ghosh

LESSON PLAN
DEPARTMENT OF ZOOLOGY
SEMESTER-III

NAME OF FACULTY: Dr. Sucharita Saha, Dr. Debjani Das (Ghosh) and Smt Suchona Chakraborty

Subject: Zoology Hons. (Major) SEC-3

Paper: Skill Enhancement Course (Poultry Farming and Animal Husbandry) -ZOOM

Planned				After Implementation	
Unit / Group / Module / Article	Topics	No of Lecture Planned	Reference Books	Content Delivery Technique	Remarks / Comments (Concerned Teacher)
Unit-1	Common breeds of fowl and their characteristics: American class, Asiatic class, Mediterranean class, English class, Indigenous breeds; Commercial strains of chickens: Broilers, Layers, Growers	06	1.Applied Zoology by Debojyoti Chattopadhyay 2.Applied Zoology by Chaki Kundu	Chalk and talk, Photographs, Link share	Dr. Sucharita Saha
Unit-2	Rearing methods in Poultry Housing and Equipment Essentials of good housing, housing requirements; poultry equipments (egg collector, incubator,chick cage); housing system,	06	Debajyoti Chattopadhyay (2012). Elementary Applied Zoology, Book syndicate (P) Ltd. Ghoshal. S and Das. K (2023). Poultry Farming and Animal	Chalk and talk, Photographs, Link share	Dr. Sucharita Saha

	Semi-intensive system, Folding unit system, deep litter system, Cage system (battery)		Husbandry. Techno world.		
Unit-3	Poultry nutrition Nutrition, Feed formulation for chicks	04	Do	Chalk and talk, Photographs, Link share	Dr. Sucharita Saha
Unit-4	Diseases of Poultry and their control measures: Viral, Parasitic, Fungal disease and their control	03	Textbook of Poultry Production and Management" by Dr. Girraj Goyal; Wilson and Kay: The complete handbook of Poultry	Chalk and talk, Photographs, PDF	Dr. Debjani Das Ghosh
Unit-5	Poultry market in India	02	1.Applied Zoology by Debojyoti Chattopadhyay 2.Applied Zoology by Chaki Kundu	1.Class lecture 2.PDF 3.Reference Notes	Suchona Chakraborty
Unit-6	Animal Husbandry: Important cattle breeds and their characteristics: Cattle breeds in India, Cattle population, Milch breeds, dual purpose breeds, draught breed, Cross-breed cattle strain	05	Alvord's "Breeds of Dairy Cattle"	Chalk and talk, Photographs, PDF	Dr. Debjani Das Ghosh
Unit 7	Livestock feed: Cattle feed--roughage and Concentrate	04	1.Applied Zoology by Debojyoti Chattopadhyay 2.Applied Zoology by Chaki Kundu	.1. Class lecture 2.PDF 3.Reference Notes	Suchona Chakraborty
Unit-8	Breeding Programme: Artificial insemination and MOET in cattles	04	Do	PDF share Coloured Photograph display	Suchona Chakraborty

Unit-9	Dairying: Composition of milk, Dairy products, National Dairy Development Board and Operation Flood Program	04	Do	PDF share Coloured Photograph display	Suchona Chakraborty
Unit-10	Dairy Pathology: Viral, Bacterial, Parasitic disease and control	04	Rebbun's Diseases of Dairy cattles	PDF share Coloured Photograph display	Dr. Debjani Das Ghosh
SEC-3-P (Practical)	Identification of following poultry breeds (only coloured photographs): Plymouth rock, Rhode Island Red, New hampshire, Cochin, Brahma, Leghorn, Cornish, Aseel, Kadaknath, Chittagong	06	Debajyoti Chattopadhyay (2012). Elementary Applied Zoology, Book syndicate (P) Ltd. Ghoshal. S and Das. K (2023). Poultry Farming and Animal Husbandry. Techno world. Wikipedia	PDF share Coloured Photograph display	Dr. Sucharita Saha
	Identification of following cattle breeds (only coloured photographs): Sahiwal, Red Sindhi, Gir, Malvi, Haryana, Tharparkar, Jersey	06	Alvord's "Breeds of Dairy Cattle"	PDF share Coloured Photograph display	Dr. Debjani Das Ghosh
	Visit to a poultry farm or animal husbandry and report making	08		Hans on training and study materials	Dr. Sucharita Saha/ Dr. Debjani Das Ghosh/ Dr./ Suchona Chakraborty

LESSON PLAN

DEPARTMENT OF ZOOLOGY

SEMESTER-III

NAME OF FACULTY: DR. SUMALLYA KARMAKAR & SMT. SUCHONA MITRA CHAKRABORTY

Subject: Zoology Minor (4 yr Minor: MNI) and MDC (3 yr MDC: CC1)

Paper: Core Course (Cell Biology) MN-1 (for 4 yr Minor) & MZOO MDC -Minor (for 3yr MDC-Minor)

Unit / Group / Module / Article	Topics	No of Lecture Planned	Reference Books	Content Delivery Technique	Remarks / Comments (Concerned Teacher)
Unit-1	Plasma membrane	7			
	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 junction, Transport through plasma membrane		1.The Cell : G.M. Cooper	1. Chalk & Talk 2.PDF 3.Reference Notes	Suchona Chakraborty
Unit-2	Cytoplasmic organelles-I	7			
	Basic concepts of ultrastructure of ER, Golgi and Lysosome; Overview of protein sorting; ER morphology, Targeting proteins to ER, The signal hypothesis; insertion of protein into ER membrane, Protein folding and processing in ER, Export of proteins and lipids from ER; Golgi apparatus:		2.Cell & Molecular Biology : Karp	1. Chalk & Talk 2.PDF 3.Reference Notes	Suchona Chakraborty

	Morphology, Protein glycosylation with Golgi, Protein sorting and export from Golgi Apparatus; Lysosome: Polymorphism, Lysosomal acid hydrolases, Endocytosis and lysosome formation				
Unit 3	Cytoplasmic organelles- II	5			
	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	3	The Cell: Bruce Alberts	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar
	Peroxisomes: Structure and Functions; Centrosome and its organization	2	The Cell: Bruce Alberts	1. Chalk & Talk method 2. PPT	
Unit 4	Cytoskeleton	4			
	Structure and Types: Microtubules, Actin filaments, and Intermediate filaments; Basic composition and function of ECM; Cell matrix Interactions (Integrins)	4	The Cell: Bruce Alberts	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar
Unit 5	Nucleus	5			
	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.	5	The Cell: Bruce Alberts	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar
Unit 6	Nucleic Acids				
	Structure and composition of DNA: Chargaff's Rule; Hypo and Hyperchromic shift ; Watson and Crick Model of the Three dimensional structure of DNA. Different forms of DNA-A, B AND Z DNA, RNA as the genetic material; Types and Function	3	Concepts of Genetics: Klugg and Cuming	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar
Unit 7	DNA Replication				
	Meselson-Stahl Experiment, DNA Replication in Prokaryotes; Enzymes/Proteins associated with Replication-Polymerase[I, II & III]; Primase and Helicase, SSB, DNA Ligase; RNA Priming; End replication problem and Replication of Telomeres in Eukaryotes	10	Concepts of Genetics: Klugg and Cuming	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar
Unit 8	Tools and Techniques in Cell Biology	4			

	Animal Cell Culture: Primary cell culture and Cell line. Subcellular fractionation and Ultracentrifugation	2		1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar
	Freeze fracture Replication and Freeze Etching	1			
	Principle of Light Microscope: Bright field, Phase contrast microscope, Fluorescence Microscope with reference to FRET, Principle of SEM & TEM	1			
Practical	Cell Biology Lab	20			
	1. Cell viability study by Trypan Blue Exclusion method	3 3	An advanced Laboratory Manual of Zoology: Poddar T., Mukhopadhyay S., Das S.K	Hands-on-Training	Dr. Sumallya Karmakar
	2. Standardization of Ocular and Stage Micrometer and measurement of cell or microscopic specimen such as <i>Paramecium</i> sp 3. Preparation of squamous epithelial cell with staining	6 2	Modern Approach to Practical Botany: Santra & Maji Practical Zoology: Ghosh K.C., Manna B. An advanced	Hands-on-Training	Suchona Chakraborty
	4. Isolation of Bone Marrow cells from Rat/Mouse and Giemsa staining		An advanced Laboratory Manual of Zoology: Poddar T., Mukhopadhyay S., Das S.K.	Hands-on-Training	Dr. Sumallya Karmakar

