# EVEN SEMESTER LESSON PLAN, 2026

## DEPARTMENT: ZOOLOGY

## PART I: 4 YEAR SEMESTER-II (CCF)

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

**Subject: Zoology Major; COURSE: ZOOM; SUBJECT CODE: DSCC2**
**Paper: Core Course (Biochemistry ) -THEORY AND PRACTICAL**

| Planned | | | | After Implementation | |
|---|---|---|---|---|---|
| **Unit / Group / Module / Article** | **Topics** | **No of Lecture Planned** | **Reference Books** | **Content Delivery Technique** | **Remarks / Comments** |
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| Unit 1 | **Carbohydrate**<br>Structure<br>Classification<br>Properties of Monosaccharide, Disaccharide & Polysaccharide | 4 | 1)Biochemistry .. by D. Das<br><br>2) Principles of Biochemistry .. by Lehninger<br><br>3) Illustrated Biochemistry ..by Harper | 1.Class lecture<br><br>2.PDF<br><br>3.Reference Notes | Suchona Chakraborty |
| | Isomerism of monosaccharide | 4 | | | |
| | Importance | 1 | | | |
| Unit 2 | **Protein**<br>Structure of amino acid<br>Classification of amino acid<br>Properties ( General & electrochemical)<br>Essential & nonessential amino acid | 4 | | | |

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| | Structure of protein ( primary, secondary, tertiary & quatenery) | 3 | | | |
| Unit 3 | **Lipid**<br>Classification<br>Saturated & unsaturated fattyacid<br>Essential & non-essential fatty acid | 2 | | | |
| | Structure & Formation of triglyceride | 1 | | | |
| Unit 4 | **Enzymes**<br>Nomenclature, classification; cofactors; specificity of enzyme action; isozymes; Mechanism of enzyme action; Enzyme kinetics; Derivation of Michaelis-Menten equation; Lineweaver-Burk plot; Factors affecting rate of enzyme catalysed reactions; Enzyme inhibition | 9 | Cox and Nelson: Lehninger's principles of biochemistry,<br>Hames and Hooper:Harper's illustrated biochemistry,<br>D. Das: Fundamentals of Biochemistry etc. | 1. chalk and talk<br>2. Peer teaching<br>3. class test<br>4. Study materials<br>5. reference notes | Dr. Debjani Das Ghosh |
| Unit 5 | **Carbohydrate metabolism**<br>Glycolysis<br>Citric acid cycle | 3 | 1)Biochemistry by D. Das<br>2) Principles of Biochemistry .. by Lehninger<br>3) Illustrated Biochemistry ..by Harper | 1.Class lecture<br>2.PDF<br>3.Reference Notes | Suchona Chakraborty |
| | Pentose phosphate pathway | 1 | | | |
| | Gluconeogenesis | 1 | | | |
| | Glycogenesis & Glycogenolysis | 2 | | | |
| Unit 6 | **Protein metabolism**<br>Transaminaton, Deamination, Glycogenic & Ketogenic amino acid | 4 | | | |
| Unit 7 | **Lipid metabolism**<br>Beta –oxidation of – Palmitic acid & Linoleic acid | 3 | | | |

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| | Fatty acid biosynthesis | 1 | | | |
| Unit 8 | **Nucleic acid Metabolism**<br><br>Degradation of purine; Purine Salvage pathway and significance. | 3 | 1)Biochemistry by D. Das<br><br>2) Principles of Biochemistry .. by Lehninger<br><br>3) Illustrated Biochemistry ..by Harper | 1.Class lecture<br><br>2.PDF<br><br>3.Reference Notes | Dr.Sumallya Karmakar |
| Unit 9 | Free radicals & antioxidants | 1 | 1)Biochemistry .. by D. Das<br><br>2) Principles of Biochemistry .. by Lehninger<br><br>3) Illustrated Biochemistry ..by Harper | 1.Class lecture<br><br>2.PDF<br><br>3.Reference Notes | Suchona Chakraborty |
| Practical<br><br>Group -A | **Qualitative test**<br>Carbohydrate | 6 | 1)Practical Zoology by Chatterjee & Chakraborty<br>2)Practical Zoology by Ghosh Manna<br>3)Laboratory Manual by Poddar | Chemicals & lab apparatus | Suchona Chakraborty |
| | Protein | 3 | | | |
| | Lipid | 1 | | | |
| Group-B | **COLORIMETRIC ESTIMATION**<br><br>1. Protein estimation by Lowry Method | **04**<br><br>**02**<br><br>**02** | ABSORPTIOMETRY AND "COLORIMETRIC ANALYSIS":H.N.Wison | Hands on experiment and study materials | Dr. Debjani Das Ghosh |

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| | **2. Amylase activity** | | | | |

**LESSON PLAN,**
**DEPARTMENT: ZOOLOGY**
# PART I: 4 YEAR SEMESTER-II (CCF)
**NAME OF FACULTY: DR. SUCHARITA SAHA**

**Subject: Zoology Major; COURSE: ZOOM; SUBJECT CODE: SEC2**
**Paper: Skill Enhancement Course (Aquaculture)- THEORY AND PRACTICAL**

| **Planned** | | | | **After Implementation** | |
|---|---|---|---|---|---|
| **Unit / Group / Module / Article** | **Topics** | **No of Lecture Planned** | **Reference Books** | **Content Delivery Technique** | **Remarks / Comments** |
| **Unit-1** | **Basic idea of Fish Biology**<br>Qualities of cultivable fish, Indegenous and exotic | 3 | 1.Sarkar, S., Kundu , G. and Chaki, K.C. (2014) . Introduction to Economic Zoology, NCBA, Kolkata<br><br>2.Pandey, K. and Shukla,J.P. (2013). Fish and Fisheries, Rastogi Publications<br><br>3.Das, M.K. and Das, R.K. (1997). Fish and Prawn Diseases in India--diagnosis and Contro. Inland Fisheries | | Dr. Sucharita Saha |
| **Unit-2** | **Sustainable aquaculture system**<br>Intensive, semi-intensive and extensive cuiture systems, Wate rquality in culture ponds and factors controlling water quality. Preparation and management of fish culture ponds in Composite Fish Culture, Cage Culture, Pen culture, raceways flowthrough system, Biofloc. Cold water | 17 | | | |

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| | fishery, jeol fishery, Sewage-fed Fishery, mariculture with special emphasis on sea-weed culture (Basic concept). Induced breeding of Carps, synthetic hormones in hypophysation. Management of fin-fish Hatcheries, glass-jar hatchery. Chinese hatchery | | Society in India, Barrackpore, West Bengal | | |
| **Unit-3** | **<u>Recent Advancement of Aquaculture</u>**<br>Aquarium Fisheries, Preparation and management of Fish Aquarium. Biology of common ornamental fish: Guppy, swordtail, Angel, Blue morph fish, Anemone fish, Butterfly fish, Molly.<br>Fiah Nutritional Requirement: Feed formulation and preparation of compound diets. Capture fishery: Fishing crafts and gears, post-harvesting Technology, fish Transport and marketing. Fish preservation and by-products.<br>Fish biotechnology: transgenic Fish, Sex-reversal in Fish, Aquaponics, Application of GIS and remote -sensing in Fisheries, fishery laws and regulatons. | 20 | | | |
| **Unit-4** | **<u>Fin-fish Pathology</u>**<br>Name of infective disease. Causative Agents, Symptoms, Control. Bacterial-- Dropsy, Fin | 5 | | | |

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| | and tail rot, Protozon--White spot disease, Fungal--Saprolegniasis, Ectoparasitic--Gyrodactylosis, dactylogyrosis, Viral—Rhabdovirus**.** | | | | |
| **Unit-5** | **Applied Aquaculture**<br><br>Breeding Techniques in Shrimp and Prawns: Eye-stalkAblation in Shripm and Salinity-shock in Prawns. Techniques of artificial Pearl Culture. | 5 | | | |
| **Practical** | **Identification of different fish species using meristic Characters (Systematic Position, Speimen Characters)**. Rohu, Catla, Cirhinus, Puntius, Amblypharyngodon, Channa punctatus, Lates, Mystus, Notopterus, Cyprinus, Hypophthalmichthyes, Ctenopharyngodon, Oreochromis niloticus, Oreochromis mossambicus, anabas, Clarius, Heteropneustes, Mugil, Macrobrachium, Penaeus | | Ghosh, K.C., Manna, B.--Practical Zoology, NCBA | | Dr. Sucharita Saha |
| | **Visit to any aquaculture farm and submission of report on the visit** | | | | |

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**LESSON PLAN**

# PART I : 4 YEAR & 3 YEAR SEMESTER-II(CCF)

**DEPARTMENT: ZOOLOGY**

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

**Subject: Zoology Minor & ZOOLOGY MDC ; SUBJECT CODE: MN2 & CC2**

**Paper: Biochemistry- MZOO & MZOO- MDC, THEORY AND PRACTICAL**

| **Planned** | | | | **After Implementation** | |
|---|---|---|---|---|---|
| **Unit / Group / Module / Article** | **Topics** | **No of Lecture Planned** | **Reference Books** | **Content Delivery Technique** | **Remarks / Comments** |
| Unit 1 | **Carbohydrate**<br>Structure<br>Classification<br>Properties of Monosaccharide, Disaccharide & Polysaccharide | 4 | 1)Biochemistry .. by D. Das<br><br>2) Principles of Biochemistry .. by Lehninger<br><br>3) Illustrated Biochemistry ..by Harper | 1.Class lecture<br><br>2.PDF<br><br>3.Reference Notes | Suchona Chakraborty |
| | Isomerism of monosaccharide | 4 | | | |
| | Importance | 1 | | | |
| Unit 2 | **Protein**<br>Structure of amino acid<br>Classification of amino acid<br>Properties ( General & electrochemical) | 4 | | | |

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| | Essential & nonessential amino acid | | | | |
| | Structure of protein ( primary, secondary, tertiary & quatenery) | 3 | | | |
| Unit 3 | **Lipid**<br>Classification<br>Saturated & unsaturated fattyacid<br>Essential & non-essential fatty acid | 2 | | | |
| | Structure & Formation of triglyceride | 1 | | | |
| Unit 4 | **ENZYMES**Nomenclature, classification; cofactors; specificity of enzyme action; isozymes; Mechanism of enzyme action; Enzyme kinetics; Derivation of Michaelis-Menten equation; Lineweaver-Burk plot; Factors affecting rate of enzyme catalysed reactions; Enzyme inhibition | 9 | D. Das: Fundamentals of Biochemistry,<br>Harper's illustrated biochemistry | 1. Chalk and Talk<br>2. Reference Materials | Dr. Debjani Das Ghosh |
| Unit 5 | **Carbohydrate metabolism**<br>Glycolysis<br>Citric acid cycle | 3 | 1)Biochemistry .. by D. Das<br>2) Principles of Biochemistry .. by Lehninger | 1.Class lecture<br>2.PDF<br>3.Reference Notes | Suchona Chakraborty |
| | Pentose phosphate pathway | 1 | | | |
| | Gluconeogenesis | 1 | | | |
| | Glycogenesis & Glycogenolysis | 2 | | | |
| Unit 6 | **Protein metabolism** | 4 | | | |

