Kharagpur College
Teaching plan for Academic Session 2022-2023 (Even Semester)
Department of Zoology

Name of Teacher:	Class/Semester 2nd SEM Hons.	Name of the Paper : CC-3 :Non-Chordates II Theory	Topics/ Unit Plan	Syllabus Allotted
Prof. Rajkumar Mandi			Unit 1: Introduction	Evolution of coelom and metamerism
			Unit 6: Echinodermata	General characteristics and Classification up to classes Water-vascular system in Asteroidea Larval forms in Echinodermata Affinities with Chordates
Prof. Rajkumar Mandi		C3 P – Non-Chordates II Practical		1. Study of following specimens: a. Annelids - Aphrodite, Nereis, Heteronereis, Sabella, Serpula, Chaetopterus, Pheretima, Hirudinaria b. Arthropods - Limulus, Palamnaeus, Palaemon, Daphnia, Balanus, Sacculina, Cancer, Eupagurus, Scolopendra, Julus, Bombyx, Periplaneta, termites and honey bees Onychophora - Peripatus c. Molluscs - Chiton, Dentalium, Pila, Doris, Helix, Unio, Ostrea, Pinctada, Sepia, Octopus, Nautilus d. Echinodermates - Pentaceros/Asterias, Ophiura, Clypeaster, Echinus, Cucumaria and e. Antedon 2. Study of digestive system, septal nephridia and pharyngeal nephridia of earthworm 3. T.S. through pharynx, gizzard, and typhlosolar intestine of earthworm 4. Mount of mouth parts and dissection of digestive system and nervous system of Periplaneta* 5. To submit a Project Report on any related topic to larval forms (crustacean, mollusc and echinoderm)

Name of Teacher:	Class/Semester 2nd SEM Hons.	Name of the Paper :CC-4 : Cell Biology Theory	Topics/ Unit Plan	Syllabus Allotted

Prof. Rajkumar Mandi			Unit 1: Overview of Cells	Basic structure of Prokaryotic and Eukaryotic cells, Viruses, Viroid, Prion and Mycoplasma
Prof. Rajkumar Mandi		C4P–Cell Biology (Lab) Practical		1. Preparation of temporary stained squash of onion root tip to study various stages of mitosis 2. Study of various stages of meiosis. 3. Preparation of permanent slide to show the presence of Barr body in human female blood cells/cheek cells. 4. Preparation of permanent slide to demonstrate: a. DNA by Feulgen reaction b. Cell viability study by Trypan Blue staining c. Mitochondria identification through vital staining

Name of Teacher:	Class/Semester 4th SEM. Hons.	Name of the Paper : CC-8: Comparative Anatomy of Vertebrates Theory	Topics/ Unit Plane	Syllabus Allotted
Prof. Rajkumar Mandi			Unit 1: Integumentary System	Structure, function and derivatives of integument in amphibian, birds and mammals
			Unit 2: Skeletal System	Overview of axial and appendicular skeleton; Jaw suspension; Visceral arches.
			Unit 3: Digestive System	Comparative anatomy of stomach; dentition in mammals.
Prof. Rajkumar Mandi		C8P: Comparative Anatomy of Vertebrates Practical		1. Study of placoid, cycloid and ctenoid scales through permanent slides/photographs. 2. Study of disarticulated skeleton of Toad, Pigeon and Guineapig. 3. Demonstration of Carapace and plastron of turtle. 4. Identification of mammalian skulls: One herbivorous (Guineapig) and one carnivorous (Dog) animal. 5. Dissection of Tilapia: Circulatory system, Brain, pituitary, urinogenital system.

Name of Teacher:	Class/Semester 4th SEM. Hons.	Name of the Paper : CC-9: Animal Physiology: Life	Topics/ Unit Plane	Syllabus Allotted

		Sustaining Systems Theory		
Prof. Rajkumar Mandi			Unit 1: Physiology of Digestion	Structural organisation and functions of Gastrointestinal tract and Associated glands; Mechanical and chemical digestion of food, absorption of Carbohydrates, Lipids, Proteins and Nucleic Acids; Digestive enzymes
Prof. Rajkumar Mandi		C9P: Animal Physiology: Life Sustaining Systems Lab Practical		1. Determination of ABO Blood group 2. Enumeration of red blood cells and white blood cells using haemocytometer 3. Estimation of haemoglobin using Sahli's haemoglobinometer 4. Preparation of haemin and haemochromogen crystals 5. Recording of blood pressure using a sphygmomanometer.