LESSON PLAN
DEPARTMENT OF ZOOLOGY
SEMESTER-III

NAME OF FACULTY: Dr. Debjani Das (Ghosh), Dr. Sucharita Saha and Smt Suchona Chakraborty

Subject: Zoology General (MDC): CC-3

Paper: Core Courses (Cell and Tissue Structure) MZOO MDC

Planned				After Implementation	
Unit / Group / Module / Article	Topics	No of Lecture Planned	Reference Books	Content Delivery Technique	Remarks / Comments (Concerned Teacher)
Unit-1	Stain, Dye and Histochemistry Difference between Stain and Dye. Components and Classification of Dye. Principle and Chemistry of PAS and Feulgen reaction	08	Conn's Biological stains; RW SABNIS: Handbook of biological stains and Dyes	PPT, chalk and talk and study materials	Dr. Debjani Das Ghosh
Unit -2	Epithelial Tissue Salient features, Classification with location and diagrams (based on structure and functions); Glandular epithelium in details. Cell-polarity, Apical domain and modifications; Lateral domain. Clinical correlation; Epithelial metaplasia	08	1.A textbook of Histology by Bloom & Fawcett 2.A Textbook of histology by JP Gunasegaran 3.Principle of physiology by Debasis Pramanik 4. Medical Physiology by Guyton	1.Class lecture 2.PDF 3.Reference Notes	Suchona Chakraborty
Unit-3	Connective tissue: salient features with respect to cell types and fibres: Classification; Structure and functions with diagram of adipose tissues--brown fat and white fat	14	1.A textbook of Histology by Bloom & Fawcett 2.Medical Physiology by Guyton	Chalk and talk Study materials	Dr. Sucharita Saha

	Areolar tissue (diagram, location, components and their functions) ; Bone tissue;(cell types, extracellular 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				
Unit-4	Muscle tissue: Salient features, Types based on function and striations, Ultrastructure of skeletal muscles; Features of single unit and multiunit smooth muscles, cardiac muscle. Difference between white and red muscle fibres Clinical correlation: Duchene muscular dystrophy	05	1.A textbook of Histology by Bloom & Fawcett 2.Medical Physiology by Guyton		Suchona Chakraborty
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	05	Review of Medical Physiology by Gannong	chalk and talk and study materials	Dr. Sucharita Saha
Unit-6	Steps of tissue repair: Inflammation, Organization, Regeneration and or Fibrosis Factors affecting it: 1. Type of tissue , 2. Type of injury, 3. Adequacy of blood supply, 4. State of Health and 5. Age	02	"Fundamentals of Inflammation" edited by Peter A. Ward, Charles N. Serhan, and Derek W. Gilroy.	PPT, chalk and talk and study materials	Dr. Debjani Das Ghosh

CC-4-P (Practical)	Preparation, staining and mounting Epithelial tissue from vaginal smear of rat using methylene blue	04	Practical Zoology by Das Poddar	Hands on training, microscopic observation	Dr. Sucharita Saha
	Connective tissue from blood film of rat using Giemsa	04	1. Practical Zoology by Ghosh Manna 2. Practical Zoology by Das Poddar	Hands on training, microscopic observation	Suchona Chakraborty
	Muscle tissue from thigh muscle of cockroach using methylene blue	04		Hands on training, microscopic observation	Dr. Sucharita Saha
	Identification with reasons the following mammalian histological sections: Lung, Liver, Stomach, Kidney	04	Ghosh-Manna: Practical book	Microscopic identification and photographs would be provided	Dr. Debjani Das ghosh
	Tissue preparation, block making and sectioning of any organ of rat/mice.	04	Hands on training	Hands on training on microtomy	Dr. Debjani Das ghosh

LESSON PLAN
DEPARTMENT:ZOOLOGY

SEMESTER-III

NAME OF FACULTY: DR. SUCHARITA SAHA, DR. DEBJANI DAS (GHOSH), DR. SUMALLYA KARMAKAR

Subject: Zoology : IDC-3

Paper: Interdisciplinary Course (Animal Biology)-ZOOD

Planned				After Implementation	
Unit / Group / Module / Article	Topics	No of Lecture Planned	Reference Books	Content Delivery Technique	Remarks / Comments
Unit 1	Animal Diversity	10	Chaki, K.C., Kundu, G. and Sarkar, S. (2005). Introduction to General Zoology, New Central Book Agency (P) Ltd. Vol-1, Chapter-1.	Chalk and talk Link share	Dr. Sucharita Saha
	Phylum Characters and examples of Cnidaria, Ctenophora, Mollusca and Echinodermata	5			
	Phylum Characters and examples of Platyhelminthes, Nematelminthes, Annelida, Arthropoda, Chordata	5	Introduction to General Zoology: Vol I & II: Sarkar, Kundu, Chaki	Chalk & Talk method Use of Charts, preserved specimens	Dr. Patralekha Mukhopadhyay
Unit 2	Genetics	12			Dr. Sumallya Karmakar

	Mendelian Principles and Laws of inheritance Linkage and Recombination basic Concepts Sex Determination with reference to Drosophila [only genic balance theory] Chromosomal Aberration [Structural and Numerical]		Snustad D P, Simmons MJ. 2009. Principles of Genetics. V Edition. John Wiley and Sons Inc Strickberger M. W – Genetics; Macmillan	Chalk & Talk method	
Unit 3	Biodiversity and Wildlife	10			
	Biodiversity: Definition, Types and Value Indices (Shannon and Simpson)	1 2	Sharma,P.D. (2001). Ecology and Environment. Rastogi Publications https://www.worldwildlife.org/page	Chalk and talk Link share	Dr. Sucharita Saha
	3.Conservation :in-situ and ex-situ 4.Conservation priority: Hotspot, Megadiversity, sensitive ecosystem	3 3	1.G.K Saha and S Majumdar:Threatened mammals of India, G.K Saha and S Majumdar:Wildlife Biology, Wilson:Biodiversity, Sidhi and Ehrlich: Conservation Biology for all etc	Photographs Chalk and talk Study materials	Dr. Debjani Das (Ghosh)
	5.Indigenous knowledge and PBR:Basic concept	1	https://Byjus.com/free-ias-prep/peoples-biodiversity-register-pbr-upsc-notes/		Dr. Sucharita Saha

Unit 4	Insect vectors	8			
	Concept of vector:Biological and mechanical vectors with examples	2	Noble and Noble: Parasitology: The biology of animal parasites Chapman: The insects: structure and function etc.	Photographs Chalk and talk Study materials	Dr. Debjani Das(Ghosh)
	2.Disease cycle & Reservoir Concept	1	Medical Entomology: Hati,A.K. Introduction to General Zoology: Vol II: Sarkar, Kundu, Chaki	Chalk & Talk method Use of Charts, preserved specimens	
	3.Life cycle, control, role as vector of <i>Anopheles</i> and <i>Aedes</i>	5			
Unit 5	Laboratory techniques and Instrumentation	5			
	Basics of Light Microscopy	2	Raghava, N. and Rabindra ,P.R. Biophysical methods tools and techniques in Biology, Part-1 Microscopy. Notion Press	Chalk and talk Link share	Dr. Sucharita Saha
	2.Principles and Application of Colorimetry	2	ABSORPTIOMETRY AND “COLORIMETRIC ANALYSIS”:H.N.Wison	Hands on experiment and reference materials	Dr. Debjani Das (Ghosh)
	3.Principles and Application of Ultracentrifugation	1			Dr. Sumallya Karmakar

