

Syllabus distribution for 1st Sem Major (B.Sc (HONOURS) MAJOR IN ZOOLOGY)

Name of Teachers:	MJ 1 T: Systematics and Diversity of Life-Protists to Chordates(Theory)	Course contents	Topic
Rajkumar Mandi (RM)		Unit 4. Diversity in acoelomate Metazoa	General characteristics and classification up to classes: Porifera, Cnidaria, Ctenophora, & Platyhelminthes (Rupert & Barnes, 1994) Special features & structural diversity in sponges with special reference to cell types; Special features of cnidarians with reference to polymorphism and division of labour; Coral reefs with diversity, formation, function & conservation. Affinity of Ctenophora Basic organizations with reference to parasitic adaptation & adaptive radiation in flatworm.
RM	MJ 1 P: Systematics and Diversity of Life-Protists to Chordates(Practical)		1. Basic requirements for laboratory work: Knowledge about the parts of microscope with their function & setting of microscopes; Knowledge of calibration, magnification & drawing with the help of camera lucida, ocular & stage micrometer with determination of magnification 2. Basic idea of fixatives, preservatives & stains with preparation method for study of museum specimen, significance of study of museum specimen 5. Observation & records of different animals from college campus or nearby any terrestrial field (forest, grassland, hill or mountain area etc.) or water body (pond, river, lake, sea etc.) or zoological park or museum Method of collection of any five species at least from three different phyla/classes (preferably from arthropoda, mollusca, fish, reptile, bird and mammals 9. Preparation of key for identification of venomous and non-venomous snakes; Preparation of key on any group (preferably insects, fishes & birds of different feeding habit (planktonivorous, detritivorous, frugivorous, carnivorous, omnivorous, insectivorous, piscivorous, graminivorous etc.) 10. Project work/Group Discussion/Seminar on any topic

			mentioned above.
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Name of Teachers:	SKILL ENHANCEMENT COURSES (SEC 1)	Course contents	Topic
RM		Apiculture	1. Identification of different species of honeybees. Identification of different working groups of honey bees. Study the morphology and sexual dimorphism of honey bees. 2. Studies on pollen basket, mouth parts, sting apparatus, wax gland of worker honey bees. 3. Studies on the special structure of bee hives and beekeeping equipments. 4. Studies on various diseases of adult Honeybees. 5. Studies on the physical and chemical nature of Honey. 6. Preparation of Honey based products. 7. Visit to an apiculture farm and preparation a project report on apiculture..

Syllabus distribution for 1st Sem Minor B.Sc. Life Sciences with ZOOLOGY (MULTIDISCIPLINARY STUDIES)

Name of Teachers:	MJA1/B1T: Diversity of Animal world(Theory)	Course contents	Topic
RM		Unit 3. Protists	General characteristics and classification of subkingdom Protozoa upto phyla (Levine et.al, 1981) Type study: Plasmodium
RM	MJA1/B1P: Practical		1. Basic requirements for laboratory work: Knowledge about the parts of microscope with their function & setting of microscope 2. Idea of fixatives & preservatives for preparation to study the museum specimen 3. Preparation of key for identification of venomous and non-venomous snakes; Preparation of key on any group (preferably insects, fishes & birds) of different feeding habit – all in form of animal album with photographs & necessary information

Kharagpur College
Department of Zoology
UG Lesson Plan of
Dr. Moumita Chakraborty
Odd Semester: Session- 2023-2024

Semester	Syllabus	Lesson plan
1st Semester(Major): Paper- MJ-1 ()	<ul style="list-style-type: none"> • Basic organization and diversity in Mollusca with reference to torsion in Mollusca with respect to disruption of bilateral symmetry and its significance. • General characteristics and affinity and evolutionary significance of Onychophora. • Characteristic features of phylum Hemichordata and Chordata; concept of Protochordates and vertebrates; Evolutionary status and affinities of Hemichordates and Cyclostomata. • Emergence of Land Vertebrates; amphibian diversity and adaptability to dual mode of life; classification of Amphibia up to 	<ul style="list-style-type: none"> • Introduction to mollusca general characters, different types of organs found and its diversity. What is torsion? Different ideas about torsion. Significance of torsion. Torsion and symmetry. • Introduction to general characteristics and affinity of Onychophora, its evolutionary significance. • Introduction to Hemichordates and Protochordates. Hemichordates and cyclostomata ,evolutionary significance, affinities. • What is land vertebrates? How does it emerge? Different types of amphibia and its diversities. How does amphibia posses duel mode of live? Classification study by