Name of Teacher:	Class/Semester 4th SEM. Hons.	Name of the Paper : CC-10: Immunology Theory	Topics/ Unit Plan	Syllabus Allotted
Prof. Rajkumar Mandi			Unit 1: Overview of Immune System	Basic concepts of health and diseases, Historical perspective of Immunology, Cells and organs of the Immune system
Prof. Rajkumar Mandi		C9P: C10P: Immunology Lab Practical		1. Demonstration of lymphoid organs. 2. Histological study of spleen, thymus and lymph nodes through slides/ photographs 3. Preparation of stained blood film to study various types of blood cells. 4. ABO blood group determination. 5. Demonstration of ELISA.

Name of Teacher:	Class/Semester 4th SEM. Hons.	Name of the Paper : SEC-2: Sericulture Theory	Topics/ Unit Plane	Syllabus Allotted
Prof. Rajkumar Mandi			Unit 1: Introduction	Sericulture: Definition, history and present status; Silk route Types of silkworms, Distribution and Races Exotic and indigenous races Mulberry and non-mulberry Sericulture

Name of Teacher:	Class/Semester 6th Sem Hons.	Name of the Paper : CC-13:	Topics/ Unit Plane	Syllabus Allotted

		Developmental Biology Theory		
Prof. Rajkumar Mandi			Unit 1: Introduction	Basic concepts: Phases of Development, Cell cell interaction, Differentiation and growth, Differential gene expression
Prof. Rajkumar Mandi		C13P: Developmental Biology Lab Practical		1. Study of whole mounts of developmental stages of chick through permanent slides: Primitive streak (13 and 18 hours), 21, 24, 28, 33, 36, 48, 72, and 96 hours of incubation (Hamilton and Hamburger stages). 2. Study of the developmental stages and life cycle of Drosophila from stock culture. 3. Study of different sections of placenta (photomicropgraph/ slides). 4. Project report on Drosophila culture/chick embryo development.

Name of Teacher:	Class/Semester 6th Sem Hons.	Name of the Paper : CC-14: Evolutionary Biology Theory	Topics/ Unit Plane	Syllabus Allotted
Prof. Rajkumar Mandi			Unit-1	Life's Beginnings: Chemogeny, RNA world, Biogeny, Origin of photosynthesis, volution of eukaryotes.
			Unit 2	Historical review of Evolutionary concepts, Lamarkism, Darwinism and Neo Darwinism
			Unit 3	Geological time scale, Fossil records of Hominids (from Australopithacus to Homo sapiens), evolution of horse. Neutral theory of molecular evolution, Molecular clock.
Prof. Rajkumar Mandi		C14P: Evolutionary Biology Lab Practical		1. Study of fossils from models/ pictures 2. Study of homology and analogy from suitable specimens 3. Study and verification of Hardy-Weinberg Law by chi square analysis 4. Graphical representation and interpretation of data of height/ weight of a sample of 100

				humans in relation to their age and sex.

Name of Teacher:	Class/Semester 6th Sem Hons.	Name of the Paper : DSE-3:Endocrinology Theory	Topics/ Unit Plane	Syllabus Allotted
Prof. Rajkumar Mandi			Unit-1: Introduction to Endocrinology	General idea of Endocrine systems, Classification, Characteristic and Transport of Hormones, Neurosecretions and Neurohormones
Prof. Rajkumar Mandi		DSE3P: Endocrinology Lab Practical		1. Dissect and display of Endocrine glands in laboratory bred rat. 2. Study of the permanent slides of all the endocrine glands 3. Tissue fixation, embedding in paraffin, microtomy and slide preparation of any endocrine gland 4. Estimation of plasma level of any hormone using ELISA. 5. Designing of primers of any hormone.