Practical	Animal Biology	20	
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	Life cycle of <i>B.mori</i> , silk gland, composition of silk, uses of silk	2	3.Chaudhuri: Economic Zoology etc.		
	Rearing, extraction, reeling of mulberry silk	2			
	Silkworm diseases, pests and their control	2			
Unit III	Apiculture	7			
	Various domesticated species of Honey bee	2			
	Social organization and life cycle	1			
	Modern method of bee keeping	1			
	Parasites and diseases and control	2			
	Bee economy	1			

Unit IV	Vermiculture Scope of vermiculture, habit categories of earthworm, 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 earthworm	7	Lekshmy , M.S. and Santhi, R. Vermitechnology. Saras Publication. ISBN:9789382459323	Chalk and talk Link share	Dr. Sucharita Saha
Unit V	Aquaculture 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	8	Pandey, K. and Shukla,J.P. (2013). Fish and Fisheries, Rastogi Publications Saha,S., Mandal,M.and Das, M. (2024). Concept of Aquaculture Theory and Practical, Techno World, Kolkata		
Unit VI	Livestock Management	8	Economic Zoology: Shukla & Upadhyay		Dr. Sumallya Karmakar

Unit VII	Lac Culture	6	1.Economic Zoology: Shukla & Upadhyay		Dr. Sumallya Karmakar
Practical	Applied zoology	20	A.Sukla: A handbook of economic Zoology Chaki, Kundu and Sarkar: Introduction to economic Zoology Chaudhuri: Economic Zoology etc.	Photographs, chalk and talk and study materials	Dr. Debjani Das (Ghosh)
	Identification of various castes of honey bee, life cycle stages of <i>Bombyx mori</i>	4			
	Identification of life stages of <i>Kerria lacca</i>			Photographs, chalk and talk and study materials	Dr. Sumallya Karmakar
	Identification of earthworms used in vermiculture	2		Photographs, chalk and talk and study materials	Dr. Sucharita Saha
	Identification of ectoparasites of Poultry birds			Photographs, chalk and talk and study materials	Dr. Sumallya Karmakar
	2. Identification of the following fish and prawn specimens (specimen characters only): <i>Labeo rohita</i> , <i>Catla catla</i> , <i>Cirrhinus mrigala</i> , <i>Cyprinus carpio</i> , <i>L. bata</i> , <i>Penaeus monodon</i> , <i>Macrobrachium rosenbergii</i>	4	Ghosh, K.C., Manna, B.-- Practical Zoology, NCBA	Chalk and talk Jar specimen display	Dr. Sucharita Saha

	3. Collection of any two pests and submission of specimens along with a report	10	Economic Zoology: Shukla & Upadhyay Review papers & journals available at Internet and Research Institutes	Chalk & Talk method Power Point presentation Use of Charts, microscopes	Dr. Debjani Das Ghosh
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LESSON PLAN

DEPARTMENT OF ZOOLOGY

SEMESTER-V

NAME OF FACULTY: DR. SUMALLYA KARMAKAR & DR. DEBJANI DASGHOSH

Subject: Zoology Hons (Major): DSCC – 9

Paper: Core Course –ZOOM (Chordate structure and function)

Unit / Group / Module / Article	Topics	No of Lecture Planned	Reference Books	Content Delivery Technique	Remarks / Comments (Concerned Teacher)
Unit 1	Introduction to Phylum Chordata	4			
	Theories of Origin of chordates with reference to Dipleurula concept and the Echinoderm theory; General characteristics and outline classification (J.Z. Young, 1981).	4	Young JZ. 1981. The Life of Vertebrates. III Edition.	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar
Unit 2	Protochordata, Agnatha and Pisces	8			
	Protochordata and Agnatha: General characters and classification up to class (J.Z. Young, 1981); Structure of pharynx and feeding in Branchiostoma; Retrogressive metamorphosis in Ascidia; Pisces: General characters and classification of Chondrichthyes and Osteichthyes upto class (J.Z. Young, 1981); Swim bladder in fishes; Structure of gills in cartilaginous and bony fishes; Accessory respiratory organs; Olfactory apparatus in Tilapia; Electric organ in Torpedo.	8	Young JZ. 1981. The Life of Vertebrates. III Edition.	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar
Unit 3	Amphibia and Reptilia	7			
	Origin of Tetrapods (Evolution of terrestrial ectotherms); General characteristics and classification of Amphibia and Reptilia up to	7	Young JZ. 1981. The Life of Vertebrates. III Edition.	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar

	living Orders (J.Z. Young, 1981); Structure, function and derivatives of integument in amphibia; Paedomorphosis in Axolotl; Poisonous and Non-Poisonous snake; Poison apparatus and Biting mechanism in Snake				
Unit 4	Aves and Mammalia	8			
	General characteristics and classification of Aves and Mammalia up to living Sub-Classes (J.Z. Young, 1981); Exoskeleton in Birds; Air-sacs in Pigeon, Aerodynamics of flight in birds; Exoskeleton derivatives of mammals; Dentition in mammals; Ruminant stomach; Echolocation in Microchiropterans	8	Young JZ. 1981. The Life of Vertebrates. III Edition.	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar
Unit 5	Comparative anatomy in chordates	10			
	Heart and Aortic arches; Brain with reference to cerebrum & cerebellum; kidneys and urinogenital ducts.	10	RK SAXENA: Comparative anatomy; KENT and CARR: Comparative anatomy of vertebrates	1. Chalk & Talk method 2. PPT 3. Study materials	Dr. Debjani Dasghosh & Dr. Sumallya Karmakar
Unit 6	Skeletal system	8			
	Jaw suspension in vertebrates; A brief account of axial skeleton and appendicular skeleton: types of skull with reference to temporal vacuities; vertebrae (structure, types based on centrum and regional specialization in mammals); structure of girdles (pectoral and pelvic girdles of Pigeon and Guinea pig) and limb bones (Toad, Pigeon and Guinea pig).	8	Gaslow GE. Analysis of Vertebrate Structure	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar

Unit / Group / Module / Article	Topics	No of Lecture Planned	Reference Books	Content Delivery Technique	Remarks / Comments (Concerned Teacher)
Practica 1	Identification	5			
	Identification (upto order) with Reasons (Preserve specimen or Photograph) Protochordata: <i>Herdmania</i> , <i>Branchiostoma</i> , Agnatha: <i>Petromyzon</i> , <i>Myxine</i> ; Pisces:		Ghosh, K.C. and Manna, B. (2009) Practical Zoology Poddar, T., Mukherjee, S.,	Hands-on-Training	Dr. Sumallya Karmakar

	<i>Scoliodon, Pristis, Hippocampus, Echeneis, Tetrodon, Taractes; Tenuulosa, Wallagu, Ompok; Amphibia: Necturus, Duttaphrynus, Rhacophorus, Hoplobatrachus, Ambystoma, Tylotriton, ; Reptilia: Chelone, Hemidactylus, Varanus, Calotes, Chamaeleon, Draco, Vipera, Hydrophis, Bungarus; Aves: Columba, Psittacula, Passer, Alcedo Mammalia: Sorex, Bat (Insectivorous and Frugivorous), Funambulus, Cavia.</i>		Das, S.K. (2003). An Advanced Laboratory Manual Of Zoology		
	Mounting of Placoid, Cycloid and Ctenoid scales.	2	Ghosh, K.C. and Manna, B. (2009) Practical Zoology	Hands-on-Training	Dr. Sumallya Karmakar
	Osteology	3			
	Identification of Limb bones, vertebrae and girdles of <i>Duttaphrynus, Columba, Cavia</i> ; skull of <i>Duttaphrynus, Trionyx, Columba, Cavia, Canis</i>		Ghosh, K.C. and Manna, B. (2009) Practical Zoology Poddar, T., Mukherjee, S., Das, S.K. (2003). An Advanced Laboratory Manual Of Zoology	Hands-on-Training	Dr. Sumallya Karmakar
	Comparative study of heart and brain, with the help of model/pictures	2	Jordan EL, Verma PS. 2003.Chordate Zoology	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar
	Anatomy study				
	Brain, pituitary, olfactory apparatus (ex situ), digestive and urino-genital system of <i>Tilapia</i>		Ghosh, K.C. and Manna, B. (2009) Practical Zoology Poddar, T., Mukherjee, S., Das, S.K. (2003). An Advanced Laboratory Manual Of Zoology	Hands-on-Training	Dr. Sumallya Karmakar
	Pecten from fowl head	2	Ghosh, K.C. and Manna, B. (2009) Practical Zoology	Hands on training	Dr. Debjani Dasghosh