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| | Transaminaton, Deamination, Glycogenic & Ketogenic amino acid | | 3) Illustrated Biochemistry ..by Harper | | |
| Unit 7 | **Lipid metabolism**<br>Beta –oxidation of – Palmitic acid & Linoleic acid | 3 | | | |
| | Fatty acid biosynthesis | 1 | | | |
| Unit 8 | **Nucleic acid Metabolism**<br><br>Degradation of purine; Purine Salvage pathway and significance. | | 1)Biochemistry by D. Das<br><br>2) Principles of Biochemistry .. by Lehninger<br><br>3) Illustrated Biochemistry ..by Harper | 1.Class lecture<br><br>2.PDF<br><br>3.Reference Notes | Dr.Sumallya Karmakar |
| Unit 9 | Free radicals & antioxidants | 1 | 1)Biochemistry .. by D. Das<br><br>2) Principles of Biochemistry .. by Lehninger<br><br>3) Illustrated Biochemistry ..by Harper | 1.Class lecture<br><br>2.PDF<br><br>3.Reference Notes | Suchona Chakraborty |
| Practical<br><br>Group -A | **Qualitative test**<br>Carbohydrate | 6 | 1)Practical Zoology by Chatterjee & Chakraborty<br>2)Practical Zoology by Ghosh Manna<br>3)Laboratory Manual by Poddar | Chemicals & lab apparatus | Suchona Chakraborty |
| | Protein | 3 | | | |
| | Lipid | 1 | | | |

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| Group-B | **COLORIMETRIC ESTIMATION**<br>1.Protein estimation by Lowry Method<br>**2.Amylase activity** | **04**<br>**02**<br>**02** | ABSORPTIOMETRY AND "COLORIMETRIC ANALYSIS":H.N.Wison | Hands on experiment and study materials | Dr. Debjani Das Ghosh |

## LESSON PLAN:

# PART I: 3 YEAR SEMESTER-II

## DEPARTMENT: ZOOLOGY

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

**Subject: Zoology, MZOO-MDC; SUBJECT CODE: SEC G**

**Paper: Skill Enhancement Course (APPLIED ZOOLOGY)-THEORY AND PRACTICAL**

| **Planned** | | | | **After Implementation** | |
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| **Unit / Group / Module / Article** | **Topics** | **No of Lecture Planned** | **Reference Books** | **Content Delivery Technique** | **Remarks / Comments** |
| **Unit I** | **Agricultural Entomology** | **6** | 1.Economic Zoology: Shukla & Upadhyay<br>2. Introduction to Economic Zoology: Sarkar, Kundu, Chaki<br>3. Elementary Applied Zoology: Debajyoti Chattopadhyay | 1.Chalk & Talk method<br>2.Power Point presentation<br>3.Use of Charts | Dr. Debjani Das Ghosh |
| | 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 | | | |

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| **Unit II** | **Sericulture** | **8** | 1.A.Sukla: A handbook of Economic Zoology,<br>2.Chaki, Kundu and Sarkar: Introduction to economic Zoology,<br>3.Chaudhuri: Economic Zoology etc. | 1.Photographs<br>2. Chalk and talk<br>3. Study materials | Dr. Debjani Das Ghosh |
| | Types of silk moths, geographical distribution, host plants | 2 | | | |
| | Life cycle of *B.mori*, silk gland, composition of silk, uses of silk | 2 | | | |
| | Rearing, extraction, reeling of mulberry silk | 2 | | | |
| | Silkworm diseases, pests and their control | 2 | | | |
| **Unit III** | **Apiculture** | **7** | 1.A.Sukla: A handbook of Economic Zoology,<br>2.Chaki, Kundu and Sarkar: Introduction to economic Zoology,<br>3.Chaudhuri: Economic Zoology | 1.Photographs<br>2. Chalk and talk<br>3. Study materials | Dr. Debjani DasGhosh |
| | 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** | **7** | Lekshmy , M.S. and Santhi, R. Vermitechnology. Saras Publication. ISBN:9789382459323 | 1.Chalk and talk<br>2. Link share | Dr. Sucharita Saha |
| | 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 | | | | |

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| | of vermicompost, advantages of vermicomposting, diseases and pests of earthworm | | | | |
| **Unit V** | **Aquaculture**<br>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 | | Dr. Sucharita Saha |
| **Unit VI** | **Livestock Management** | **8** | 1. A.Sukla: A handbook of economic Zoology<br>2.Chaki, Kundu and Sarkar: Introduction to economic Zoology<br>3. Chaudhuri: Economic Zoology etc | Photographs, chalk and talk and study materials | Dr. Sumallya Karmakar |
| **Unit VII** | **Lac Culture**<br>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**<br>**20** | | | |

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| **Practical** | **Applied zoology** | | | | |
| | 1.a.Identification of various castes of honey bee, life cycle stages of *Bombyx mori* | 4 | 1. A.Sukla: A handbook of economic Zoology<br>2.Chaki, Kundu and Sarkar: Introduction to economic Zoology<br>3. Chaudhuri: Economic Zoology etc | Photographs, chalk and talk and study materials | Dr. Debjani Das Ghosh |
| | b. Identification of life stages of *Kerri lacca* | **2** | Chaki, Kundu and Sarkar: Introduction to economic Zoology | Photographs, chalk and talk and study materials | Dr. Sumallya Karmakar |
| | c. Identification of earthworms used in vermiculture | **2** | Lekshmy , M.S. and Santhi, R. Vermitechnology. Saras Publication. ISBN:9789382459323 | | Dr. Sucharita Saha |
| | d. Identification of ectoparasites of Poultry birds | | | | Dr. Sumallya Karmakar |
| | 2. Identification of the following fish and prawn specimens ( specimen characters only): *Labeo rohita, Catla catla, Cirrhinus mrigala, Cyprinus carpio, L. bata, Penaeus monodon, Macrobrachium rosenbergi* | 4 | Ghosh, K.C., Manna, B.--Practical Zoology, NCBA | 1.Chalk and talk<br>2. Jar specimen display | Dr. Sucharita Saha |
| | 3. Collection of any two pests | 10 | 1. Economic Zoology: | 1. Chalk & Talk method | Suchona |

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| | and submission of specimens along with a report | | Shukla & Upadhyay<br>2. Review papers & journals available at Internet and Research Institutes | 2. Power Point presentation<br>3.Use of Charts, microscopes | Chakraborty |
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**LESSON PLAN:**

# PART I: 4 YEAR SEMESTER-II(CCF)

**DEPARTMENT: ZOOLOGY**

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

**Subject: Zoology, ZOOD; SUBJECT CODE: IDC2**

**Paper: Interdisciplinary Course (Animal Biology)-IDC-2, THEORY AND PRACTICAL**

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

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| | Arthropoda, Chordata | | & II: Sarkar, Kundu, Chaki | specimens | |
| **Unit 2** | **Genetics** | **12** | Concepts of Genetics Klugg& Cummings | 1.Chalk and talk | **Dr.Sumallya Karmakar** |
| | Mendelian Principles and Laws of inheritance<br>Linkage and Recombination basic Concepts<br>Sex Determination with reference to Drosophila [only genic balance theory]<br>Chromosomal Aberration [Structural and Numerical] | | | | |
| **Unit 3** | **Biodiversity and Wildlife** | **10** | | | |
| | 1.Biodiversity: Definition, Types and Value<br><br>2.Indices (Shannon and Simpson) | 5 | 1.Sharma,P.D. (2001). Ecology and Environment. Rastogi Publications<br>2.https://www.worldwildlife.org/page | 1.Chalk and talk<br>2. Link share | Dr. Sucharita Saha |
| | 3.Conservation :in-situ and ex-situ | 2 | 1.G.K Saha and S Majumdar:Threatened mammals of India,<br>2. G.K Saha and S Majumdar:Wildlife Biology,<br>3.Wilson:Biodiversity,<br>4.Sidhi and Ehlich: Conservation Biology for all etc | 1.Photographs<br>2. Chalk and talk<br>3. Study materials | Dr. Debjani Das Ghosh |
| | 4.Conservation priority: Hotspot, Megadiversity,<br>sensitive ecosystem | 2 | | | |
| | 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** | | | |
| | 1. Concept of vector:Biological and mechanical vectors with examples | 2 | 1.Noble and Noble: Parasitology: The biology of animal parasites | 1.Photographs<br>2. Chalk and talk<br>3. Study materials<br>1. Chalk & Talk method | Dr. Debjani Das Ghosh |

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| | | | 2.Chapman: The insects: structure and function etc. | 2. Use of Charts, preserved specimens | |
| | 2.Disease cycle & Reservoir Concept | 1 | 1. Medical Entomology: Hati,A.K.<br>2. Introduction to General Zoology: Vol II: Sarkar, Kundu, Chaki | | |
| | 3.Life cycle, control, role as vector of *Anopheles* and *Aedes* | 5 | | | Dr. Sucharita Saha<br><br>Dr. Sucharita Saha |
| **Unit 5** | **Laboratory techniques and Instrumentation** | **5** | | | |
| | 1.Basics of Light Microscopy | 2 | Raghava, N. and Rabindra ,P.R. Biophysical methods tools and techniques in Biology, Part-1 Microscopy. Notion Pres | 1.Chalk and talk<br>2. Link share | Dr. Sucharita Saha |
| | 2.Principles and Application of Colorimetry | 2 | Ghosh and Manna: Practical Zoology | 1.Photographs<br>2. Chalk and talk<br>3. Study materials | Dr. Debjani Das Ghosh |
| | 3.Principles and Application of Ultracentrifugation | 1 | Biotechnology by Thieman & i | 1.Photographs<br>2. Chalk and talk<br>3. Study materials | Dr. Sumallya Karmakar |
| **Practical** | **Animal Biology** | **20** | | | |
| | 1.Karyotype analysis of Klinefelter, Down,Turner, Edward & Patau Syndrome | 6 | | | Dr. Sumallya Karmakar |
| | 2.Identification of specimens: *Amoeba, Paramoecium, Taenia,Ascaris, Nereis, Pheretima, Penaeus, Macrobrachium, Musca, Anopheles, Culex*<br>Identification of specimens:*Sycon*, Neptune's | 8 | 1. Practical Zoology: Ghosh K.C., Manna B.<br>2.An advanced Laboratory Manual of Zoology: Poddar T., | 1. Chalk & Talk method<br>2. Use of Charts, preserved specimens, permanent slides, microscopes | Dr. Sucharita Saha |