Name of Teacher:	Class/Semester 6th Sem Hons.	Name of the Paper : DSE-4: Biology of Insects Theory	Topics/ Unit Plane	Syllabus Allotted
Prof. Rajkumar Mandi			Unit-1: Introduction	General Features of Insects. Distribution and Success of Insects on the Earth.
Prof. Rajkumar Mandi		DSE4P: Biology of Insects Lab Practical		1. Study of life cycle of Mosquito 2. Study of different kinds of antennae, legs and mouth parts of insects 3. Mounting of insect wings, spiracles and genitalia of any insects 4. Methodology of collection, preservation and identification of insects. 5. Morphological studies of various castes of Apis, Camponotus Odontotermes 6. Study of major insect pests of paddy and their damages 7. Study of Mulberry silk moth as beneficial insect

Name of Teacher:	Class/Semester 2nd Sem Gen.	Name of the Paper : DSC-1B (CC-2): Comparative	Topics/ Unit Plane	Syllabus Allotted

		Anatomy and Developmental Biology of Vertebrates Theory		
Prof. Rajkumar Mandi			Unit 1: Integumentary System	Derivatives of integument w.r.t. glands and digital tips
			Unit 2: Skeletal System	Evolution of visceral arches
			Unit 3: Digestive System	Brief account of alimentary canal and digestive glands.
			Unit 4: Respiratory System	Brief account of gills, lungs, air sacs and swim bladder
Prof. Rajkumar Mandi		DSC1BP: Comparative Anatomy and Developmental Biology of Vertebrates (Practical)		1. Osteology: a) Disarticulated skeleton of fowl and rabbit b) Carapace and plastron of turtle /tortoise c) Mammalian skulls: One herbivorous and one carnivorous animal. 2. Frog - Study of developmental stages - whole mounts and sections through permanent slides – cleavage stages, blastula, gastrula neurula, tail bud stage, tadpole external and internal gill stages. 3. Study of the different types of placenta- histological sections through permanent slides or photomicrographs. 4. Study of placental development in humans by ultrasound scans. 5. Examination of gametes - frog/rat - sperm and ova through permanent slides or photomicrographs.

Name of Teacher:	Class/Semester 4^{th} Sem Gen.	Name of the Paper : Paper : DSC-1D (CC-4): Genetics and Evolutionary Biology Theory	Topics/ Unit Plane	Syllabus Allotted
Prof. Rajkumar Mandi			Unit 1: Introduction to Genetics	Mendel's work on transmission of traits, Genetic Variation, Molecular basis of genetic information
			Unit 2: Mendelian	Principles of Inheritance, Chromosome theory of inheritance, Incomplete

			Genetics and its Extension	dominance and codominance, Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, sex linked inheritance, extra-chromosomal inheritance
			Unit 3: Linkage, Crossing Over and Chromosomal Mapping	Linkage and crossing over, Recombination frequency as a measure of linkage intensity, two factor and three factor crosses, Interference and coincidence, Somatic cell genetics – an alternative approach to gene mapping
			Unit 10: Species Concept	Biological species concept (Advantages and Limitations); Modes of speciation (Allopatric, Sympatric)
			Unit 11: Macro-evolution	Macro-evolutionary Principles (example: Darwin's Finches)
			Unit 12: Extinction	Mass extinction (Causes, Names of five major extinctions, K-T extinction in detail), Role of extinction in evolution
Prof. Rajkumar Mandi		DSC1DP: Genetics and Evolutionary Biology (Practical)		1. Study of Mendelian inheritance and gene interactions (Non- Mendelian inheritance) using suitable examples. Verify the results using Chi-square test. 2. Study of Linkage, recombination, gene mapping using the data. 3. Study of Human Karyotypes (normal and abnormal). 4. Study of fossil evidences from plaster cast models and pictures 5. Study of homology and analogy from suitable specimens/ pictures 6. Charts: a. Phylogeny of horse with diagrams/ cut outs of limbs and teeth of horse ancestors b. Darwin's Finches with diagrams/ cut outs of beaks of different species 7. Visit to Natural History Museum and submission of report.