LESSON PLAN

DEPARTMENT OF ZOOLOGY

SEMESTER-V

NAME OF FACULTY: DR. DEBJANI DAS GHOSH, DR. SUMALLYA KARMAKAR & SMT. SUCHONA CHAKRABORTY

Subject: Zoology Hons (Major)

Paper: Core Course ZOOM– DSCC – 10 (Endocrinology and Reproductive Biology)

Planned						After implementation	
CLASS	COURSE	UNIT/ GROUP/ MODULE/ ARTICLE	TOPIC	REFERENCE BOOKS	NO.OF LECTURES PLANNED	CONTENT DELIVERY TECHNIQUE	REMARKS
SEM-V, MAJOR	DSCC-10TH	1.	Introduction to endocrine system: General idea of endocrine system, classification & Transport of Hormones	Fox et al: Endocrinology ,Strauss and Barbieri: Yen and Jeffe's Reproductive endocrinology Gardnander Shoback: Greenspan's	02	PPT, chalk and talk and study materials	Dr. Debjani Dasghosh
		2.	Hypothalamo-Hypophyseal Axis: Hypothalamic nuclei; Feedback mechanism with hypothalamo-Hypophyseal-gonadal axis. Chromophobes and Chromophils of anterior pituitary with their hormone		05	PPT, chalk and talk and study materials	

			and functions, Posterior pituitary; HORMONES AND FUNCTIONS IN BRIEF, HYPOTHALAMO-HYPOPHYSEAL PORTAL SYSTEM	basic and clinical endocrinology, Norris: Vertebrate endocrinology,			
		3.	<u>Regulation of Hormone action:</u> - Receptors: Steroid hormone receptor, Isoreceptor, Orphan receptor. - Mechanism of action of steroidal, non-steroidal hormones with receptors(cAMP, IMP-DAG)		05	PPT, chalk and talk and study materials	
CC-10-Theory		8.	<u>Reproductive endocrinology:</u> <u>Histology of Testis and Ovary(LM study)</u> <u>Biosynthesis of estrogen and Testosterone.</u> <u>Effect of Testosterone on prostate function.</u> <u>Effect of estrogen on uterus.</u> <u>Lactation and its hormonal control.</u> <u>Parturition and its hormonal control.</u>	Fox et al: Endocrinology , Strauss and Barbieri: Yen and Jeffe's Reproductive endocrinology	05	PPT, PDF, chalk and talk and study materials	
CC-10-Theory		9.	<u>Endocrine disorders:</u> <u>Cause, Symptoms, Treatment of :</u> <u>Grave's disease</u> <u>Type-I and Type-II diabetes.</u> <u>Cushing syndrome</u>	Fox et al: Endocrinology , Strauss and Barbieri: Yen and Jeffe's	02	PPT, PDF, chalk and talk and study materials	

				Reproductive endocrinology			
	CC-10-PRACTICAL	1.	Demonstration to localize thyroid, pancreas, adrenal, ovary and Testis in Rat.	Ghosh-Manna: Practical book	05	Hands on training	Smt. Suchona Chakraborty
		2.	Identification with reasons: Histological sections of : Thyroid, Pancreas, Adrenal, Ovary, Testis of Rat	Ghosh-Manna: Practical book	05	Hands on training	Dr. Debjani Dasghosh
		3.	Analysis and interpretation of clinical condition from the provided blood sample data: a. T3,T4,TSH and TPO b. Insulin, blood glucose and HbA1C		05	Hands on training	Dr. Sumallya Karmakar
		4.	Haematoxylin-Eosin Staining of histological section: Mammalian Thyroid, adrenal, Pancreas, Testis and Ovary	Ghosh-Manna: Practical book	05	Hands on training	Dr. Debjani Dasghosh
		5.	LNB				

LESSON PLAN

DEPARTMENT OF ZOOLOGY

SEMESTER-V

NAME OF FACULTY: SUCHONA CHAKRABORTY

Subject: Zoology Hons (Major)

Paper: Core Course –ZOOM-DSCC – 11 (Animal Physiology)

Planned					After Implementation
Unit / Group / Module / Article	Topics	No of Lecture Planned	ReferenceBooks	Content Delivery Technique	Remarks/Comments (ConcernedTeacher)
Theory Unit – 1	Physiology of Digestion	6	1.Review of Medical Physiology by Ganong 2.Principle of physiology by Debasis Pramanik 3. Medical Physiology by Guyton 4.Controlling & Coordinating System by Routray	1.Class lecture 2.PDF 3.Reference Notes	.Library work from referred books by students 2.Preparation of answers by students from suggestion questions 3.Class test at regular interval
	Anatomy of alimentary canal	2			
	Digestion	2			
	Absorption	1			
	GI - hormones	1			
Unit -2	Physiology of respiration	6	“	“	“
	Anatomy of respiratory system	2			
	Mechanism of breathing	1			
	Transport of O ₂ and	2			

	CO2 Oxygen dissociation curve. Haldane effect				
	CO poisoning	1			
Unit -3	Physiology of circulation	8	“	“	“
	Structure of Haemoglobin	2			
	Blood clotting	2			
	ABO – blood group	1			
	Human heart	2			
	Cardiac cycle	1			
Unit -4	Renal Physiology	8	“	“	“
	Anatomy of kidney	2			
	Urea cycle	1			
	Urine formation	2			
	Role of ADH, RAAS	1			
	Osmoregulation	2			
Unit -5	Neurophysiology	5	“	“	“
	Structure of neuron	2			
	Nerve impulse	3			
Unit – 6	Muscular physiology	5	“	“	“
	Structure of muscle	2			
	Muscle contraction	3			
Unit -7	Thermoregulation	3	“	“	“
	Aestivation & Hibernation	2			
	Thermoregulation in polar bear, camel	3			
Unit -8	Reproductive physiology	4	“	“	“
	Menstrual cycle	2			
	Estrous cycle	2			
Practical	1.ABO blood group	2	1.Practical Zoology by Ghosh Manna	Specimen Apparatus	Practice & test
	2.Human blood film	4			

	3.Hemocytes of cockroach	2	2. Practical Zoology by Poddar	Chemicals	
	4.Haemin crystals of rat blood	1			
	5.Blood pressure	3			
	6.Test for urea, ammonia, uric acid	5			

LESSON PLAN

DEPARTMENT OF ZOOLOGY

SEMESTER-V

NAME OF FACULTY: DR. SUCHARITA SAHA

Subject: Zoology Hons (Major)

Paper: Core Course ZOOM–DSCC – 12 (Biodiversity and Conservation Biology)