	<p>order(Duellman and Trueb,1986)</p> <ul style="list-style-type: none"> • Special features of Monotremes and Marsupials with evolutionary significance; features of living Primates- Prosimi and Anthropoidea. 	<p>showing museum specimens.</p> <ul style="list-style-type: none"> • Who are monotremes? Classification of mammals as outline idea. Special features study of monotreme and marsupial by the help of photograph. Their evolutionary significance. Special feature study of living primates with different examples.
3rd semester(H): Paper- CC5 (Chordates)	Unit-1; Introduction to chordates	General characters and classification with examples.
	Unit2; Protochordata	Introduction, definitions of respiratory volume and capacities, vital capacity, measurement of VC, Carries of Oxygen and Carbon-di-oxide, Hamberg's Phenomenone, Halden effect
	Unit-3 Origin of Chordata	Diplural concept and echinoderm theory of origin of Chordates. Advance features of Vertebrates over Protochordates.
	Unit-4 Agnatha	General characteristics and classification of cyclostome up to order.
	Unit-6 Amphibia	General characteristics and classification up to order. Metamorphosis and Parental care in Amphibia.
	Unit- 9 Mammals	General characteristics and classification up to order. Affinities of Prototheria.
Paper- CC6 (Animal Physiology:)	Unit-6: Endocrine System	Classification of hormones. Mechanism of hormone action. Signal transduction

		<p>pathway for steroidal and non-steroidal hormones.</p> <p>Hypothalamus- principal nuclei in neuroendocrine control in anterior pituitary and endocrine system.</p> <p>Placental hormones.</p>
5 th Semester (H) CC-11	Unit-3 Mutation.	Types of gene mutation, types of chromosomal aberration, non-disjunction, variation in chromosome number, molecular basis of mutation in relation to Uv light.
	Unit-4 Sex determination	Mechanism of sex determination in <i>Drosophila</i> and mammals. Doses compensation in <i>Drosophila</i> and Human.
DSE-! Animal Behaviour and Chronobiology	Unit-4 Introduction to Chronobiology	Historical development in chronobiology,, Biology of Oscillation, the concept of average amplitude, phase and period. Adaptive significance of biological clocks.
	Unit-5 Biological Rhythm	Types, characteristics, short term. long term. Circadian rhythm. Tidal rhythm. Lunar rhythm. Concept of Synchronization, Photo period, regulation of periodic reproduction in vertebrates. Role of Metatonin.
3 rd Semester DSC-3	Unit 1-4	Introduction to genetics, Mendelian genetics, linkage, crossing over, mutation.
	PRACTICAL	
MJ-1	Microscpre Identification of animals in different phylum.	Microscope handling, types, different parts, magnification etc.

		Identification of Animals with characters (Mollusca, protochordates, amphibia, mammals)
CC-5	Protochordates Agnatha	<i>Balanoglossus, Hardmania, Branchiostoma</i> <i>Petromyzon, Myxine</i>
	Amphibia	<i>Ichthyophis, Tylotriton, Necturus, Cryptobranchus, Hyla, Rhacophorus etc</i>
	Mammals	<i>Mega and micro chiroptera etc</i>
CC-11	Mutation	Translocation mutation through photograph
DSE-1	1, Study of nesting behaviour. 2. Behavioural response of wood lice-----condition. 3. Geotaxis behaviour of earthworm. 4. Phototaxis behaviour of insect larva.	1. Different types of nests formed by bird and social insect through downloaded image and forest visit. 2. Through oral mode demonstration and downloaded photograph. 3. Soil earthworm study. 4. Through demonstration.