Name of Teacher:	Class/Semester 6^{th} sem Gen	Name of the Paper : DSE- 2: Insect, Vector and Diseases	Topics/ Unit Plane	Syllabus Allotted
Prof. Rajkumar Mandi			Unit I: Introduction to Insects	General Features of Insects, Morphological features, Head –

				Eyes, Types of antennae, Mouth parts w.r.t. feeding habits
			Unit II: Concept of Vectors	Brief introduction of Carrier and Vectors (mechanical and biological vector), Reservoirs, Host-vector relationship, Vectorial capacity, Adaptations as vectors, Host Specificity
			Unit III: Insects as Vectors	Classification of insects up to orders, detailed features of orders with insects as vectors – Diptera, Siphonaptera, Siphunculata, Hemiptera
Prof. Rajkumar Mandi		DSE2P: Insect Vector and Diseases (Practical)		1. Study of different kinds of mouth parts of insects 2. Study of following insect vectors through permanent slides/ photographs: Aedes, Culex, Anopheles, Pediculus humanus capitis, Pediculus humanus corporis, Phithirus pubis, Xenopsylla cheopis, Cimex lectularius, Phlebotomus argentipes, Musca domestica, through permanent slides/ photographs 3. Study of different diseases transmitted by above insect vectors 4. Submission of a project report on any one of the insect vectors and disease transmitted.

Name of Teacher:	Class/Semester 6^{th} sem Gen	Name of the Paper :SEC4T: Sericulture Theory	Topics/ Unit Plane	Syllabus Allotted
Prof. Rajkumar Mandi			Unit 1: Introduction	Sericulture: Definition, history and present status; Silk route, Types of silkworms, Distribution and Races, Exotic and indigenous races, Mulberry and non-mulberry Sericulture

Kharagpur College

Department of Zoology

UG Lesson Plan of

Dr. Moumita Chakraborty

Even Semester: Session- 2022-2023

Semester	Syllabus	Lesson plan
2nd Semester(H): Paper- CC3 (Non-Chordates)	Arthropoda- General Characteristics and classification;	1.Introduction to arthropod general characters 2. classify phylum Arthropoda up to class with important features. 3.
	Unit: Mollusca- general characteristics and classification up to class. Torsion in gastropods; Nervous system in Mollusca;	1.Introduction to Mollusca general characters 2. classify phylum mollusca up to class with important features. 3. What is torsion? Why is it occur? Process of torsion. Significance of torsion. Diagram. 4. Types of nerve, ganglia. Connectives and commissures. Different types of nervous system found in different classes with diagram. Significance.
4th semester(H): Paper- CC9 (Animal Physiology)	Unit-1; Digestive System	Gut, histology of gut, different digestive glands- location, secretion of juice, functions. Liver- histology, functions, bile and gall bladder. Different digestive enzymes,
	Unit2; respiratory system	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-5 Thermoregulation	Introduction, types of animals on the basis of thermoregulation, process of thermoregulation. Role of hypothalamus in thermoregulation.
Semester 6 CC-13	Gametogenesis (Spermatogenesis and Oogenesis), Fertilisation, Block to polyspermy.	Introduction, process of spermatogenesis with diagram, process of oogenesis with diagram, process of fertilization. Block to polyspermy.
CC-14	Fossil, dating mechanism etc.	Introduction, fossil, types, formation, dating mechanism.
DSE-3	Endocrinology	Structure and functions of hypothalamus, Pituitary gland, hypothalamo-hypophyseal portal system, Hypo and hyper secretion of pituitary gland, disorders of pituitary gland, control of pituitary hormones.
DSE-4	Insect Biology	Introduction, classification, wings, insect hormones.
Semester-4 DSC-4	Unit 1-4	Introduction to genetics, Mendelian genetics, linkage, crossing over, mutation.
	PRACTICAL	
CC-3	Arthropoda and Mollusca	Identification of Animals up to class with characters.
CC-9	Osteology	Appendicular bones, skull, girdles, vertebrae of Columba and Cavia. Skull of Chelone, Canis.
DSE-3	Permanent slide Preparation of slide of endocrine gland of rat.	Identification of permanent slides of different endocrine glands. Section cutting through microtechnique.