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| | cup,*Pila, Lamellidens, Asterias* | | Mukhopadhyay S., Das S.K.<br>3. Practical Zoology: Chatterjee A.K., Chakraborty C. | | |
| | 3.Study of different types of ecosystems | 6 | 1. Books on Biodiversity And materials from internet | 1.Chalk & Talk method<br><br>3.Use of Computers and internet | Dr. Debjani Das Ghosh |

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**LESSON PLAN,**

# PART II: 4 YEAR SEMESTER-IV (CCF)

## DEPARTMENT OF ZOOLOGY

## NAME OF FACULTY: SUCHONA CHAKRABORTY

**Subject: Zoology (Major) ZOOM, SUBJECT CODE: DSCC 5**

**Paper: DSCC5 (Non-chordate structure and function), THEORY AND PRACTICAL**

| Unit/ Group/ Article/ Module | Topic | No. Of Lectures | Reference books | AFTER IMPLEMENTATION | |
|---|---|---|---|---|---|
| | | | | Content delivery technique | Remarks/ Comments |
| **Theory Unit – 1** | **Kingdom Protista** Protozoa – Characters & classification | 1 | 1.Invertebrate zoology by Rupert Barnes 2. Invertebrates by kotpal 3. Invertebrates by Brusca & Brusca | 1.Class lecture 2.PDF 3.Reference Notes | **Suchona Chakraborty** |
| | Locomotion of Euglena, Paramoecium, , Amoeba | 2 | | | |
| | Conjugation | 1 | | | |
| **Unit-2** | Kingdom Animalia | 4 | | | |
| **Unit-3** | Phylum-Porifera | 4 | | | |
| **Unit-4** | Phylum-Cnidaria | | 1.Invertebrates : Kotpal 2.Invertebrates V.K. Agarwal | 1.Class lecture 2.PDF | **Suchona Chakraborty** |
| **Unit – 5** | Phylum Helminths Characters & classification | 1 | | | |
| | Fasciola – digestive, excretory, reproductive | 2 | | | |
| | Ascaris - " " " | 1 | | | |

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| **Unit - 6** | Phylum Annelida<br>Characters & classification | 1 | 3.General Zoology: Ganguly.Adhikari . Sinha .4.General Zoology : Chaki& Kundu<br>5. Invertebrates Brusca & Brusca | 3.Reference Notes<br><br>4.Library work from referred books by students<br>5.Preparation of answers by students from suggestion questions<br>6.Class test at regular interval | |
| | Excretion | 2 | | | |
| | Metamerism | 1 | | | |
| **Unit – 7** | Phylum Onychophora | 2 | | | |
| **Unit-8** | Phylum-Arthropoda | 6 | | | |
| **Unit-9** | Phylum-Mollusca | 5 | | | |
| **Unit-10** | Phylum-Echinodermata | 5 | | | |
| **Unit-11** | Phylum-Hemichordata | 3 | | | |
| **Practical** | 1. Identification with reasons and systematic position of Entamoeba, trypanosoma, sycon, Obelia, Aurelia, Metridium, Madrepora, Fasciola, Taenia, ascaris, nereis, Chaetpoterus, Hirudinaria, peripatus, Limulus, Buthus, Macrobrachium, Balanus, Eupagurus, Julus, Scolopendra, Patella, Chiton, Pila, Sepia, Octopus, Asterius, Ophura, Echinus, Cucumaria, Antedon and Balanoglossus<br>2. Anatomical study: **Earthworm**: Mounting of nerve ring, **Periplaneta sp**: Nervous system, Male and Female Reproductive systems<br>3. Whole mount of Paramoecium/ Euglena/Amoeba | 2 | 1)Practical Zoology by Chatterjee & Chakraborty<br>2)Practical Zoology by Ghosh Manna<br>3)Laboratory Manual by Poddar | Specimen, Microscope, Stains, Apparatus | Suchona Chakraborty |

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**LESSON PLAN,**

# PART II: 4 YEAR SEMESTER -IV(CCF)

## DEPARTMENT NAME: ZOOLOGY

## NAME OF FACULTY: DR. DEBJANI DAS GHOSH

**Subject: Zoology (Major), ZOOM, SUBJECT CODE: DSCC-6**

**Paper: Parasitology : DSCC-6 THEORY AND PRACTICAL**

| Unit/ Group/ Article/ Module | Topic | No. Of Lectures | Reference books | AFTER IMPLEMENTATION | |
|---|---|---|---|---|---|
| | | | | Content delivery technique | Remarks/ Comments |
| **Theory Unit – 1** | Introduction to Parasitology | 4 | Cheng TC, Dailey MD, Gunn A, Chatterjee KD, Janovy J, Smyth JD | Chalk & Talk method<br>2. PowerPoint presentation<br>3.Use of Charts, microscopes | **Debjani DasGhosh** |
| **Unit-2** | Parasitic Protists | 7 | | | |
| **Unit-3** | Parasitic Platyhelminthes | 8 | | | |
| **Unit-4** | Parasitic Nematodes | 8 | | | |
| **Unit – 5** | Parasitic Arthropods | 8 | | | |
| **Unit - 6** | Parasitic Vertebrates | 3 | | | |
| **Unit – 7** | Parasitic adaptation and host relation | 4 | | | |

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| **Practical** | 1.Identification of *E. histolytica, L. donovani, Plasmodiu*m vivax<br>2.Identification of *Schistosoma haematobium, Echinococcus granulosus.*<br>3. Identification of *Ascaris lumbricoides, Ancyclostoma duodenale, Wuchereria bancrofti*.<br>4. Isolation, Fixation, Staining and Mounting of protozoa and helminth from the gut of Cockroach<br>5.LNB | 20 | 1)Practical Zoology by Chatterjee & Chakraborty<br>2)Practical Zoology by Ghosh Manna<br>3)Laboratory Manual by Poddar | 1.Use of Charts, microscopes, photographs etc.,<br>2.Hands on training,<br>3.Specimens | Debjani DasGhosh |

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**LESSON PLAN,**

# PART II: 4 YEAR SEMESTER -IV(CCF)

## DEPARTMENT NAME: ZOOLOGY

## NAME OF FACULTY: DR. SUMALYYA KARMAKAR

**Subject: ZOOLOGY MAJOR (ZOOM), SUBJECT CODE: DSCC 7**

**Paper: Molecular Biology : DSCC-7 , THEORY AND PRACTICAL**

| Planned | | | | After Implementation | |
|---|---|---|---|---|---|
| **Unit / Group / Module / Article** | **Topics** | **No of Lecture Planned** | **Reference Books** | **Content Delivery Technique** | **Remarks / Comments** |
| **Unit 1** | **Transcription**<br>Mechanism of Transcription in prokaryotes and eukaryotes, Transcription factors, Difference between prokaryotic and eukaryotic transcription. | **6** | 1. Genetics-Strickberger 3 rd edition<br>2. iGenetics-Russell 3 rd edition<br>3. Genetics-Benjamin A Pierce 4 th Edition<br>4. Concepts of Genetics- Klug and Cummings 12th Edition<br>5. Molecular Biology of the Gene-Watson 7 | 1. ICT<br>2. Chalk & Talk | **DR. SUMALYYA KARMAKAR** |

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| **Unit 2** | **<u>Post Transcriptional Modifications and Processing of Eukaryotic RNA</u>**<br>Capping and Poly A tail formation in mRNA; Concept of introns and exons and Split genes; Splicing mechanism [Intron Removal by Spliceosome]; RNA editing (gRNA mediated and cytidine deaminase mediated) | **6** | th Edition<br>6. Cell Bruce-Alberts 6th Edition<br>7. Molecular Biology-Weaver 5 th Edition<br>8. Principles and techniques of Biochemistry and Molecular Biology-Walker and Wilson 8 th Edition | 1. ICT<br>2. Chalk & Talk | **DR. SUMALYYA KARMAKAR** |
| **Unit 3** | **<u>Translation</u>**<br>Genetic code; Characteristics of the Genetic Code; Aminoacylation of a tRNA molecule; Mechanism of protein synthesis in prokaryotes. | **6** | | 1. ICT<br>2. Chalk & Talk | **DR. SUMALYYA KARMAKAR** |
| **Unit 4** | **<u>Gene Regulation</u>**<br>Regulation of Transcription in prokaryotes: lac operon and trp operon (Attenuation control); Regulation of Transcription in eukaryotes: Activators, enhancers, silencer, repressors, miRNA mediated gene silencing. Epigenetic Regulation: DNA Methylation (by DNMT), Histone Methylation (by HMT) & Acetylation (by | **8** | | 1. ICT<br>2. Chalk & Talk | **DR. SUMALYYA KARMAKAR** |

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| | HAT and HDAC). | | | | |
| **Unit 6** | **<u>Cell Cycle</u>** | **5** | | 1. ICT<br>2. Chalk & Talk | **DR. SUMALYYA KARMAKAR** |
| **Unit 7** | **<u>DNA Repair Mechanisms</u>**<br>Types of DNA repair mechanisms, RecBCD model in prokaryotes, nucleotide and base excision repair, SOS repair | **4** | | 1. ICT<br>2. Chalk & Talk | **DR. SUMALYYA KARMAKAR** |
| **Unit 8** | **<u>Molecular Techniques</u>**<br>Principle and use of Agarose Gel Electrophoresis<br>Principle and use of SDS PAGE<br>Blot Technique: Southern, Northern and Western Blot<br>PCR: Basic Principle, Reverse Transcriptase-PCR | **4** | | 1. ICT<br>2. Chalk & Talk | **DR. SUMALYYA KARMAKAR** |

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| **Practical** | 1. Isolation of genomic DNA from Goat Liver by phenol-chloroform method.<br>2. Quantification of DNA by diphenylamine (DPA) method. 3. Agarose Gel Electrophoresis.<br>4. Concept of buffer preparation and related calculation and dilution.<br>5. Instruments and accessories used to be shown by photographs for the following techniques: PCR, SDS PAGE, Western Blot, Southern Blot. | **20** | 1)Practical Zoology by Chatterjee & Chakraborty<br>2)Practical Zoology by Ghosh Manna<br>3)Laboratory Manual by Poddar | **Hands on Training** | **DR. SUMALYYA KARMAKAR** |