Teaching plan: 2023-2024 (Odd Semester)

SIBANI CHOWDHURI

Department of Zoology

Semester-I		
Syllabus Allotted	Concept of evolution of body cavity, Taxonomy, Annelida, Adaptive radiation	
MJ1 T	Lecture No.	Topics to be covered
	Term-I	
	01	Course outcome and concept of evolution of body cavity – acoelomate, blastocoelomate & eucoelomate.
	02	Definition, relationship & utility of Systematics, Taxonomy.
	03	Concept of Evolution, Classification & Nomenclature.
	04	Phyletic lineages: Kinds & components of classification; Linnaean hierarchy.
	05	Concept of species & clade.
	06	Six kingdom classification; Concept of major & minor phyla.
	07	Zoological Nomenclature – principles & codes
	Term-II	
	08	General characteristics and classification of Annelida.
	09	Adaptive radiations in reptiles
	10	Adaptive radiations in birds.
	11	Adaptive radiations in mammals.
	12	Concept of coelome and evolutionary significance.
	Term-III	
	13	Assignment
	14	Problem discussion
	15	Assignment
	16	Problem discussion
MJ1P	Lab. No.	Topics to be covered
	Term-I	
	01	Identification of Nereis, Aphrodite.
	02	Identification of Tubifex, Earthworm.

	Term-II	
	03	Identification of Chaetopterus, Arenicola, Leech.
	04	Practical revision
	Term-III	
	05	Practical revision
	06	Practical revision
	07	Practical revision
	08	Practical revision
Semester-III		
Syllabus Allotted	C5T: Reptilia, Aves. C6T: Unit-1 Tissue C7T: Unit-1 (structure and role)	
C5T, C6T, C7T	Lecture No.	Topics to be covered
	Term-I	
	01	General characteristics and classification up to Sub-Classes.
	02	Exoskeleton in Birds
	03	Migration in birds
	04	Principles and aerodynamics of flight
	05	General characters and classification up to living orders
	06	Affinities of Prototheria
	07	Exoskeleton derivatives of mammals
	08	Adaptive radiation in mammals with reference to locomotory appendages
	Term-II	
	09	Echolocation in Micro chiropterans
	10	Echolocation in Cetaceans
	11	Structure, location, classification and functions of epithelial tissue
	12	Structure, location, classification and functions of connective tissue
	13	Structure, location, classification and functions of muscular tissue
	Term-III	
	14	Structure, location, classification and functions of nervous tissue
	15	Principle and types of fixation.
	16	Principle and types of stain. Stain Vs. dye.
	17	Structure and Biological importance: Monosaccharides, Disaccharides.
	18	Structure and Biological importance: Polysaccharide. Derivatives of

		Monosachharides.
	19	Assignment
	20	Problem discussion
C 7P	Lab No.	Topics to be covered
	Term-I	
	01	Qualitative tests of functional groups in carbohydrates Known.
	02	Qualitative tests of functional groups in carbohydrates Known
	03	Qualitative tests of functional groups in carbohydrates unknown
	Term-II	
	04	Qualitative tests of functional groups in carbohydrates unknown
	05	Qualitative tests of functional groups in carbohydrates unknown
	Term-III	
	06	Qualitative tests of functional groups in proteins Known.
	07	Qualitative tests of functional groups in proteins Unknown.
	08	Qualitative tests of functional groups in proteins unknown.
	09	Practical revision
	10	Practical revision
Semester-V		
Syllabus Allotted	Unit 1: Mendelian Genetics and its Extension	
C12T	Lecture No.	Topics to be covered
	Term-I	
	01	Course outcome. Principles of inheritance
	02	Incomplete dominance and co-dominance
	03	Epistasis
	04	Lethal alleles, Pleiotropy
	Term-II	
	05	Sex-linked, sex- influenced and sex-limited inheritance
	06	Polygenic Inheritance.
	07	Multiple alleles
	Term-III	
	08	Problems on multiple alleles
	09	Assignment
	10	Problem discussion
C12P	Lab	Topics to be covered