Unit / Group / Module / Article	Topics	No of Lecture Planned	Reference Books	Content Delivery Technique	Remarks / Comments (Concerned Teacher)
Unit-1	Introduction to Biodiversity: Definition, Biodiversity values: Direct and indirect values, Types of	10	Sharma,P.D. (2001). Ecology and Environment.Rastogi Publications	Chalk and talk PDF share Link share	Dr. Sucharita Saha

	biodiversity, Depicting species diversity as alpha beta and gamma diversity Biodiversity indices: Shannon diversity index, Simpson's diversity index Genetic diversity: Significance of biodiversity persistence, consequences of loss of genetic diversity Ecosystem diversity: Basic concept of structural and functional diversity with significance. Megadiversity countries: Concept of endemism and biodiversity Hot-spots; indicator species, Flagship species, Keystone species, Umbrella species (definition with examples)		https://www.worldwildlife.org/page Perspectives in Ecology Including Practical By Manideep Raj (2018), Kalyani Publishers		
Unit-2	Threats to Biodiversity: Habitat loss, Habitat degradation, habitat fragmentation and edge effects in Ecotonal communities; Overexploitation of natural resources. Concept of exotic or invasive species. Climate change: Cause and effects on marine Ecosystems. Climate change effect on Indian fauna	07			
Unit-3	Wildlife conservation: In-situ conservation Definition of conservation; Red data book (Extinct, threatened, endangered, rare and vulnerable). Indian Wildlife Protection Act, 1972 and Schedules-I to V (mammalian examples any two). Concept of Population Viability Analysis	15			

	Wildlife conservation methods: In-situ conservation; Concept and Design of protected areas, National Park, Wildlife sanctuary, Biosphere reserves (with examples) Tiger Project; Elephant Project (History, objective, implementation, Tiger crisis; Concept of corridors; Advantages and disadvantages of wildlife corridors; Causes and consequences of Human-Wildlife conflicts; Migration of conflict--an overview; Joint forest management; People's Biodiversity Register				
Unit-4	Ex-situ conservation Captive breeding of wild animals: Concept of captive breeding, its advantages and challenges; Re-introduction	7			
Unit-5	Wildlife laws: Convention on biodiversity; Biodiversity Act, 2002 and Rules 2004 (Basic concept); Wildlife trade and impacts: The Convention On International Trade in Endangered Species of Wild Fauna and Flora (CITES) and Wildlife Trade Monitoring Network (TRAFFIC); IUCN, WWF (Basic concept)	7			
Practical	Determination of population density in a natural/hypothetical community by quadrat method and calculation of Shannon-Weaver diversity index for the same community Demonstration of basic equipments needed in wildlife studies; use, care and maintenance: Compass, binoculars, Spotting scope, Range finder, Global Positioning	2 2			Dr. Sucharita Saha

Unit / Group / Module / Article	Topics	No of Lecture Planned	Reference Books	Content Delivery Technique	Remarks / Comments (Concerned Teacher)
Unit-1	Stain, Dye and Histochemistry Difference between Stain and Dye. Components and Classification of Dye. Principle and Chemistry of PAS and Feulgen reaction	08	Conn's Biological stains; RW SABNIS: Handbook of biological stains and Dyes	PPT, chalk and talk and study materials	Dr. Debjani Das Ghosh
Unit -2	Epithelial Tissue Salient features, Classification with location and diagrams (based on structure and functions); Glandular epithelium in details. Cell-polarity, Apical domain and modifications; Lateral domain. Clinical correlation; Epithelial metaplasia	08	1.A textbook of Histology by Bloom & Fawcett 2.A Textbook of histology by JP Gunasegaran 3.Principle of physiology by Debasis Pramanik 4. Medical Physiology by Guyton	1.Class lecture 2.PDF 3.Reference Notes	Suchona Chakraborty
Unit-3	Connective tissue: salient features with respect to cell types and fibres: Classification; Structure and functions with diagram of adipose tissues--brown fat and white fat Areolar tissue (diagram, location, components and their functions) ; Bone tissue;(cell types, extracellular 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	14	1.A textbook of Histology by Bloom & Fawcett 2.Medical Physiology by Guyton	Chalk and talk Study materials	Dr. Sucharita Saha
Unit-4	Muscle tissue: Salient features, Types based on function and striations, Ultrastructure of skeletal muscles; Features of single unit and multiunit smooth muscles, cardiac muscle. Difference between white and red muscle	05	1.A textbook of Histology by Bloom & Fawcett 2.Medical Physiology by Guyton	Chalk and talk Study materials	Suchona Chakraborty

	fibres Clinical correlation: Duchene muscular dystrophy				
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	05	Review of Medical Physiology by Gannong	chalk and talk and study materials	Dr. Sucharita Saha
Unit-6	Steps of tissue repair: Inflammation, Organization, Regeneration and or Fibrosis Factors affecting it: 1. Type of tissue , 2. Type of injury, 3. Adequacy of blood supply, 4. State of Health and 5. Age	02	Fundamentals of Inflammation" edited by Peter A. Ward, Charles N. Serhan, and Derek W. Gilroy.	PPT, chalk and talk and study materials	Dr. Debjani Das Ghosh
CC-4-P (Practical)	Preparation, staining and mounting Epithelial tissue from vaginal smear of rat using methylene blue	04	Practical Zoology by Das Poddar	Hands on training, microscopic observation	Dr. Sucharita Saha
	Connective tissue from blood film of rat using Giemsa	04	1. Practical Zoology by Ghosh Manna 2. Practical Zoology by Das Poddar	Hands on training, microscopic observation	Suchona Chakraborty
	Muscle tissue from thigh muscle of cockroach using methylene blue	04		Hands on training, microscopic observation	Dr. Sucharita Saha
	Identification with reasons the following mammalian histological sections: Lung, Liver, Stomach, Kidney	04	Ghosh-Manna: Practical book	Microscopic identification and photographs would be	Dr. Debjani Das ghosh

				provided	
	Tissue preparation, block making and sectioning of any organ of rat/mice.	04	Hands on training	Hands on training on microtomy	Dr. Debjani Das ghosh

LESSON PLAN

DEPARTMENT OF ZOOLOGY

SEMESTER-V

NAME OF FACULTY: DR. SUMALLYA KARMAKAR

Subject: Zoology General (MDC)

Paper: Core Course MZOO-MDC– CC – 6 (Chordate Structure and Function)

Unit / Group / Module / Article	Topics	No of Lecture Planned	Reference Books	Content Delivery Technique	Remarks / Comments (Concerned Teacher)
Unit 1	Introduction to Phylum Chordata	4			
	Theories of Origin of chordates with reference to Dipleurula concept and the Echinoderm theory; General characteristics and outline classification (J.Z. Young, 1981).	4	Young JZ. 1981. The Life of Vertebrates. III Edition.	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar

Unit 2	Protochordata, Agnatha and Pisces	8			
	Protochordata and Agnatha: General characters and classification up to class (J.Z. Young, 1981); Structure of pharynx and feeding in Branchiostoma; Retrogressive metamorphosis in Ascidia; Pisces: General characters and classification of Chondrichthyes and Osteichthyes upto class (J.Z. Young, 1981); Swim bladder in fishes; Structure of gills in cartilaginous and bony fishes; Accessory respiratory organs; Olfactory apparatus in Tilapia; Electric organ in Torpedo.	8	Young JZ. 1981. The Life of Vertebrates. III Edition.	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar
Unit 3	Amphibia and Reptilia	7			
	Origin of Tetrapods (Evolution of terrestrial ectotherms); General characteristics and classification of Amphibia and Reptilia up to living Orders (J.Z. Young, 1981); Structure, function and derivatives of integument in amphibia; Paedomorphosis in Axolotl; Poisonous and Non-Poisonous snake; Poison apparatus and Biting mechanism in Snake	7	Young JZ. 1981. The Life of Vertebrates. III Edition.	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar
Unit 4	Aves and Mammalia	8			
	General characteristics and classification of Aves and Mammalia up to living Sub-Classes (J.Z. Young, 1981); Exoskeleton in Birds; Air-sacs in Pigeon, Aerodynamics of flight in birds; Exoskeleton derivatives of mammals; Dentition in mammals; Ruminant stomach; Echolocation in Microchiropterans	8	Young JZ. 1981. The Life of Vertebrates. III Edition.	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar
Unit 5	Comparative anatomy in chordates	10			
	Heart and Aortic arches; Brain with reference to cerebrum & cerebellum; kidneys and urinogenital ducts.	10	Jordan EL, Verma PS. 2003. Chordate Zoology	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar
Unit 6	Skeletal system	8			
	Jaw suspension in vertebrates; A brief account of axial skeleton and appendicular skeleton: types of skull with reference to temporal vacuities; vertebrae (structure, types based on centrum and regional specialization in mammals); structure of girdles (pectoral and pelvic girdles of Pigeon and Guinea pig) and limb bones (Toad, Pigeon and Guinea pig).	8	Gaslow GE. Analysis of Vertebrate Structure	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar