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**LESSON PLAN,**

# PART II: 4 YEAR & 3 YEAR SEMESTER -IV(CCF)

## DEPARTMENT NAME: ZOOLOGY

## NAME OF FACULTY: DR. SUCHARITA SAHA

**Subject: Zoology MAJOR (ZOOM) & MZOO-MDC; SUBJECT CODE: DSCC-8 & CC5**

**Paper: DSCC-8 (ECOLOGY). & CC5 (ECOLOGY), THEORY AND PRACTICAL**

| Planned | | | | After Implementation | |
|---|---|---|---|---|---|
| **Unit / Group / Module / Article** | **Topics** | **No of Lecture Planned** | **Reference Books** | **Content Delivery Technique** | **Remarks / Comments** |
| **Unit 1** | **Introduction to Ecology**; Autecology/Synecology, laws of limiting factor. Temperature as limiting factor (Effect on plant and animal metabolism, Bergman's rule, Jordon's rule, Allen's rule, Rensch's rule). Light as limiting factor (photoperiodism in plants and animals) | 5 | 1. Roy, M. (2018). Perspectives in Ecology,Kalyani Printings, ISBN: 978-93-272-9087-5<br><br>2. Sharma, P.D. (2001).Ecology and Environment, Rastogi Publications<br><br>3. Kormondy, E.J. (2002). concepts of Ecology. 4th indian reprint, Pearson Education<br><br>4. Ricklefs R.E., Miller, G.L.(2000). 4th ed, W.H. Freeman and Company | Chalk and talk<br><br>Link share<br><br>Reference notes | Dr. Sucharita Saha |
| **Unit-2** | **Energy flow in Ecosystem:** Functional components of ecosystem: Energy flow (Universal model and Y -shaped model, ten perent law of energy flow); Productivity (Primary and | 8 | | | |

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| | secondary) and eclogical efficiencies.Types of ecological pyramids with examples; Food chains (Detritus food chain and grazing food chain); Food web and types; Biogeochemical cycles (Nitrogen cycle). | | | | |
| **Unit-3** | **Population Ecology**: Definition and properties (Natality, Mortality,Density, Biotic potential, Age structure, Survivorship curves, Growth curves with equations); Population regulation(density-dependant and independent); r and K strategies | 7 | | | |
| **Unit-4** | **Niche and Competition:** Definition of habitat and niche, Types of niche, N-dimentional niche concept, Niche overlap and resource partitioning. Competition and exclusion principle, Gause's and Connel's field experiment, niche segregation and character displacement, Lotka-volterra equation for competition, habitat ecology-Metabolism and ecosystem services of tropical rain forest and wetlands | 8 | | | |
| **Unit-5** | **Community Ecology;** Community-Definition and types, stratification, species richness and evenness; | 4 | | | |

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| | dominance-Diversity analysis, interspecific interaction within equilibrial communities (definition and examples) | | | | |
| **Unit-6** | **Ecological succession;** definition and types of succession, seral stages with special reference to hydrosere and lithosere, Models of ecological succession, resource-ratio hypothesis | 4 | | | |
| **Unit-7** | **Pollution Biology:** definition, types of pollutants (primary and secondary with examples), causes and effects of acid-rain, photochemical smog, ozone layer depletion and eutrophication, cause and effects of heavy-metal pollution in water ( Pb, As, Hg0; groundwater pollution, concept of bioconcentration and biomagnification | 8 | | | |
| **Practical: Ecology Lab CC-8-P** | **1. Quantitative estimation** of dissolved oxygen, free carbondioxide, alkalinity from the provided water sample and comment on the observation. | 8 | 1. Roy, M. (2018). Perspectives in Ecology (with practical),Kalyani Printings, ISBN: 978-93-272-9087-5<br><br>2. Sharma, P.D. (2001).Ecology and Environment, Rastogi publications | 1. Hydrological analysis with chemicals<br>2. Handling of instrument (pH meter)<br>3. Display of specimen in slides and vials<br>4. Practice of problem solving | Dr. Sucharita Saha |
| | **2. Estimation of pH value** of provided water sample | 2 | | | |
| | **3. Identification with reasons** of the following zooplanktons; *Daphnia, Cyclops, Cypris* | 2 | | | |

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| | **4. Identification with reasons** of the followingsoil arthropods: Collembola, termite worker, ant | 2 | | | |
| | **5. Study of life tables and survivorship curve** from a hypothetical data set and comment on the results. | 6 | | | |

**LESSON PLAN,**

# PART II: 3 YEAR SEMESTER-IV(CCF)

## DEPARTMENT NAME: ZOOLOGY

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# NAME OF FACULTY: SUCHONA CHAKRABORTY

**Subject: Zoology (MZOO-MDC); SUBJECT CODE: CC4**

**Paper : CC-4 (Non-chordate structure and function); MZOO-MDC, THEORY AND PRACTICAL**

| Unit/ Group/ Article/ Module | Topic | No. Of Lectures | Reference books | AFTER IMPLEMENTATION | |
|---|---|---|---|---|---|
| | | | | Content delivery technique | Remarks/ Comments |
| **Theory Unit – 1** | **Kingdom Protista** Protozoa – Characters & classification | 1 | 1.Invertebrate zoology by Rupert Barnes 2. Invertebrates by kotpal 3. Invertebrates by Brusca & Brusca | 1.Class lecture 2.PDF 3.Reference Notes | **Suchona Chakraborty** |
| | Locomotion of Euglena, Paramoecium, , Amoeba | 2 | | | |
| | Conjugation | 1 | | | |
| **Unit-2** | Kingdom Animalia | 4 | | | |
| **Unit-3** | Phylum-Porifera | 4 | | | |
| **Unit-4** | Phylum-Cnidaria | | | | |
| **Unit – 5** | Phylum Helminths Characters & classification | 1 | 1.Invertevrates : Kotpal 2.Invertebrates V.K. Agarwal 3.General Zoology: Ganguly.Adhikari . Sinha 4..General Zoology : Chaki& Kundu 5. Invertebrates | 1.Library work from referred books by students 2.Preparation of answers by students from suggestion questions 3.Class test at regular interval | |
| | Fasciola – digestive, excretory, reproductive | 2 | | | |
| | Ascaris - “ “ “ | 1 | | | |
| **Unit - 6** | Phylum Annelida | 1 | | | |

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| | Characters & classification | | Brusca & Brusca | “ | Suchona Chakraborty |
| | Excretion | 2 | | | |
| | Metamerism | 1 | | | |
| **Unit – 7** | Phylum Onychophora | 2 | | | |
| **Unit-8** | Phylum-Arthropoda | 6 | | | |
| **Unit-9** | Phylum-Mollusca | 5 | | | |
| **Unit-10** | Phylum-Echinodermata | 5 | | | |
| **Unit-11** | Phylum-Hemichordata | 3 | | | |
| **Practical** | 4. Identification with reasons and systematic position of Entamoeba, trypanosoma, sycon, Obelia, Aurelia, Metridium, Madrepora, Fasciola, Taenia, ascaris, nereis, Chaetpoterus, Hirudinaria, peripatus, Limulus, Buthus, Macrobrachium, Balanus, Eupagurus, Julus, Scolopendra, Patella, Chiton, Pila, Sepia, Octopus, Asterius, Ophura, Echinus, Cucumaria, Antedon and Balanoglossus<br>5. Anatomical study: **Earthworm**: Mounting of nerve ring, **Periplaneta sp**: Nervous system, Male and Female Reproductive systems<br>6. Whole mount of Paramoecium/ Euglena/Amoeba | 2 | 1)Practical Zoology by Chatterjee & Chakraborty<br>2)Practical Zoology by Ghosh Manna<br>3)Laboratory Manual by Poddar | Specimen, Microscope, Stains, Apparatus | |

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**LESSON PLAN,**

# PART II: 4 YEAR & 3 YEAR SEMESTER-IV (CCF)

## DEPARTMENT NAME: ZOOLOGY

**NAME OF FACULTY: Suchona Chakraborty, Dr. Debjani Das Ghosh & Dr. Sumallya Karmakar**

**Subject: Zoology MN2(100 LEVEL) & CC2(200 LEVEL)**

**Paper: MZOO ( BIOCHEMISTRY) & MZOO- MDC- Minor (Biochemistry), THEORY AND PRACTICAL**

| **Planned** | | | | **After Implementation** | |
|---|---|---|---|---|---|
| **Unit / Group / Module / Article** | **Topics** | **No of Lecture Planned** | **Reference Books** | **Content Delivery Technique** | **Remarks / Comments** |
| Unit 1 | **Carbohydrate**<br>Structure<br>Classification<br>Properties of Monosaccharide, Disaccharide & Polysaccharide | 4 | 1)Biochemistry .. by D. Das<br><br>2) Principles of Biochemistry .. by Lehninger<br><br>3) Illustrated Biochemistry ..by Harper | 1.Class lecture<br><br>2.PDF<br><br>3.Reference Notes | Suchona Chakraborty |
| | Isomerism of monosaccharide | 4 | | | |
| | Importance | 1 | | | |
| Unit 2 | **Protein**<br>Structure of amino acid<br>Classification of amino acid<br>Properties ( General & electrochemical)<br>Essential & nonessential amino acid | 4 | | | |

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| | Structure of protein ( primary, secondary, tertiary & quatenery) | 3 | | | |
| Unit 3 | **Lipid**<br>Classification<br>Saturated & unsaturated fattyacid<br>Essential & non-essential fatty acid | 2 | | | |
| | Structure & Formation of triglyceride | 1 | | | |
| Unit 4 | **Enzymes**<br>Nomenclature, classification; cofactors; specificity of enzyme action; isozymes; Mechanism of enzyme action; Enzyme kinetics; Derivation of Michaelis-Menten equation; Lineweaver-Burk plot; Factors affecting rate of enzyme catalysed reactions; Enzyme inhibition | 9 | Cox and Nelson: Lehninger's principles of biochemistry,<br>Hames and Hooper:Harper's illustrated biochemistry,<br>D. Das: Fundamentals of Biochemistry etc. | 1. chalk and talk<br>2. Peer teaching<br>3. class test<br>4. Study materials<br>5. reference notes | Dr. Debjani Das Ghosh |
| Unit 5 | **Carbohydrate metabolism**<br>Glycolysis<br>Citric acid cycle | 3 | 1)Biochemistry .. by D. Das<br>2) Principles of Biochemistry .. by Lehninger<br>3) Illustrated Biochemistry ..by Harper | 1.Class lecture<br>2.PDF<br>3.Reference Notes | Suchona Chakraborty |
| | Pentose phosphate pathway | 1 | | | |
| | Gluconeogenesis | 1 | | | |
| | Glycogenesis & Glycogenolysis | 2 | | | |
| Unit 6 | **Protein metabolism**<br>Transaminaton, Deamination, Glycogenic & Ketogenic amino acid | 4 | | | |
| Unit 7 | **Lipid metabolism** | 3 | | | |