	No.	
	Term-I	
	01	Chi-square analyses-1
	02	Chi-square analyses-2
	Term-II	
	03	Chi-square analyses-3
	Term-III	
	04	Practical revision
	05	Practical revision
DSE1 T	Lecture No.	Topics to be covered Unit 2: Patterns of Behaviour Unit 4: Introduction to Chronobiology
	Term-I	
	01	Stereotyped Behaviours (Orientation, Reflexes)
	02	Individual Behavioural patterns; Instinct vs. Learnt Behaviour
	03	Associative learning, classical and operant conditioning
	Term-II	
	04	FAP, Habituation.
	05	Imprinting.
	06	Historical developments in chronobiology
	07	Biological oscillation: the concept of Average, amplitude, phase and period.
	Term-III	
	06	Adaptive significance of biological clock.
	07	Assignment
	08	Problem discussion
DSE1 P	Lab No.	Topics to be covered
	Term-I	
	01	Study and actogram construction of locomotor activity of suitable animal models.
	02	To study the phototaxis behaviour in insect larvae.
	Term-II	
	03	To study the behavioural responses of wood lice to dry and humid conditions.
	04	Practical revision
	Term-III	
	05	Practical revision

Teaching plan: 2023-2024 (Odd Semester)

ABHIMANYU MUDI

Department of Zoology

Semester-I		
Syllabus Allotted	<p>MJ 1 T: Systematics and Diversity of Life-Protists to Chordates</p> <ul style="list-style-type: none"> ➤ Unit 1. Products of evolutionary process. ➤ Unit 4. Diversity in acoelomate Metazoa: General characteristics and classification up to classes: Porifera, Cnidaria(Rupert & Barnes, 1994). Special features & structural diversity in sponges with special reference to cell types; Special features of cnidarians with reference to polymorphism and division of labour; Coral reefs with diversity, formation, function & conservation. ➤ Unit 8. Diversity in vertebrates: Features of venomous & non venomous snake, distribution & type of snake venom with antidote in India <p>MJ 1 P: Systematics and Diversity of Life-Protists to Chordates (Lab)</p>	
MJ 1T	Lecture No.	Topics to be covered
	Term-I	
	01	Course outcome and develop critical understanding how animals changed from a primitive cell to a collection of simple cells to form a complex body plan. Discuss how morphological change due to change in environment helps drive evolution over a long period of time.
	02	Cellularity from unicellular grade to multicellularity; Origin of metazoans; Body symmetry; Concept of mesozoa, parazoa & eumetazoa. Concept of evolution of germinal layer - diploblastic and triploblastic organizationn; Concept of coelenteron & transition of third germ layer.
	03	Types of coelom; Concept of protostome & deuterostome; Concept of evolution of body cavity – acoelomate, blastocoelomate & eucoelomate;

	04	Concept of anamniote & amniote with structural features of amniote egg. Sequence & strategies of life cycle: Concept of classification of life cycles, adaptations & relationship between ontogeny & phylogeny.
	05	Origin of life on Earth: Arrival of simple form from primordial chemicals.
	06	Phylum porifera: general characteristics and classification up to classes(Rupert & Barnes, 1994)
	07	Special features & structural diversity in sponges with special reference to cell types.
	Term-II	
	08	Phylum cnidaria: general characteristics and classification up to classes(Rupert & Barnes, 1994)
	09	Special features of cnidarians with reference to polymorphism and division of labour.
	10	Coral reefs diversity, formation, function & conservation strategy.
	11	Features of venomous & non venomous snake, distribution
	12	Type of snake venom and antidote in India.
	Term-III	
	13	Assignments.
	14	Problem discussion.
	15	Assignments.
	16	Problem discussion.
MJ 1P	Lab. No.	Topics to be covered
	Term-I	
	01	Study of animals through identification museum specimens in the laboratory with details on their classification upto classes, adaptive features, economic/medical/ecological importance and diagnostic features: Sycon, Neptune's cup
	02	Study of animals through identification museum specimens in the laboratory with details on their classification upto classes, adaptive features, economic/medical/ecological importance and diagnostic features: Obelia, Hydra, Aurelia.
	Term-II	
	03	Study of animals through identification museum specimens