Unit /	Topics	No of	Reference Books	Content Delivery	Remarks /
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Group / Module / Article		Lecture Planned		Technique	Comments (Concerned Teacher)
Practical	Identification	5			
	Identification (upto order) with Reasons (Preserve specimen or Photograph) Protochordata: <i>Herdmania</i> , <i>Branchiostoma</i> , Agnatha: <i>Petromyzon</i> , <i>Myxine</i> ; Pisces: <i>Scoliodon</i> , <i>Pristis</i> , <i>Hippocampus</i> , <i>Echeneis</i> , <i>Tetrodon</i> , <i>Taractes</i> ; <i>Tenualosa</i> , <i>Wallagu</i> , <i>Ompok</i> ; Amphibia: <i>Necturus</i> , <i>Duttaphrynus</i> , <i>Rhacophorus</i> , <i>Hoplobatrachus</i> , <i>Ambystoma</i> , <i>Tylotriton</i> , ; Reptilia: <i>Chelone</i> , <i>Hemidactylus</i> , <i>Varanus</i> , <i>Calotes</i> , <i>Chamaeleon</i> , <i>Draco</i> , <i>Vipera</i> , <i>Hydrophis</i> , <i>Bungarus</i> ; Aves: <i>Columba</i> , <i>Psittacula</i> , <i>Passer</i> , <i>Alcedo</i> Mammalia: <i>Sorex</i> , Bat (Insectivorous and Frugivorous), <i>Funambulus</i> , <i>Cavia</i> .		Ghosh, K.C. and Manna, B. (2009) Practical Zoology Poddar, T., Mukherjee, S., Das, S.K. (2003). An Advanced Laboratory Manual Of Zoology	Hands-on-Training	Dr. Sumallya Karmakar
	Mounting of Placoid, Cycloid and Ctenoid scales.	2	Ghosh, K.C. and Manna, B. (2009) Practical Zoology	Hands-on-Training	Dr. Sumallya Karmakar
	Osteology	3			
	Identification of Limb bones, vertebrae and girdles of <i>Duttaphrynus</i> , <i>Columba</i> , <i>Cavia</i> ; skull of <i>Duttaphrynus</i> , <i>Trionyx</i> , <i>Columba</i> , <i>Cavia</i> , <i>Canis</i>		Ghosh, K.C. and Manna, B. (2009) Practical Zoology Poddar, T., Mukherjee, S., Das, S.K. (2003). An Advanced Laboratory Manual Of Zoology	Hands-on-Training	Dr. Sumallya Karmakar
	Comparative study of heart and brain, with the help of model/pictures	2	Jordan EL, Verma PS. 2003.Chordate Zoology	1. Chalk & Talk method 2. PPT	Dr. Sumallya Karmakar
	Anatomy study				
	Brain, pituitary, olfactory apparatus (ex situ), digestive and urino-genital system of Tilapia		Ghosh, K.C. and Manna, B. (2009) Practical Zoology Poddar, T.,	Hands-on-Training	Dr. Sumallya Karmakar

			Mukherjee, S., Das, S.K. (2003). An Advanced Laboratory Manual Of Zoology		
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LESSON PLAN

DEPARTMENT OF ZOOLOGY

SEMESTER-V

NAME OF FACULTY: DR. SUCHARITA SAHA

Subject: Zoology General (MDC)

Paper: Core Course MZOO-MDC– CC – 7 (Biodiversity and Conservation Biology)

Unit / Group / Module / Article	Topics	No of Lecture Planned	Reference Books	Content Delivery Technique	Remarks / Comments (Concerned Teacher)
Unit-1	Introduction to Biodiversity: Definition, Biodiversity values: Direct and indirect values, Types of biodiversity, Depicting species diversity as alpha beta and gamma diversity Biodiversity indices: Shannon diversity index, Simpson's diversity index	10	Sharma,P.D. (2001). Ecology and Environment.Rastogi Publications https://www.worldwildl	Chalk and talk PDF share Link share	Dr. Sucharita Saha

	Genetic diversity: Significance of biodiversity persistence, consequences of loss of genetic diversity Ecosystem diversity: Basic concept of structural and functional diversity with significance. Megadiversity countries: Concept of endemism and biodiversity Hot-spots; indicator species, Flagship species, Keystone species, Umbrella species (definition with examples)		ife.org/page Perspectives in Ecology Including Practical By Manideep Raj (2018), Kalyani Publishers		
Unit-2	Threats to Biodiversity: Habitat loss, Habitat degradation, habitat fragmentation and edge effects in Ecotonal communities; Overexploitation of natural resources. Concept of exotic or invasive species. Climate change: Cause and effects on marine Ecosystems. Climate change effect on Indian fauna	07	Sharma, P.D. (2001). Ecology and Environment. Rastogi Publications https://www.worldwildlife.org/page Perspectives in Ecology Including Practical By Manideep Raj (2018), Kalyani Publishers	Chalk and talk PDF share Link share	Dr. Sucharita Saha
Unit-3	Wild life conservation: In-situ conservation Definition of conservation; Red data book (Extinct, threatened, endangered, rare and vulnerable). Indian Wildlife Protection Act, 1972 and Schedules-I to V (mammalian examples any two). Concept of Population Viability Analysis Wildlife conservation methods: In-situ conservation; Concept and Design of protected areas, National Park, Wildlife sanctuary, Biosphere reserves (with examples) Tiger Project; Elephant Project (History, objective, implementation, Tiger crisis; Concept of corridors; Advantages and disadvantages of wild life corridors; Causes and consequences of Human-Wildlife conflicts; Migration of conflict--an overview; Joint forest management; People's Biodiversity Register	15	Sharma, P.D. (2001). Ecology and Environment. Rastogi Publications https://www.worldwildlife.org/page Perspectives in Ecology Including Practical By Manideep Raj (2018), Kalyani Publishers	Chalk and talk PDF share Link share	Dr. Sucharita Saha
Unit-4	Ex-situ conservation Captive breeding of wild animals: Concept of captive breeding, its advantages and challenges; Re-introduction	7	Sharma, P.D. (2001). Ecology and Environment. Rastogi Publications	Chalk and talk PDF share Link share	Dr. Sucharita Saha

[illegible]

	Tree height measurement Measurement of canopy cover Butterfly sampling Pitfall sampling Quadrat sampling	13			Dr. Sucharita Saha/ Dr. Debjani Das Ghosh/ Dr. Sumallya Karmakar/Suchon a Chakraborty
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LESSON PLAN

DEPARTMENT OF ZOOLOGY

SEMESTER-V

NAME OF FACULTY: SUCHONA CHAKRABORTY

Subject: Zoology General (3 yr MDC Minor +4 yr Minor)

Paper: Core Course MZOO-MDC- CC – 4 (Non-chordate structure and function) for 3 yr Minor and MN-4 for 4 yr Minor