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| | Beta –oxidation of – Palmitic acid & Linoleic acid<br>Fatty acid biosynthesis | <br>1 | | | |
| Unit 8 | Nucleic acid Metabolism | 3 | | Class lecture<br>2.PDF<br>3.Reference Notes | Dr. Sumallya Karmakar |
| Unit 9 | Free radicals & antioxidants | 1 | 1)Biochemistry .. by D. Das<br>2) Principles of Biochemistry .. by Lehninger<br>3) Illustrated Biochemistry ..by Harper | 1.Class lecture<br>2.PDF<br>3.Reference Notes | Suchona Chakraborty |
| Practical<br>Group -A | **Qualitative test**<br>Carbohydrate<br>Protein<br>Lipid | 6<br>3<br>1 | 1)Practical Zoology by Chatterjee & Chakraborty<br>2)Practical Zoology by Ghosh Manna<br>3)Laboratory Manual by Poddar | Chemicals & lab apparatus | Suchona Chakraborty |
| Group-B | **COLORIMETRIC ESTIMATION**<br>1.Protein estimation by Lowry Method<br>**2.Amylase activity** | **04**<br>**02**<br>**02** | ABSORPTIOMETRY AND "COLORIMETRIC ANALYSIS":H.N.Wison | Hands on experiment and study materials | Dr. Debjani Das Ghosh |

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**LESSON PLAN,**

# PART-III: 4 YEAR SEMESTER-VI (CCF)

**DEPARTMENT: ZOOLOGY**

**NAME OF FACULTY: DR. SUCHARITA SAHA and DR. SUMALLYA KARMAKAR**

**Subject: ZOOLOGY MAJOR (ZOOM), SUBJECT CODE: DSCC13**

**Paper: Core Course ZOOM–DSCC – 13 (Developmental Biology), THEORY AND PRACTICAL**

| Unit / Group / Module / Article | Topics | No of Lecture Planned | Reference Books | Content Delivery Technique | Remarks / Comments (Concerned Teacher) |
|---|---|---|---|---|---|
| **Unit-1** | **Gametogenesis**: Origin and fate of primordial germ cells; Structure of mammalian sperm | **5** | Chordate Embryology by Veer Bala Rastogi | Class lecture<br><br>2.PDF | **Dr. Sucharita Saha** |

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| | and ovum; Spermatogenesis in mammals, stages of spermiogenesis, spermiation; Oogenesis in mammal; Composition of yolk and polarity and types of egg (based on amount of yolk and its distribution). | | | 3.Reference Notes | |
| **Unit-2** | **Fertilization:**<br>Internal and external fertilization; phases of fertilization in sea urchin and mammal | **4** | An introduction to embryology by Balinsky | Class lecture<br>2.PDF<br>3.Reference Notes | **Dr. Sucharita Saha** |
| **Unit-3** | **Post fertilization events**<br>Cleavage: Types based on plane and pattern; Role of yolk in cleavage<br>Blastula formation in chick<br>Gastrulation: Definition, morphogenetic movement (epiboly, emboly, invagination, ingression, involution, delamination) with special reference to Nieuwkoop centre and Koller's sickle; Process of gastrulation in chick; Process of gastrulation in frog; Fate map in chick embryo, fate mapping using vital dye technique<br>Extraembryonic membranes in chick and their functions | **10** | An introduction to embryology by Balinsky | Chalk and Talk<br>PDF share<br>Link share | **Dr. Sucharita Saha** |
| **Unit-4** | **Organogenesis**<br>Induction and its types: Organizer concept, Competence, Spemann and Mangold experiment as origin of organizer concept; Concept of moleclar nature of organizer molecules (signalling/molecular mechanism excluded). | **8** | Chordate Embryology by Veer Bala Rastogi | Chalk and Talk<br>PDF share<br>Link share | **Dr. Sucharita Saha** |

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| | Development of eye in chick: Retina, optic cup, lens with special reference to induction<br>Development of Kidney: different phases and reciprocal induction | | | | |
| **Unit-5** | Implantation:<br>Implantation in humanhumans: Types and hormonal control<br>Placenta: structure, types based on histological association and distribution of villi; functions of placenta | **4** | | Chalk and Talk<br>PDF share<br>Link share | **Dr. Sucharita Saha** |
| Unit 6 | **<u>Infertility and ART</u>**<br><br>Causes of infertility; Types of ART (ZIFT, GIFT, ICSI, IUI); Cryopreservation of gametes; IVF: method, advantages and disadvantages. | 4 | 7. Carlson BM. 2014. Human Embryology and Developmental Biology. 5th Edn. Elsevier.<br><br>2. GilbertS.F. 2010. Developmental Biology, IX Edition, Sinauer Associates, Inc., Publishers, | 1. ICT<br>2. Chalk & Talk | Dr. Sumallya Karmakar |
| Unit 7 | **<u>Stem cells and its application</u>**<br><br>Definition, Types with examples, concept of potency, applications of stem cell therapy in bone marrow transplantation and cartilage regeneration. | 4 | | | |
| Unit 8 | **<u>Regeneration</u>**<br><br>Regeneration: Morphallaxis and Epimorphosis in Hydra; Epimorphic limb regenerations in Salamander. | 4 | | | |
| **Practical (CC-13-P)** | Study of whole mount of developmental stages of chick embryo through permanent slides : 24, 48, 72 and 96 hrs of incubation | **4** | Practical Zoology by Gosh and Manna | Use of slides, microscopes | **Dr. Sucharita Saha** |

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| | Study of the developmental stages of life cycle of Drosophila and Frog using photographs | **4** | An advanced Laboratory Manual of Zoology by Das, Mukhopadhyay and Poddar | Use of photographs | **Dr. Sucharita Saha** |
| | Study of different sections of placenta (by photograph) | **4** | | Use of Photographs | **Dr. Sucharita Saha** |
| | Identification of larva through slides--Trochophore, Nauplius, Zoea, Megalopa, Mysis, Veliger and Glochidium | **4** | An advanced Laboratory Manual of Zoology by Das, Mukhopadhyay and Poddar | Use of slides, microscopes | **Dr. Sucharita Saha** |
| | Mounting of rat sperm and fish ova | **4** | | | |

**LESSON PLAN,**

**PART-III: 4 YEAR SEMESTER-VI (CCF)**

**DEPARTMENT: ZOOLOGY**

**NAME: DR.SUMALLYA KARMAKAR & SUCHONA CHAKRABORTY**

**Subject: ZOOLOGY MAJOR (ZOOM); SUBJECT CODE: DSCC14**

**Paper: CORE COURSE TAXONOMY , EVOLUTION & ADAPTATION THEORY AND PRACTICAL**

| **Unit/Group/ Article/ Module** | **Topic** | **No. Of Lectures** | **Reference books** | **AFTER IMPLEMENTATION** | |
|---|---|---|---|---|---|
| | | | | **Content delivery technique** | **Remarks/ Comments** |
| THEORY Unit 1 | Taxonomy & Systematics<br>Nomenclature<br>Homonymy & Synonymy | 5 | 1.Organic Evolution By Rastogi | | SUCHONA CHAKRABORTY |

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| | Type Concept<br>Linnean Hierarchy | | 2. Evolution by Strickberger<br><br>3. Theory and Practical of Animal Taxonomy by V.C. Kapoor<br><br>4.Taxonomy ( Principles & Problems ) by Sanjib Ghosal | 1..Class lecture<br><br>2.PDF<br><br>3.Reference Notes | SUCHONA CHAKRABORTY |
| Unit 2 | Characters & Character states<br>Types with examples | 3 | | | |
| Unit 3 | Classification<br>Phenetic<br>Cladistics<br>Parsimony | 8 | | | |
| | Taxonomy & Systematics<br>Nomenclature<br>Homonymy & Synonymy<br>Type Concept<br>Linnean Hierarchy | 5 | | | |
| | Characters & Character states<br>Types with examples | 3 | | | |
| | Classification<br>Phenetic<br>Cladistics<br>Parsimony | 8 | | | |
| | Taxonomy & Systematics<br>Nomenclature<br>Homonymy & Synonymy<br>Type Concept<br>Linnean Hierarchy | 5 | | | |
| | Characters & Character states<br>Types with examples | 3 | | | |
| | Classification<br>Phenetic<br>Cladistics<br>Parsimony | 8 | | | |

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| | Taxonomy & Systematics<br>Nomenclature<br>Homonymy & Synonymy<br>Type Concept<br>Linnean Hierarchy | 5 | | | |
| Unit 4 | **<u>Evolution1: Gene frequency in a Population and Factors influencing gene frequency.</u>**<br><br>Hardy-Weinberg Principle: Assumption, proof of equilibrium, calculation of gene frequency and genotype frequency (for autosomal gene only), testing for equilibrium;<br>Equilibrium destabilizing forces: concept and mathematical expression of Selection (against deleterious recessive allele only); Mutation (changes from dominant to recessive allele only) and Migration. | 8 | Futuyma,D.J. (2024) Evolution (5TH Edn.) Oxford University Press. | 1. ICT<br>2. Chalk & Talk | Dr. Sumallya Karmakar |
| Unit 5 | Concept of evolution<br>Origin of Life<br>Darwinism & Nep Darwinism<br>Variation & Natural Selection<br>Genetic Drift &Population Bottle neck<br>Isolation<br>Speciation | 7 | 1.Organic Evolution By Rastogi<br><br>2. Evolution by Strickberger<br><br>3. Theory and Practical of Animal Taxonomy by V.C. Kapoor | 1.Library work from referred books by students<br><br>2.Preparation of answers by students from suggestion questions | SUCHONA CHAKRABORTY |
| Unit 6 | Biogeographical realms<br>Geological timescale | 7 | | | |

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| | Fossils<br>Evolution of horse<br>Evolution of Man | | 4.Taxonomy ( Principles & Problems ) by Sanjib Ghosal | 3.Class test at regular interval | |
| Unit 7 | Adaptation<br>Divergence | 4 | | | |
| Unit 8 | Adaptation<br>Types<br>Colouration & Mimicry | 5 | | | |
| **Practical** | 1.Study of Fossils<br>2.Study of features & their adaptive significance<br>3.Phylogenetic tree construction | 15 | | | SUCHONA CHAKRABORTY |
| | Calculation of change in gene frequency in population due to Selection (against deleterious recessive trait only), Mutation (changes from dominant to recessive trait only), Migration. | 05 | Som,D.K.,Bhowal,S.K.,Ghosh ,N. and Mukherjee,A.(2024) A concise Text Book on Practical Zoology. (1st Edn). Rainbow Publishers, Kolkata, India | 1. ICT<br>2. Chalk & Talk | Dr. Sumallya Karmakar |
| | LNB | | | | ALL |

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**LESSON PLAN,**

# PART-III: 4 YEAR SEMESTER-VI (CCF)

## DEPARTMENT: ZOOLOGY

## NAME OF FACULTY: DR. DEBJANI DAS GHOSH

**Subject: ZOOLOGY MAJOR (ZOOM); SUBJECT CODE: DSCC15**

**Paper: CORE COURSE -DSCC15 (Animal Behaviour ) THEORY AND PRACTICAL**

| | Unit / Group / Module / Article | Topics | Reference Books | No. Of lectures planned | Content delivery techniques | Remarks/Comments |
|---|---|---|---|---|---|---|
| DSCC 15-TH<br>ANIMAL BEHAVIOR | Unit1:<br>Introduction to Animal Behaviour | Contribution to Konrad Lorenz,Karl Von Frisch and Niko Tinbergen | Alcock: Animal behavior<br>Dujatkin: Principles of animal behavior,<br>R. Mathur: Animal behavior etc. | 02 | Study materials and reference notes to be given Chalk and talk, PDF study materiaChalk and talk, PDF study materials | DR. DEBJANI DAS GHOSH |
| | | Three foundations of behaviour study | | 02 | | |
| | | Approaches in behaviour study | | 01 | | |
| | UNIT2: Patterns of Behaviour | Stereotyped behaviours(Orientation and Reflex) | Alcock: Animal behaviour,<br>Dujatkin: Principles of | 02 | | |