		in the laboratory with details on their classification upto classes, adaptive features, economic/medical/ecological importance and diagnostic features: Physalia, Gorgonia, Madripora (horn coral).
	04	Study of animals through identification museum specimens in the laboratory with details on their classification upto classes, adaptive features, economic/medical/ecological importance and diagnostic features: Sea anemone, Sea pen, Beroe.
	Term-III	
	05	Assessment of relationship by constructing a cladogram using any five animals belonging to a clade.
	06	Preparation of key on insects, fishes & birds.
	07	Practical revision.
	08	Practical revision.
Semester-III		
Syllabus Allotted	C6T: ➤ Unit 3: Nervous System. ➤ Unit 4: Muscular system. C7T: ➤ Unit 4: Nucleic Acids. ➤ Unit 5: Enzymes ➤ Unit 5: Oxidative Phosphorylation	
C6T, C7T	Lecture No.	Topics to be covered
	Term-I	
	01	Course outcome and develop critical understanding about biomolecules.
	02	Explain structure of Purines and pyrimidines, Nucleosides, Nucleotides, Nucleic acids.
	03	Watson –crick model of DNA , Types of DNA and RNA.
	04	Complementarity of DNA, Hpyo- Hyperchromaticity of DNA
	05	Basic concept of nucleotide metabolism
	06	Explain Structure of neuron, resting membrane potential, Origin of action potential.
	07	Types of synapse, Synaptic transmission and Neuromuscular

		junction.
	08	Reflex action and its types.
	Term-II	
	09	Histology of different types of muscle; Ultra structure of skeletal muscle; Characteristics of muscle fibre
	10	Molecular and chemical basis of muscle contraction.
	11	Nomenclature and classification; Cofactors; Specificity of enzyme action; Isozymes
	12	Mechanism of enzyme action; Enzyme kinetics; Derivation of Michaelis-Menten equation, Lineweaver-Burk plot
	13	Factors affecting rate of enzyme-catalyzed reactions; Enzyme inhibition; Allosteric enzymes and their kinetics; Strategy of enzyme action- Catalytic and Regulatory
	Term-III	
	14	Redox systems; Review of mitochondrial respiratory chain, Inhibitors and un-couplers of Electron Transport System
	15	Assignments.
	16	Problem discussion.
C7P	Lab No.	Topics to be covered
	Term-I	
	01	Quantitative estimation of Lowry Methods.
	02	Paper chromatography of amino acids.
	03	Demonstration of proteins separation by SDS-PAGE.
	Term-II	
	04	Practical revision.
	05	Practical revision.
	Term-III	
	06	Practical revision.
	07	Practical revision.
	08	Practical revision.
	09	Practical revision.
Semester-V		
Syllabus Allotted	C11T ➤ Unit 2: DNA Replication. ➤ Unit 3: Transcription.	

	<p>➤ Unit 4: Translation.</p> <p>➤ Unit 6: Gene Regulation</p>	
C11T	Lecture No.	Topics to be covered
	Term-I	
	01	Course outcome and brief idea about central dogma, types of DNA replication.
	02	Semiconservative mode of DNA replication.
	03	Replication process of prokaryotes : bidirectional and discontinuous replication.
	04	RNA priming and function and mode of action of different replisomes.
	05	Process of replication of telomeres and its evolutionary significance.
	Term-II	
	06	Mechanism of Transcription in prokaryotes and eukaryotes
	07	Transcription factors, Difference between prokaryotic and eukaryotic transcription.
	08	Transcription termination in prokaryotes: rho dependent and rho-independent.
	09	Mechanism of protein synthesis in prokaryotes, Ribosome structure and assembly in prokaryotes, fidelity of protein synthesis, aminoacyl tRNA synthetases and charging of tRNA.
	10	Proteins involved in initiation, elongation and termination of polypeptide chain; Genetic code, Degeneracy of the genetic code and Wobble Hypothesis
	11	Inhibitors of protein synthesis; Difference between prokaryotic and eukaryotic translation
	Term-III	
	12	Operon concept: inducible and repressible system.
	13	Positive and negative control of lac operon.
	14	Mutations in lac operon gene. Problems of lac operon.
	15	Trp operon control mechanism.
	16	Regulation of Transcription in eukaryotes: Activators, enhancers, silencer, repressors,
	17	miRNA mediated gene silencing, Genetic imprinting.