Planned					After Implementation
Unit / Group / Module / Article	Topics	No of Lecture Planned	Reference Books	Content Delivery Technique	Remarks/Comments (Concerned Teacher)
Theory Unit -1	1.Protista: Characters & Classification of Protozoa	1	1.Invertebrates: Kotpal	Class lecture	Smt. Suchona Chakraborty
	2. Locomotion	2	2.Invertebrates V.K. Agarwal4.	2.PDF	
	3. Reproduction	1	3.General Zoology: Ganguly.Adhikar i . Sinha	3.Reference Notes	
Unit-2	1. Animalia: Symmetry Cavity	2	4. General Zoology: Chaki& Kundu	“	
	2. Origin of Metazoa	2			
Unit-3	1. .Porifera : Characters & Classification	1	5. Invertebrates Brusca & Brusca	“	
	2. Canal System	2			
	3. Spicules	1			
Unit-4	1.. Cnidaria : Characters &	1	“	“	

	Classification				
	2. Metagenesis & Polymorphism	2			
	3. Corala	1			
Unit-5	1. Helminths : Characters & Classification	1	“	“	
	2. <i>Fasciola</i>	2			
	3. <i>Ascaris</i>	1			
Unit-6	1. Annelida : Characters & Classification	1	“	“	
	2. Metamerism	2			
	3. Excretion	1			
Unit-7	Onychophora	2	“	“	
Unit-8	1. Arthropoda : Characters & Classification	1	“	“	
	2. Respiration	3			
	3. Excretion	2			
Unit-9	1. Mollusca: Characters & Classification	1	“	“	
	2. Nervous & respiratory system	3			
	3. Torsion	1			
Unit-10	1. Echinoderms: Characters & Classification	1	“	“	
	2. Water Vascular system	2			
	3. Larva & affinities	2			
Unit-11	1. Echinoderms: Characters	1	“	“	
	2. Affinities	2			
Practical	1. Mounting : Nerve ring of earthworm	3	1. Practical Zoology by Ghosh Manna 2. Practical Zoology by Poddar	Hands on training with Specimen	
	2. Dissection : Nervous system of cockroach	3			
	3. Dissection : Reproductive system of cockroach	4			
	4. Whole mount of a protozoa	2			

LESSON PLAN

DEPARTMENT OF ZOOLOGY PART IV: SEMESTER-VII CORE COURSE-16: BIOTECHNOLOGY & ITS APPLICATION [DSCC-16 Theory], ZOOLOGY MAJOR

NAME OF FACULTY: DR. SUMALLYA KARMAKAR

Unit / Group / Module / Article	Topics	No of Lecture Planned	Reference Books	Content Delivery Technique	Remarks / Comments (Concerned Teacher)
Unit 1: Introduction and Molecular Techniques in Gene manipulation	Organization of <i>E.coli</i> 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. Polymerase chain reaction: DNA Fingerprinting	08	Brown TA: Gene cloning and DNA ANALYSIS	1. Chalk & Talk 2. PDF 3. Reference Notes	Dr. Sumallya Karmakar
Unit 2: Genetically Modified Organisms.	Production of cloned and transgenic animals: Nuclear Transplantation, Retroviral Method, DNA microinjection.	05	Old RW & Primrose SB: Principles of gene manipulation and genomics	1. Chalk & Talk 2. PDF 3. Reference Notes	
Unit 3: Culture Techniques and Applications	Animal cell culture, Expressing cloned genes in mammalian cells, Molecular diagnosis of genetic diseases (Cystic fibrosis, Sickle Cell Anaemia). Dolly & Polly cloning. Gene Therapy	05	Russell PJ: iGenetics: A molecular approach	1. Chalk & Talk 2. PDF 3. Reference Notes	

Unit 4: Introduction to Bioinformatics	Overview of Bioinformatics: Definition, scope, and significance in modern biology and biotechnology: Types of molecular biological data: Genomic sequences; Protein sequences and structures; Gene expression data Biological Databases and Data Sources Nucleotide Sequence Databases: NCBI GenBank; NCBI RefSeq (Ref.Sequence Database) Protein Structure and Sequence Databases: RCSB PDB (Protein Data Bank) Functional Gene Databases: GeneCards - The Human Gene Database Expression Data Repositories: NCBI GEO (Gene Expression Omnibus)	09	Thieman WJ & Palladino MA: Introduction to Biotechnology	1. Chalk & Talk 2.PDF 3.Reference Notes	
Unit 5: Tools of Bioinformatics Sequence Alignment and Comparative Genomics:	Importance and applications in functional and evolutionary biology; Key Concepts: Similarity vs Homology; Homology, Paralogy, Orthology, Analogy, Xenology Sequence Alignment Techniques Pairwise Alignment: Local and global alignment; Dot matrix method Multiple Sequence Alignment (MSA): Purpose and significance; Tools: ClustalW Sequence Search BLAST (Basic Local Alignment Search Tool): Working principle and types of BLAST FASTA Format: Representation and structure for nucleotide and amino acid sequences Phylogenetic Analysis Using sequence data to infer evolutionary relationships Distance-Based Methods: UPGMA (Unweighted Pair Group Method with Arithmetic Mean) Neighbour Joining (NJ)	09	Russell PJ: iGenetics: A molecular approach; Old RW & Primrose SB: Principles of gene manipulation and genomics	1. Chalk & Talk 2.PDF 3.Reference Notes	
Unit 6: Microbial Biotechnology Food	Diary products & probiotics, Pharmaceuticals-production of antibiotics and antifungals and Biofuel production	05	Weaver RF: Molecular Biology	1. Chalk & Talk 2.PDF 3.Reference Notes	

Production					
Unit 7: Biosafety Biosafety Principle:	Primary and Secondary Barriers; Types of Risk (occupational, environmental, ethical) & Risk management process; Biosafety level (BSL-1 to BSL-4), Biosafety Cabinet, (I, II, II) Occupational health support of Biomedical Research, Personal Protective equipment (PPE)	05	Russell PJ: iGenetics: A molecular approach	1. Chalk & Talk 2.PDF 3.Reference Notes	
BIOTECHNOLOGY & ITS APPLICATION LAB; DSCC-16-P					
1.	Melting Temperature (Tm) Calculation of PCR Primers: Designing short oligonucleotide primers for PCR Calculating melting temperature (Tm) using standard formulas or online tools.	5	Web materials and link	Hands on training	
2.	Phylogenetic Tree Construction: Application of distance matrix methods-UPGMA (Unweighted Pair Group Method with Arithmetic Mean); Neighbour Joining (NJ) method	5	Web materials and link	Hands on training	
3.	LNB	4			

LESSON PLAN**DEPARTMENT OF ZOOLOGY****SEMESTER-VII****NAME OF FACULTY: DR. SUCHARITA SAHA****Subject: Zoology Hons (Major)****Paper: Core Course ZOOM–DS CC – 17 (Neurobiology)**

Unit / Group / Module / Article	Topics	No of Lecture Planned	Reference Books	Content Delivery Technique	Remarks / Comments (Concerned Teacher)
Unit-1	Structures of Nervous System Types of Invertebrates nervous system: Nervous system in Cnidarians (Nerve net of Hydra, medusa nerve net and pacemaker nerve in Aurelia), Ladder Annelida (Earth worm), and Insects (Cockroach), Mollusca (Octopus), Echinodermata (Asterias). General plan and organizations of central, peripheral and autonomic nervous system in Vertebrate. Different nuclei/lobes/areas and function of thalamus, hypothalamus, cerebellum, cerebral cortex and brainstem in humans.	9	The textbook of medical physiology by Guyton and Hall Invertebrates by R.L. Kotpal Biology of animals Vol 2 by Ganguly, Adhikary, Sinha And Goswami.	Class lecture 2.PDF 3.Reference Notes	Dr. Sucharita Saha
Unit-2	Nerve And Nerve-Muscle Physiology Structure of neuromuscular junction and mechanism of neuromuscular transmission. Modulation of Synaptic transmission.	5	The textbook of medical physiology by Guyton and Hall Review of medical physiology by Ganong	Class lecture 2.PDF 3.Reference Notes	
Unit-3	Sensory Nervous System Structure of retina, Photochemistry of vision and visual pathways, Modern concept of color	8	The text book of medical physiology by Guyton and Hall	Chalk and Talk PDF share Link share	