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| | | **Sign stimulus and FAP in Stickleback**<br><br>**Individual behavioral patterns** | **animal behaviour,**<br><br>**R. Mathur: Animal behaviour etc.** | **02** | | |
| | | **Instinct vs learned behaviour** | | **01** | | |
| | | **Associative learning and operant conditioning**<br><br>**Habitation and Sensitisation**<br><br>**Imprinting: Filial and sexual** | | **01** | | |
| | **UNIT 3: Social Behaviour** | **Advantage of group living**<br><br>**Eusociality, Social organisation in termites and Lion pride** | | **01** | **Chalk and talk, PDF study materials**<br><br>**Study materials and reference notes to be given** | |
| | | **Kinship theory: Relatedness and inclusive fitness** | | **02** | | |

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| | | **Altruism, Selfishness, Hamilton's rule, Reciprocal altruism** | | **02** | | |
| | | **Cooperation and cooperative behaviours: Social grooming in spider monkey, Group hunting in hyenas** | | **01** | | |
| | | **Aggregations: schooling in Fish; Flocking in birds** | | **01** | | |
| | **Unit 4: Sexual behaviour** | **Sexual dimorphism; Courtship behaviour and mate choice** | **Alcock: Animal behavior**<br>**Dujatkin: Principles of animal behavior,**<br>**R. Mathur: Animal behavior etc.** | **02** | **PPT, PDF, Class materials**<br>**Study materials and reference notes to be given** | |
| | | **Good genes model in sexual selection** | | **02** | | |
| | | **Runaway sexual selection hypothesis** | | **01** | | |
| | | **Intra-sexual selection and inter-sexual selection** | | **01** | | |
| | | **Definition with examples:** | | **01** | | |

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| | | **Monogamy, Polygamy and Polyandry** | | | | |
| | **Unit 5: Evolutionary strategies** | **Concept of Parental care and parental investment** | **Alcock: Animal behavior Dujatkin: Principles of animal behavior, R. Mathur: Animal behavior etc.** | **01** | **PPT, PDF, Class materials**<br><br>**Study materials and reference notes to be given** | |
| | | **Parental care in fishes** | | **01** | | |
| | | **Nest building behaviour in Fish and Amphibia** | | **01** | | |
| | | **Cost and benefit of parental care by male fish** | | **01** | | |
| | | **Parent -Offspring conflict, Infanticide, Sexual conflict in parental care** | | **02** | | |
| | | **Territorial behaviour in Monkey** | | **01** | | |
| | | **Evolutionary stable strategies (ESS): awk-Dove model** | | **01** | | |

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| | Unit 6: Biological Rhythm | Types and characteristics of biological rhythms | V. Kumar: Biological rhythms,<br>Dunlap et al: Chronobiology and biological timekeeping etc. | 01 | PPT, PDF, Class materials<br>Study materials and reference notes to be given | |
| | | Photic and non-photic zeigebers, concept of synchronisation and masking<br>Biological oscillation | | 01 | | |
| | | Adaptive significance of biological clock | | 01 | | |
| | | Circa annual rhythm: case study Bird migration | | 01 | | |
| | | Human Biological clock; Sleep wake cycle and its hormonal regulation; Concept of biological cycle disorders in human | | 01 | | |
| | Unit 7: Communication | Adaptive value of communication | Alcock: Animal behavior<br>Dujatkin: Principles of | 01 | PPT, PDF, Class materials<br>Study materials and reference notes to be given | |
| | | Cost benefits of signal producer | | 01 | | |

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| | | **Chemical communication** | **animal behavior, R. Mathur: Animal behavior etc.** | **01** | | |
| | | **Pheromones in Big cat** | | **02** | | |
| | | **Tactile communication: Bee dance language** | | **01** | | |
| **DSE(B) -6-1-P**<br>**ANIMAL BEHAVIOR**<br>**Lab** | **LAB PRACTICALS** | **1. Demonstration of nests and nesting behaviour of the bird through photographs.** | **Sinha, Chatterjee and Chattopaadhyaay: Advanced practical Zoology etc.** | **05** | **Hands on experiment and study materials**<br>**Study materials and reference notes to be given** | |
| | | **2. Study of geotaxis behaviour in earthworm and phototaxis behaviour in insect larvae.** | **Sinha, Chatterjee and Chattopaadhyaay: Advanced practical Zoology etc** | **05** | **Hands on experiment and study materials**<br>**Study materials and reference notes to be given** | |

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| | | 3. Identification of common behaviour. | Sinha, Chatterjee and Chattopaadhyaay: Advanced practical Zoology etc. | | Hands on experiment and study materials | |
| | | 4. To study circadian functions in humans | | | Hands on experiment and study materials | |
| | | | | | Study materials | |

## LESSON PLAN,

## PART-III: 4 YEAR SEMESTER-VI (CCF)

## DEPARTMENT: ZOOLOGY

## NAME OF FACULTY: DR.SUCHARITA SAHA, DR. DEBJANI DAS GHOSH, & SUCHONA CHAKRABORTY

**Subject: ZOOLOGY MINOR,(MZOO): SUBJECT CODE: MN3**

**Paper: MN3, CELL AND TISSUE STRUCTURE THEORY AND PRACTICAL**

| COURSE | UNIT/ GROUP/MOD | TOPIC | REFERENCE BOOKS | NO.OF LEC | CONTENT DELIVERY TECHNIQUE | REMARKS |
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| | **ULE/ARTICLE** | | | **TURES PLANNED** | | |
| MN3: MZOO: Cells and Tissue structure-Theory | **Unit 1.** | Stain, Dye and Histochemistry<br>Difference between Stain and Dye.<br>Components and Classification of Dye.<br>Principle and Chemistry of PAS and Feulgen reaction | Conn's Biological stains; RW SABNIS: Handbook of biological stains and Dyes | 08 | PPT, chalk and talk and study materials | DR. DEBJANI DAS GHOSH |
| | **Unit 2** | **Epithelial Tissue**<br>Salient features, Classification with location and diagrams (based on structure and functions); Glandular epithelium in details. Cell-polarity, Apical domain and modifications; Lateral domain.<br>Clinical correlation; Epithelial metaplasia | 1.A text book of Histology by<br>Bloom &Faecwt<br>2.Atextbook of histology by<br>JP Gunasegaran<br>3.Principle of physiology by Debasis Pramanik<br>4. Medical Physiology by Guyton | **08** | 1.Class lecture<br>2.PDF<br>3.Reference Notes<br>4..Library works | SUCHONA CHAKRABORTY |
| | **Unit 3** | **Connective tissue:** salient features with respect to cell types and fibres: Classification;<br>Structure and functions with diagram of adepose tissues--brown fat and white fat<br>Aereolar tissue (diagram, location, componenets and their functions) ;<br>Bone tissue;( cell types, extracellular | .1.A text book of Histology by<br>Bloom &Faecwt<br>2.Medical Physiology by Guyton | **14** | Class lecture<br>Study materials | DR.SUCHARITA SAHA |

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| | | matrix and ossification with diagram); cartilage tissue (structure, types with location and diagram); Blood tissue (composition with function)<br>Brief idea on epithelial membrane: cutaneous membrane, mucous membrane<br>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<br>Clinical correlation: Duchene muscular dystrophy | 1.A text book of Histology by Bloom &Faecwt<br><br>2.Atextbook of histology by JP Gunasegaran<br><br>3.Principle of physiology by Debasis Pramanik<br><br>4. Medical Physiology by Guyton | **05** | **1.Class lecture**<br><br>**2.PDF**<br><br>**3.Reference Notes**<br><br>**4.Library** | SUCHONA CHAKRABORTY |
| | **Unit 5** | **Nervous tissue**: salient features; structure of neurons and types based on origin, myelin sheath and processes; Neuroglia and functions<br>Clinical correlation; multiple sclerosis | | **05** | Class lecture<br><br>2.PDF<br><br>3.Reference Notes | **DR.SUCHARITA SAHA** |
| | Unit 6 | **Steps of tissue repair:**<br>5. Inflammation,<br>6. Organization,<br>7. Regeneration and<br>8. or Fibrosis | Fundamentals of Inflammation" edited by Peter A. Ward, Charles N. Serhan, and Derek W. Gilroy. | **02** | PPT, chalk and talk and study materials | DR. DEBJANI DAS GHOSH |

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| | | **Factors affecting it:**<br>1. Type of tissue ,<br>2. Type of injury,<br>3. Adequacy of blood supply,<br>4. State of Health and<br>5. Age | | | | |
| **PRACTICAL**<br>MN3: MZOO: Cells and Tissue structure-Cells and Tissue structure | **1a.** | **Preparation, staining and mounting**<br>Epithelial tissue from vaginal smear of rat using methylene blue | **04** | Practical Zoology by Das Poddar | Hands on training, microscopic observation | **Suchona Chakraborty** |
| | **1b.** | Connective tissue from blood film of rat using Giemsa | **04** | .Practical Zoology by Ghosh Manna<br>2. Practical Zoology by Das Poddar | Hands on trianing, microscopic observation | **Suchona Chakraborty** |
| | **1c.** | Muscle tissue from thigh muscle of cockroach using methylene blue | **04** | | Hands on trianing, microscopic observation | **Dr. Sucharita Saha** |
| | **2.** | Identification with reasons the following mammalian histological sections: Lung, Liver, Stomach, Kidney | **Ghosh-Manna: Practical book** | **05** | **Microscopic identification and photographs would be provided** | DR. DEBJANI DAS GHOSH |
| | **3.** | Tissue preparation, block making and sectioning of any organ of rat/mice. | **Hands on training** | **05** | Hands on training on microtomy | DR. DEBJANI DAS GHOSH |