	18	Assignments.
	19	Problem discussion.
C11P	Lab No.	Topics to be covered
	Term-I	
	01	Demonstration of polytene and lampbrush chromosome from photograph.
	02	Practical revision.
	Term-II	
	03	Agarose gel electrophoresis for DNA.
	Term-III	
	04	Practical revision.
	05	Practical revision.
C12 T	Lecture No.	Topics to be covered
		C12T: <ul style="list-style-type: none"> ➤ Unit 2: Linkage, Crossing Over and Chromosomal Mapping. ➤ Unit 3: Mutations. ➤ Unit 6: Recombination in Bacteria and Viruses.
	Term-I	
	01	Linkage and Crossing Over, molecular basis of crossing over.
	02	Measuring Recombination frequency and linkage intensity using three factor crosses, Interference and coincidence.
	03	Problems of three point crosses.
	04	Types of gene mutations (Classification)- point mutation.
	Term-II	
	05	Types of chromosomal aberrations with examples; Non-disjunction and variation in chromosome number.
	06	Molecular basis of mutations in relation to UV light and chemical mutagens.
	07	Process of conjugation : concept about F, F', Hfr factors.
	08	Problems on interrupted mating.
	Term-III	
	09	Mechanism of transformation and transduction.
	10	Complementation test in bacteriophage – Benzer's experiment.

	11	Assignments.
	12	Problem discussion.
C12 P	Lab No.	Topics to be covered
	Term-I	
	01	Pedigree analysis of some human inherited traits: autosomal dominant and recessive trait.
	02	Pedigree analysis of some human inherited traits: sex linked (X linked) dominant and recessive trait; Ylinked trait.
	Term-II	
	03	Linkage maps based on conjugation.
	04	Linkage maps based on conjugation.
	Term-III	
	05	Practical revision.
	06	Practical revision.
DSE2T	Lecture No.	Topics to be covered
		➤ Unit 2: Molecular Techniques in Gene manipulation. ➤ Unit 3: Genetically Modified Organisms.
	Term-I	
	01	Course outcome and biotechnology and genomics.
	02	Cloning vectors: Plasmids, Cosmids, Phagemids, Lambda Bacteriophage, M13, BAC, YAC, MAC and Expression vectors (characteristics).
	03	Restriction enzymes: Nomenclature, detailed study of Type II.
	04	Transformation techniques: Calcium chloride method and electroporation. Construction of genomic and cDNA libraries and screening by colony and plaque hybridization
	05	Southern, Northern and Western blotting
	06	DNA sequencing: Sanger method. Application.
	Term-II	
	07	Polymerase Chain Reaction, DNA Finger Printing and DNA micro array.
	08	Production of cloned and transgenic animals: Nuclear Transplantation, Retroviral Method.

	09	DNA microinjection. Applications of transgenic animals.
	Term-III	
	10	Production of pharmaceuticals, production of donor organs, knock out mice.
	11	Assignments.
	12	Problem discussion.
DSE2 P	Lab No.	Topics to be covered
	Term-I	
	01	To study following techniques through photographs: Southern Blotting, Northern Blotting, Western Blotting.
	02	To study following techniques through photographs:, DNA Sequencing (Sanger's Method), PCR, DNA fingerprinting.
	03	Genomic DNA isolation from <i>E. coli</i> .
	04	Construction of circular and linear restriction map from the data provided.
	Term-II	
	05	Practical revision.
	06	Practical revision.
	Term-III	
	07	Practical revision.
	08	Practical revision.