	vision, Structure and function of organ of Corti, Auditory pathways, Structure of gustatory and olfactory organs. Gustatory and olfactory pathways. Neuronal pathways carrying pain, thermal, touch and kinesthetic impulses. Corticospinal, corticobulbar and bulbo-spinal tracts carrying motor information from the brain to the periphery.				
Unit-4	Neurodevelopment And Higher Brain Functions Neurogenesis, neuronal migration and neuronal differentiation in vertebrate models. Human Brain evolution. Brain and cognitive development. Neural control of Learning and Behaviour, Higher Brain Functions: Sleep, Memory, Emotions and Speech.	8	Chordate Embryology by Veer Bala Rastogi The textbook of medical physiology by Guyton and Hall	Class lecture 2.PDF 3.Reference Notes	
Unit-5	Neurochemistry And Neuroendocrine System Cellular and Molecular foundation of Neuro-biochemistry (Human): Neurotransmitters and Neuromodulators [Acetylcholine, Dopamine, GABA, Serotonin, Nor-epinephrine and Glutamine and receptors for Acetylcholine., Blood brain barrier	5	The textbook of medical physiology by Guyton and Hall	Class lecture 2.PDF 3.Reference Notes	
Unit-6	Tools In Neuroscience Techniques and tools applicable in neuroscience: CT, MRI, PET, Optogenetics, Patch Clamp, EEG, Neural stimulation, Brain-computer interface.	5			
Unit-7	Neuropathology Degeneration and regeneration of nerve fibers in the Peripheral and Central Nervous System. Cellular and Molecular Mechanisms and genetics of the Neurological Diseases: Alzheimer's disease, Parkinson's Disease, Cerebral Stroke, Epilepsy, Muscular Dystrophy.	5		Class lecture 2.PDF 3.Reference Notes	

Practical (DSCC-17-P) Full Marks 25 1 Credit 20 Hours	List of Practical Identification of CNS and PNS structures in animal models (Mouse/ Chick/ Zebrafish/ Drosophila).	4	Practical Zoology by Gosh and Manna	Use of slides, microscopes	
	Gross anatomy of Human brain and its different parts (with models).	4		Use of photographs	
	Studying early, mid and late developmental stages of CNS in animal models (Chick, Zebrafish).	4	An advanced Laboratory Manual of Zoology by Das, Mukhopadhyay and Poddar	Use of Photographs	
	4. Identification of different brain areas in CT and MRI images.	4		Use of slides, microscopes	
	5. LNB	4			

LESSON PLAN

DEPARTMENT OF ZOOLOGY

NAME OF FACULTY:SUCHONA MITRA CHAKRABORTY

LESSON PLAN: SEMESTER-VII

Subject: Zoology (Major)

Paper: Core Course – DSCC – 18(Toxicology)

Planned					After Implementation
Unit / Group / Module / Article	Topics	No of Lecture Planned	Reference Books	Content Delivery Technique	Remarks / Comments (Concerned Teacher)
Unit -1	Introduction to toxicology	5	1.Toxicology (Theory & practical) by Supriyo Acharya and Dr. Sanjay Dey 2. A Textbook of Modern Toxicology By Hodgson Ernest 3. Fundamentals of Toxicology by Pandey & Shukla	1.Class lecture	Library work from referred books by students 2.Preparation of answers by students from suggestion questions 3.Class test at regular interval
	Classification of toxicants	5		2.PDF 3.Reference Notes	
Unit-2	Exposure to toxicant	4	“	“	
	Factors influencing toxicity	4			

	Dose of toxicants	2			
Unit-3	Xenobiotics	2	“	“	
	Target organ toxicity	2			
	Phases of Xenobiotics metabolism	3			
Unit-4	Action of DDT and lead	5	“	“	
	Bioremediation	3			
	Therapeutic index	2			
Unit-5	Food Additives	2	“	“	
	Bioindicators	2			
	Genotoxicology	2			
Unit-6	Source, types, effect of : BPA PCB DDT DES PAH		“	“	
Practical	Acute and subacute toxicity study	5	“	Specimen Apparatus Chemicals	Practice & test
	LC 50 study	5			
	Micronucleus study	5			
	Instrument study	5			

LESSON PLAN

DEPARTMENT OF ZOOLOGY

NAME OF FACULTY: DR. DEBJANI DAS(GHOSH)

PART IV: SEMESTER VII

CORE COURSE-19: IMMUNOLOGY [DSCC-19 Theory], ZOOLOGY MAJOR

Unit / Group / Module / Article	Topics	No of Lecture Planned	Reference Books	Content Delivery Technique	Remarks / Comments (Concerned Teacher)
Unit 1: Introduction	Cells and Organs [Primary, Secondary and Tertiary] of the Immune system	5	Abbas KA & Lichtman AH: Cellular and Molecular immunology Reed JC & Green DR: Apoptosis: Physiology and pathology	PPT, chalk and talk and study materials	Dr. Debjani Das Ghosh
Unit 2: Innate and Adaptive Immunity	Anatomical barriers, Inflammation, Cell and molecules involved in innate immunity [PAMPS & PRR], Adaptive immunity (Overview of the pathway of activation for Cell Mediated Immunity and Humoral Immunity).	7	Mohanty and Leela: Textbook of Immunology	PPT, chalk and talk and study materials	
Unit 3: Antigens	Antigenicity and Immunogenicity, Immunogens, Adjuvants and Haptens, Factors influencing immunogenicity, B and T-Cell epitopes	4	Roitt IM: Roitt's essential immunology	PPT, chalk and talk and study materials	

Unit 4: Immunoglobulins	Structure and functions of different classes of immunoglobulins, Antigen-antibody interactions, Immunoassays (ELISA, RIA and Immunoprecipitation), Monoclonal antibody production	7	Shetty N: Immunology	PPT, chalk and talk and study materials	
Unit 5: Major Histocompatibility Complex	Structure and functions of MHC molecules. Processing of exogenous and endogenous antigens [Pathway only] Structure of T cell Receptor and its Signaling, T cell development & selection	6	Kuby: Immunology	PPT, chalk and talk and study materials	
Unit 6: Cytokines	Types, properties and functions of cytokines.	3	Abbas KA & Lichtman AH: Cellular and Molecular immunology	PPT, chalk and talk and study materials	
Unit 7: Complement System	Components and pathways of complement activation.	4	Abbas KA & Lichtman AH: Cellular and Molecular immunology	PPT, chalk and talk and study materials	
Unit 8: Hypersensitivity	Gell and Coombs' classification and brief description of various types of hypersensitivities; Autoimmunity: Major factors that contribute to the development of autoimmunity; Genetic susceptibility and environmental triggers. Examples- Rheumatoid arthritis & Systemic lupus erythematosus.	6	Virella G: Medical Immunology	PPT, chalk and talk and study materials	
Unit 9: Vaccines &	Various types of vaccines. Active & Passive immunization (Artificial and natural); Cancer immunotherapy: i) MABS in treating cancer; ii) cytokine augmentation; iii)	3	Playfair JHL: Immunology at a glance Virella G: Medical	PPT, chalk and talk and study materials	

Immunot herapy	therapeutic vaccines.		Immunology		
IMMUNOLOGY LAB; DSCC-19-P					
1.	Widal test.	4	Website link and notes		
2.	Demonstration of Lymphoid Organs (by picture).	4	An advanced Laboratory Manual of Zoology by Das, Mukhopadhy a and Poddar	Hands on training, Slides, Photographs	
3.	Histological study of Bursa of Fabricius, Spleen, Thymus and Lymph nodes through slides/ photographs	4	An advanced Laboratory Manual of Zoology by Das, Mukhopadhy a and Poddar	Hands on training, Slides, Photographs	
4.	Demonstration of ELISA, Immunoprecipitation and Ouchterlony method through photographs	4	Website link and notes	Hands on training, Slides, Photographs	
5.	LNB	4			