Teaching plan for Academic Session 2022-2023(Even Semester)
Department of Zoology *(Sibani Chaudhuri)*

Zoology Hons Sem6	**CC-13 Developmental Biology**	**.Unit2: early embryonic development**	1.Gametogenesis 2.Process ofSpermatogenesis &spermiogenesis 3.Oogenesis process& structure of a typical ovum 4.Types of eggs: classification of eggs on the basis of amount of egg yolk&distribution of egg yolk 5.Egg membranes:Classification of eggs on the basis of egg envelope &egg shell Cheese
	CCP13	**Study of whole mount of developmental stages of chick through permanent slide**	Demonstration of permanent slides of 21, 24, 28, 33,36,48, 72& 96 hours embryos of chick
Zoology Hons Sem6	**CC-14 Evolutionary biology**	**Unit-6 Specie concept**	1.Concept of species, 2.Typological species concept ,Nominalistic species concept &their drawbacks 3.genetic species concept ,evolutionary species concept &their drawbacks 4.Biological species concept, Advantages and disadvantages of various species concept.
		Isolating Mechanisms	5.Definition of isolation,Classification of isolating mechanism 6.Premating mechanisms 7.Postmating mechanisms
		Modes of speciation	8.Classification of modes of speciation: 9.Allopatric speciation 10.Parapatric speciation 11.Peripatric speciation 12.Sympatric speciation
		Adaptive Radiation	13Concept of evolution & macroevolution 14.Concept of adaptive Radiation,the Galapagos island ,role of gene flow,Darwin finches 15.Adaptive Radiation in Darwin Finches

Zoology Hons Sem6	**DSE3T Endocrinology**	**Unit-3 Peripheral Endocrine glands**	1.Structure ,Hormones,Function & Regulation &disorders of: a.Thyroid gland b.Parathyroid c.Thymus d.Adrenal e.Pancreas d.Testis e.Ovary 2. Role of Hormones in Homeostasis'
	DSE3P Endocrinology Lab	**2.Study of permanent slides of all endocrine glands**	Microscopic Study of T.S. of pituitary & thyroid, parathyroid. & thymus, adrenal pancreas, testis & ovary
Zoology Hons Sem6	. **DSE4T Biology of insect**	**Unit1 Introduction**	.1.General Features of Insect 2.Distribution &Success of insect on earth
		Unit7 Insect as vector	3.General Concept of vector , Biological & mechanical vector 4.Role of insect as Biological & Mechanical. Vector 5.Brief discussion on Mosquito & Housefly. as a vector
	DSE4P	**Practical**	1.Study of Lifecycle of Mosquito by chart and models 2.Study of different kinds of antennae,legs &mouthparts of insects 3.Study of major insect pest of paddy and their damages 4.Study of Mulberry silk moth as a beneficial insect

Zoo(Hons)	Paper	Syllabus allotment	Lesson Plan
Zoology Hons Sem4	**CC9T Animal Physiology**	**Unit 4 Physiology of circulation**	1.Components of Blood & their functions 2Structure &Function of Haemoglobin 3.Concept of Haemostasis 4.Blood clotting system 5 Fibrinolytic system 6.Haematopoisis 7.Study of ABO blood grouping system & Rh Factor
	CC9P	**Practical**	1.Determination of ABO blood group 2.Preparetion of Haemin and Haemohromogen crystals 3.Recording of Blood Pressure through Sphygmomanometer
Zoology Hons Sem4	**CC10T**	**Unit1 Overview of immune system**	1.Basic concept of Health &Diseases 2.Historical perspective of Immunology 3.Cells & Organs of Immune system 4.Anatomical Barrier 5.Process and stages of inflammation
		Unit2 Innate and Adaptive Immunity	6.Cells and molecules involved in innate immunity 7.Adaptive immunity: (a).Cell mediated (b).Humoral immunity
		Unit 3 Antigens	8.Antigenecity and immunogenicity 9.Concept of immunogenicity,Adjuvants & Haptens 10.Factors influencing immunogenicity 11.Concept of B &T cell epitopes
		Unit10 Vaccines	12.Various Types of Vaccines 13.Active Immunization 14.Passive immunization
	CC10P	**Practical**	1.Demonstration of Lymphoid Organs 2.Historical study of spleen,thymus, &lymph node through slides and photographs 3.Preparation of stained blood film to stain various types of blood cells 4.ABO blood group determination