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**LESSON PLAN,**

# PART III: 4YEAR SEMESTER-VI (CCF)

## DEPARTMENT OF ZOOLOGY

## NAME OF FACULTY: SUCHONA CHAKRABORTY

**Subject: ZOOLOGY MINOR (MZOO), SUBJECT CODE: MN4**

**Paper: MN 4 (Non-chordate structure and function) THEORY AND PRACTICAL**

| Unit/ Group/ Article/ Module | Topic | No. Of Lectures | Reference books | AFTER IMPLEMENTATION | |
|---|---|---|---|---|---|
| | | | | Content delivery technique | Remarks/ Comments |
| **Theory Unit – 1** | **Kingdom Protista** Protozoa – Characters & classification | 1 | 1.Invertebrate zoology by Rupert Barnes 2. Invertebrates by kotpal 3. Invertebrates by Brusca & Brusca | 1.Class lecture 2.PDF 3.Reference Notes | **Suchona Chakraborty** |
| | Locomotion of Euglena, Paramoecium, , Amoeba | 2 | | | |
| | Conjugation | 1 | | | |
| **Unit-2** | Kingdom Animalia | 4 | | | |
| **Unit-3** | Phylum-Porifera | 4 | | | **Suchona Chakraborty** |
| **Unit-4** | Phylum-Cnidaria | | 1.Invertebrates : Kotpal 2.Invertebrates V.K. Agarwal 3.General Zoology: Ganguly.Adhikari . Sinha | 1.Class lecture 2.PDF | |
| **Unit – 5** | Phylum Helminths Characters & classification | 1 | | | |
| | Fasciola – digestive, excretory, reproductive | 2 | | | |

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| | Ascaris - " " " | 1 | .4.General Zoology : Chaki& Kundu<br>5. Invertebrates<br>Brusca & Brusca | 3.Reference Notes<br><br>4.Library work from referred books by students<br>5.Preparation of answers by students from suggestion questions<br>6.Class test at regular interval | |
| **Unit - 6** | Phylum Annelida<br>Characters & classification | 1 | | | |
| | Excretion | 2 | | | |
| | Metamerism | 1 | | | |
| **Unit – 7** | Phylum Onychophora | 2 | | | |
| **Unit-8** | Phylum-Arthropoda | 6 | | | |
| **Unit-9** | Phylum-Mollusca | 5 | | | |
| **Unit-10** | Phylum-Echinodermata | 5 | | | |
| **Unit-11** | Phylum-Hemichordata | 3 | | | |
| **Practical** | 8. Identification with reasons and systematic position of Entamoeba, trypanosoma, sycon, Obelia, Aurelia, Metridium, Madrepora, Fasciola, Taenia, ascaris, nereis, Chaetpoterus, Hirudinaria, peripatus, Limulus, Buthus, Macrobrachium, Balanus, Eupagurus, Julus, Scolopendra, Patella, Chiton, Pila, Sepia, Octopus, Asterius, Ophura, Echinus, Cucumaria, Antedon and Balanoglossus<br>9. Anatomical study: **Earthworm**: Mounting of nerve ring, **Periplaneta sp**: Nervous system, Male and Female Reproductive systems<br>10. Whole mount of Paramoecium/ Euglena/Amoeba | 2 | 1)Practical Zoology by Chatterjee & Chakraborty<br>2)Practical Zoology by Ghosh Manna<br>3)Laboratory Manual by Poddar | Specimen, Microscope, Stains, Apparatus | Suchona Chakraborty |

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**LESSON PLAN,**

# PART-III: 3 YEAR SEMESTER-VI (CCF)

**DEPARTMENT: ZOOLOGY**

**NAME OF FACULTY: DR.SUCHARITA SAHA & DR.DEBJANI DAS GHOSH**

**SUBJECT: ZOOLOGY MZOO-MDC ; PAPER CODE: CC7**

**Paper: CC7 ( BIODIVERSITY AND CONSERVATION BIOLOGY) THEORY AND PRACTICAL**

| 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<br>**Biodiversity indices:** Shannon diversity index, Simpson's diversity index<br>**Genetic diversity:** Significance of biodiversity persistence, consequences of loss of genetic diversity<br>Ecosystem diversity: Basic concept of structural and functional diversity with significance. | **10** | Sharma,P.D. (2001). Ecology and Environment.Rastogi Publications<br><br>https://www.worldwildlife.org/page<br><br>Perspectives in Ecology<br>Including Practical<br>By Manideep Raj (2018), Kalyani Publishers | Chalk and talk<br>PDF share<br>Link share | **Dr. Sucharita Saha** |

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| | Megadiversity countries: Concept of endemism and biodiversity Hot-spots; indicator species, Flagship species, Keystone species,Umbrella species (definition with examples) | | | | |
| **Unit-2** | **Threats to Biodiversity:**<br>Habitat loss, Habitat degradation, habitat fragmentation and edge effects in Ecotonal communities; Overexploitation of natural resources.<br>Concept of exotic or invasive species.<br>Climate change: Cause and effects on marine Ecosystems.<br>Climate change effect on Indian fauna | **07** | | Chalk and talk<br>PDF share<br>Link share | **Dr. Sucharita Saha** |
| **Unit-3** | **Wild life conservation: In-situ conservation**<br>Definition of conservation; Red data book (Extinct, threatened, endangered, rare and vulnerable).<br>Indian Wildlife Protection Act, 1972 and Schedules-I to V (mammalian examples any two). Concept of Population Viability Analysis<br>Wildlife conservation methods: In-situ conservation; Concept and Design of protected areas, National | **15** | | Chalk and talk<br>PDF share<br>Link share | **DR.DEBJANI DASGHOSH** |

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| | Park, Wildlife sanctuary, Biosphere reserves (with examples)<br>Tiger Project; Elephant Project (History, objective, implementation, Tiger crisis0; Concept of corridors; Advantages and disadvantages of wild life corridors;<br>Causes and consequences of Human-Wildlife conflicts; Migration of conflict--an overview; Joint forest management; People's Biodiversity Register | | | | |
| **Unit-4** | **Ex-situ conservation**<br>Captive breeding of wild animals: Concept of captive breeding, its advantages and challenges; Re-introduction | **7** | | Chalk and talk<br>PDF share<br>Link share | **DR.DEBJANI DASGHOSH** |
| **Unit-5** | **Wildlife laws:**<br>Convention on biodiversity; Biodiversity Act, 2002 and Rules 2004 (Basic concept); Wildlife trade and impacts: The Conventionon International Trade in Endangered Species of Wild Fauna and Flora (CITIES) and Wildlife Trade Monitoring Network (TRAFFIC); IUCN, WWF (Basic concept) | **7** | | Chalk and talk<br>PDF share<br>Link share | **DR.DEBJANI DASGHOSH** |
| **Practical** | 1.Determination of population density in a natural/hypothetical community by quadrat method and calculation of Shannon-Wever diversity index for the same community<br>2. Demonstration of basic equipments needed in wildlife studies; use, care and maintenance: Compass, binoculars, Spotting scope, Range finder, Global | **2**<br>**2** | Perspectives in Ecology Including Practical<br>By Manideep Raj (2018), Kalyani Publishers | 20 | **Dr. Sucharita Saha**<br>**Dr. Sucharita Saha** |

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| | Positioning System(GPS), various DSLR camera (Photographs may be used)<br>3. Familiarisation and study of animal secondary evidences (through phtographs); Identification of animals through pug marks of tigerand leopard, hoof marks of deer and elephant, scats of tiger and dung of elephant, antler and horn<br>4. Biodiversity study of any one of the ecosystems of West Bengal (Study A is mandatory and any two studies from the rest)<br>Checklist of fauna should be prepared along with calculation of any diversity index<br>Bird count using line transect<br>Tree height measurement<br>Measurement of canopy cover<br>Butterfly sampling<br>Pitfall sampling<br>Quadrat sampling | **3**<br><br>**13** | Educational excursion | | **Dr. Sucharita Saha**<br><br>**Dr. Sucharita Saha/ Dr. Debjani Das Ghosh/ Dr. Sumallya Karmakar/Suchona Chakraborty** |

## LESSON PLAN,

## PART-III: 3 YEAR SEMESTER-VI (CCF)

## DEPARTMENT: ZOOLOGY

## NAME: DR.SUMALLYA KARMAKAR & SUCHONA CHAKRABORTY

**Subject: ZOOLOGY, MZOO-MDC; SUBJECT CODE: MZOO-MDC**

**Paper: CC8, (TAXONOMY , EVOLUTION & ADAPTATION) THEORY AND PRACTICAL**

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| Unit/Group/ Article/ Module | Topic | No. Of Lectures | Reference books | AFTER IMPLEMENTATION | |
|---|---|---|---|---|---|
| | | | | Content delivery technique | Remarks/ Comments |
| THEORY<br>Unit 1 | Taxonomy & Systematics<br>Nomenclature<br>Homonymy & Synonymy<br>Type Concept<br>Linnean Hierarchy | 5 | 1.Organic Evolution By Rastogi<br><br>2. Evolution by Strickberger<br><br>3. Theory and Practical of Animal Taxonomy by V.C. Kapoor<br><br>4.Taxonomy ( Principles & Problems ) by Sanjib Ghosal | 1..Class lecture<br><br>2.PDF<br><br>3.Reference Notes | SUCHONA CHAKRABORTY |
| Unit 2 | Characters & Character states<br>Types with examples | 3 | | | |
| Unit 3 | Classification<br>Phenetic<br>Cladistics<br>Parsimony | 8 | | | |
| | Taxonomy & Systematics<br>Nomenclature<br>Homonymy & Synonymy<br>Type Concept<br>Linnean Hierarchy | 5 | | | |
| | Characters & Character states<br>Types with examples | 3 | | | SUCHONA CHAKRABORTY |
| | Classification<br>Phenetic<br>Cladistics<br>Parsimony | 8 | | | |
| | Taxonomy & Systematics<br>Nomenclature<br>Homonymy & Synonymy | 5 | | | |

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| | Type Concept<br>Linnean Hierarchy | | | | |
| | Characters & Character states<br>Types with examples | 3 | | | |
| | Classification<br>Phenetic<br>Cladistics<br>Parsimony | 8 | | | |
| | Taxonomy & Systematics<br>Nomenclature<br>Homonymy & Synonymy<br>Type Concept<br>Linnean Hierarchy | 5 | | | |
| Unit 4 | **<u>Evolution1: Gene frequency in a Population and Factors influencing gene frequency.</u>**<br><br>Hardy-Weinberg Principle: Assumption, proof of equilibrium, calculation of gene frequency and genotype frequency (for autosomal gene only), testing for equilibrium;<br>Equilibrium destabilizing forces: concept and mathematical expression of Selection (against deleterious recessive allele only); Mutation (changes from dominant to recessive allele only) and Migration. | 8 | Futuyma,D.J. (2024) Evolution (5TH Edn.) Oxford University Press. | 1. ICT<br>2. Chalk & Talk | Dr. Sumallya Karmakar |