Zoology Hons 2nd semistar	**C3T-Nonchordatesll**	**Unit1: Introduction**	1.Definition of coelom, Genera idea of coelom,Functions of coelom and it's importance 2.Examples of coelomates, Protostome coelomates &Deuterostome coelomates, their comparison 3. Origin of coelom , schizocoel & enterocoel hypothesis 4. Evolution of coelom, various theories of evolution of coelom 5. Concept of Metamerism, origin & evolution of metamerism, 6Various Theories of metamerism ,significance of metamerism.
		Unit2: Annelida General characteristics & classification	7.Introduction of Phylum Annelida, important characteristics features of Phylum Annelida with various examples 8.Scheme of Classification of Phylum Annelida, Systematic resume of phylum Annelida upto classes
		Excretion in Annelida	9.Detailed structure of a typical nephridia . 10.Study of different types of nephridia found in Annelida : a.septal nephridia *b.pharyngeal nephridia* *c.integumentary nephridia* 11.Comparison of various nephridia found in Annelida : *a.Proto vs Metanephridia* *b. Micro & Meganephridia* *c.Exo & enteronephridia*

2nd semester	**C3T**	**Metamerism in Annelida**	12 Metamerism and tagmatization,Pattern of segmentation,general ,components of metameres Types of metamerism ,significance of metamerism in Annelida
		Unit7: Hemichordata	13.General characteristics of Phylum Hemichordata 14.Relationship with chordates and nonchordates
	C3P	**Study of the following specimens**	1.Aphrodite,Nereis,Heteronereis,Sabella,Serpula, Chaetopterus ,Pheretima,Hirudinaria. 2.Study of digestive system,septal nephridia &pharyngeal nephridia of earthworm by proper diagrams and explanation 3.Study of permanent slide through pharynx,gizzard,typhlosolar intestine of earthworms
	C4P	**Study of various stages of meiosis**	4.Demonstration of permanent slide of various sub phases of Prophase: Pachytene ,Leptotene,Zygotene , Diakinesis etc, Metaphase -I,&11, Anaphase1,11, Telophase 1&11

Teaching plan: 2022-2023 (Even Semester)