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| Unit 5 | Concept of evolution<br>Origin of Life<br>Darwinism & Nep Darwinism<br>Variation & Natural Selection<br>Genetic Drift &Population Bottle neck<br>Isolation<br>Speciation | 7 | 1.Organic Evolution By Rastogi<br><br>2. Evolution by Strickberger<br><br>3. Theory and Practical of Animal Taxonomy by V.C. Kapoor<br><br>4.Taxonomy ( Principles & Problems ) by Sanjib Ghosal | 1.Library work from referred books by students<br><br>2.Preparation of answers by students from suggestion questions<br><br>3.Class test at regular interval | SUCHONA CHAKRABORTY |
| Unit 6 | Biogeographical realms<br>Geological timescale<br>Fossils<br>Evolution of horse<br>Evolution of Man | 7 | | | |
| Unit 7 | Adaptation<br>Divergence | 4 | | | |
| Unit 8 | Adaptation<br>Types<br>Colouration & Mimicry | 5 | | | |
| **Practical** | 1.Study of Fossils<br>2.Study of features & their adaptive significance<br>3.Phylogenetic tree construction | 15 | | | SUCHONA CHAKRABORTY |
| | Calculation of change in gene frequency in population due to Selection (against deleterious recessive trait only), Mutation (changes from dominant to recessive trait only), Migration. | 05 | Som,D.K.,Bhowal,S.K.,Ghosh,N. and Mukherjee,A.(2024) A concise Text Book on Practical Zoology. (1stEdn). Rainbow Publishers, Kolkata, India | 1. ICT<br>2. Chalk & Talk | Dr. Sumallya Karmakar |
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**LESSON PLAN,**

# PART-III: 4 YEAR & 3 YEAR SEMESTER -VI (CCF)

**DEPARTMENT NAME: ZOOLOGY**

**NAME OF FACULTY: DR. SUCHARITA SAHA**

**Subject: MZOO-MDC-MINOR; SUBJECT CODE: CC5**

**Paper: CC-5 (Ecology). THEORY AND PRACTICAL**

| Planned | | | | After Implementation | |
|---|---|---|---|---|---|
| **Unit / Group / Module / Article** | **Topics** | **No of Lecture Planned** | **Reference Books** | **Content Delivery Technique** | **Remarks / Comments** |
| **Unit 1** | **Introduction to Ecology**; Autecology/Synecology, laws of limiting factors. Temperature as a limiting factor (Effect on plant and animal metabolism, Bergman's rule, Jordon's rule, Allen's rule, Rensch's rule). Light as limiting factor | 5 | 9. Roy, M. (2018). Perspectives in Ecology,Kalyani Printings, ISBN: 978-93-272-9087-5<br><br>10. Sharma, P.D. (2001).Ecology and Environment, Rastogi Publications | Chalk and talk<br><br>Link share<br><br>Reference notes | Dr. Sucharita Saha |

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| | (photoperiodism in plants and animals) | | 11. Kormondy, E.J. (2002). concepts of Ecology. 4th indian reprint, Pearson Education<br><br>12. Ricklefs R.E., Miller, G.L.(2000). 4th ed, W.H. Freeman and Company | | |
| **Unit-2** | **Energy flow in Ecosystem:** Functional components of ecosystem: Energy flow (Universal model and Y -shaped model, ten percent law of energy flow); Productivity (Primary and secondary) and ecological efficiencies.Types of ecological pyramids with examples; Food chains (Detritus food chain and grazing food chain); Food web and types; Biogeochemical cycles (Nitrogen cycle). | 8 | | | |
| **Unit-3** | **Population Ecology**: Definition and properties (Natality, Mortality,Density, Biotic potential, Age structure, Survivorship curves, Growth curves with equations); Population regulation(density-dependant and independent); r and K strategies | 7 | | | |
| **Unit-4** | **Niche and Competition:** Definition of habitat and niche, Types of niche, N-dimentional niche concept, Niche overlap and resource partitioning. Competition and exclusion principle, Gause's | 8 | | | |

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| | and Connel's field experiment, niche segregation and character displacement, Lotka-volterra equation for competition, habitat ecology-Metabolism and ecosystem services of tropical rain forest and wetlands | | | | |
| **Unit-5** | **Community Ecology;** Community-Definition and types, stratification, species richness and evenness; dominance-Diversity analysis, interspecific interaction within equilibrial communities (definition and examples) | 4 | | | |
| **Unit-6** | **Ecological succession;** definition and types of succession, seral stages with special reference to hydrosere and lithosere, Models of ecological succession, resource-ratio hypothesis | 4 | | | |
| **Unit-7** | **Pollution Biology:** definition, types of pollutants (primary and secondary with examples), causes and effects of acid-rain, photochemical smog, ozone layer depletion and eutrophication, cause and effects of heavy-metal pollution in water ( Pb, As, | 8 | | | |

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| | Hg0; groundwater pollution, concept of bioconcentration and biomagnification | | | | |
| **Practical: Ecology Lab CC-8-P** | **6. Quantitative estimation** of dissolved oxygen, free carbondioxide, alkalinity from the provided water sample and comment on the observation. | 8 | 3. Roy, M. (2018). Perspectives in Ecology (with practical),Kalyani Printings, ISBN: 978-93-272-9087-5<br><br>4. Sharma, P.D. (2001).Ecology and Environment, Rastogi publications | 5. Hydrological analysis with chemicals<br>6. Handling of instrument (pH meter)<br>7. Display of specimen in slides and vials<br>8. Practice of problem solving | Dr. Sucharita Saha |
| | **7. Estimation of pH value** of provided water sample | 2 | | | |
| | **8. Identification with reasons** of the following zooplanktons; *Daphnia, Cyclops, Cypris* | 2 | | | |
| | **9. Identification with reasons** of the followingsoil arthropods: Collembola, termite worker, ant | 2 | | | |
| | **10. Study of life tables and survivorship curve** from a hypothetical data set and comment on the results. | 6 | | | |

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**LESSON PLAN,**

# PART-III: 4 YEAR & 3 YEAR SEMESTER -VI (CCF)

**DEPARTMENT NAME: ZOOLOGY**

**NAME OF FACULTY: DR. SUMALYYA KARMAKAR**

**Subject: MZOO-MDC-MINOR; SUBJECT CODE: CC6**

**Paper: CC-6. ( CHORDATE STRUCTURE AND FUNCTION). THEORY AND PRACTICAL**

| **Planned** | | | | **After Implementation** | |
|---|---|---|---|---|---|
| **Unit / Group / Module / Article** | **Topics** | **No of Lecture Planned** | **Reference Books** | **Content Delivery Technique** | **Remarks / Comments** |
| Unit 1 | **Introduction to Phylum Chordata:**<br><br>Theories of Origin of chordates with reference to Dipleurula concept and the Echinoderm theory;<br>General characteristics and outline classification (J.Z. Young, 1981). | 4 | Young J.Z. 1981. The Life of Vertebrates. III Edition. OxfordUniversitypress | 1. ICT<br>2. Chalk & Talk | Dr. Sumallya Karmakar |

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| Unit 2 | **Protochordata, Agnatha and Pisces:**<br><br>Protochordata and Agnatha: General characters and classification up to class (J.Z. Young,1981);<br>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); Swimbladder in fishes; Structure of gills in cartilaginous and bony fishes; Accessory<br>respiratory organs; Olfactory apparatus in Tilapia; Electric organ inTorpedo. | 8 | Young J.Z. 1981. The Life of Vertebrates. III Edition. OxfordUniversitypress | 1. ICT<br>2. Chalk & Talk | Dr. Sumallya Karmakar |
| | **Amphibia and Reptilia:**<br><br>Origin of Tetrapods (Evolution of terrestrial ectotherms); General characteristics and classification of Amphibia and Reptilia up to living Orders (J.Z. Young,1981);<br>Structure, function and derivatives of integument in amphibia; Paedomorphosis in Axolotl; Poisonous and Non-Poisonous snake; Poison<br>apparatus and Biting mechanism in Snake. | 7 | Young J.Z. 1981. The Life of Vertebrates. III Edition. OxfordUniversitypress | 1. ICT<br>2. Chalk & Talk | Dr. Sumallya Karmakar |

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| | **Aves and Mammalia:**<br><br>General characteristics and classification of Aves and Mammalia upto living Sub-Classes (J.Z.Young,1981); Exoskeleton in Birds; Air-sacs in Pigeon, Aerodynamics of flight in birds; Exoskeleton derivatives of mammals; Dentition inmammals; Ruminant stomach; Echolocation in Micro- chiropterans. | 8 | Young J.Z. 1981. The Life of Vertebrates. III Edition. OxfordUniversitypress | 1. ICT<br>2. Chalk & Talk | Dr. Sumallya Karmakar |
| | **Comparative anatomy in chordates:**<br><br>Heart and Aortic arches; Brain with reference to cerebrum & cerebellum; kidneys and urino-genital ducts. | 10 | Kardong KV. 2005. Comparative Anatomy of Vertebrates, Function and Evolution; McGraw-Hill | 1. ICT<br>2. Chalk & Talk | Dr. Sumallya Karmakar |
| | **Skeletal system:**<br><br>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 | Kardong KV. 2005. Comparative Anatomy of Vertebrates, Function and Evolution; McGraw-Hill<br><br>Young J.Z. 1981. The Life of Vertebrates. III Edition. OxfordUniversitypress | 1. ICT<br>2. Chalk & Talk | Dr. Sumallya Karmakar |
| **Practical** | 1. Identification (upto order) with Reasons (Preserve specimen or Photograph) Protochordata: Herdmania, | 2 | | 1. ICT<br>2. Chalk & Talk | Dr. Sumallya Karmakar |

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| | Branchiostoma, Agnatha: Petromyzon, Myxine; Pisces: Scoliodon, Pristis, Hippocampus, Echeneis, Tetradon, Taractes; Tenualosa, Wallagu, Ompok; Amphibia: Necturus, Duttaphrynus, Rhacophorus, Hoplobatrachus, Ambystoma,Tylototriton, ; Reptilia: Chelone, Hemidactylus, Varanus, Calotes, Chamaeleon, Draco, Vipera, Hydrophis, Bungarus; Aves: Columba, Psittacula, Passer, AlcedoMammalia: Sorex, Bat (Insectivorous and Frugivorous), Funambulus, Cavia. | | Som,D.K.,Bhowal,S.K.,Ghosh,N. and Mukherjee,A.(2024) A concise Text Book on Practical Zoology. (1stEdn). Rainbow Publishers, Kolkata, India | 1. ICT<br>2. Chalk & Talk<br>3. Hands on Training | Dr. Sumallya Karmakar |
| | 2. MountingofPlacoid,CycloidandCtenoidscales. | 2 | | | |
| | 3. Osteology:IdentificationofLimbbones,vertebraeandgirdlesofDuttaphrynus,Columba,Cavia;skullof Duttaphrynus,Trionyx,Columba,Cavia,Canis. | 2 | | | |
| | 4. Comparativestudyofheartandbrain,withthehelpofmodel/pictures. | 2 | | | |
| | 5. Anatomystudy:Brain,pituitary,olfactoryapparatus(exsitu),digestiveanduri no-genitalsystemofTilapia | 3 | | | |

## SUMMER INTERNSHIP

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