ABHIMANYU MUDI

Department of Zoology

<table>
<tr><th colspan="3">Semester-II</th></tr>
<tr><td>Syllabus Allotted</td><td colspan="2">C4 T (Cell Biology):
➢ Unit 4: Cytoplasmic organelles II – Mitochondria.
➢ Unit 7: Cell Division.
➢ Unit 8: Cell Signaling
C4P–Cell Biology (Lab)
GE2 T-Animal Diversity (Unit 1 – 9)
GE2 P - Animal Diversity Lab</td></tr>
<tr><td rowspan="14">C4 T</td><td>Lecture No.</td><td>Topics to be covered</td></tr>
<tr><td colspan="2">Term-I</td></tr>
<tr><td>01</td><td>Course outcome and concept about cytoplasmic organelles.</td></tr>
<tr><td>02</td><td>Ultrastructure and function of Mitochondria. Mt DNA Vs. genomic DNA.</td></tr>
<tr><td>03</td><td>Mitochondrial Respiratory Chain-ETC and its inhibitors.</td></tr>
<tr><td>04</td><td>Semi-autonomous nature of mitochondria, Endosymbiotic hypothesis, Chemi-osmotic hypothesis.</td></tr>
<tr><td>05</td><td>Peroxisomes: Structure and Functions.
Centrosome: Structure and Functions.</td></tr>
<tr><td>06</td><td>Overview of cell division. What is cell cycle? Significance of different phases of cell cycle.</td></tr>
<tr><td>07</td><td>Check points concept. Regulation mechanism of cell cycle: cyclin-CDK complex.</td></tr>
<tr><td colspan="2">Term-II</td></tr>
<tr><td>08</td><td>Mitosis and Meiosis: Basic process and their significance. MTOC, APC/cyclosome complex. Difference between mitosis and meiosis.</td></tr>
<tr><td>09</td><td>Arrest of cell cycle. P53 is the guardian of genome.</td></tr>
<tr><td>10</td><td>Cancer: normal cell vs. transformed cell, Concept of oncogenes and tumor suppressor genes: P53, Ras and APC.</td></tr>
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	11	Overview of cell signaling transduction pathways; Types of signaling molecules and receptors GPCR.
	12	Mode of action of G-protein, Role of second messenger (cAMP)
	Term-III	
	13	Programmed cell death- Apoptosis pathway. Necrosis Vs. Apoptosis.
	14	Assignments.
	15	Problem discussion.
	16	Problem discussion.
C4P	**Lab. No.**	**Topics to be covered**
	Term-I	
	01	Experiment-1: Preparation of temporary stained squash of onion root tip to study various stages of mitosis.
	02	Experiment-2: Study of various stages of meiosis by squash preparation from grasshopper testis.
	Term-II	
	03	Experiment-3: Preparation of permanent slide to show the presence of Barr body in human female cheek cells.
	04	Experiment-4: Mitochondria identification through vital staining
	Term-III	
	05	Practical revision.
	06	Practical revision.
	07	Practical revision.
	08	Practical revision.
GE2 T	**Lecture No.**	**Topics to be covered**
	Term-I	
	01	Course outcome. Brief idea about nonchordates. General characters of Protozoa.
	02	Life cycle of *Plasmodium.*
	03	General characters and canal system in Porifera
	04	General characters of Cnidarians and polymorphism. Polyp Vs. medusa
	05	Concept about coelome development. Protostome vs.

		deuterostome.
	06	General characters of Helminthes.
	07	General characters of Nematoda and Parasitic adaptations.
	Term-II	
	08	Concept of metamerism. General characters of annelid.
	09	General characters. Social life in insects.
	10	General characters of mollusk.
	11	Pearl Formation
	12	General characters of Echinodermata.
	Term-III	
	13	Water Vascular system in Starfish.
	14	Salient features of protochordates.
	15	Assignments
	16	Problem discussion.
GE2 P	**Lab No.**	**Topics to be covered**
	Term-I	
	01	Identification of *Euglena, Noctiluca, Paramecium*
	02	Identification of *Sycon,Physalia, Tubipora, Metridium*.
	03	Identification of *Ascaris, Nereis, Aphrodite, Leech, Peripatus, Limilus*.
	04	Identification of *Hermitcrab, Daphnia, Millipede, Centipede, Beetle*.
	05	Identification of *Chiton, Dentalium, Octopus, Asterias, Antedon*.
	Term-II	
	06	Study of cross section of Sycon, T. S. of Earthworm passing through pharynx, gizzard, and typhlosolar intestine.
	07	Study of Sea anemone, *Ascaris* (male & female).
	08	Temporary mounts of Septal & pharyngeal nephridia of earthworm.
	Term-III	
	09	Dissections of digestive and nervous system of Cockroach.
	10	Practical revision.
	11	Practical revision.
	12	Practical revision.

<table>
<tr><th colspan="3">Semester-IV</th></tr>
<tr><td>Syllabus Allotted</td><td colspan="2">C8 T (Comparative Anatomy of Vertebrates):
➢ Unit 7: Nervous System.
➢ Unit 8: Sense Organs.
C9T: Animal Physiology: Life Sustaining Systems:
➢ Unit 4: Physiology of Heart.
C9P: Animal Physiology: Life Sustaining Systems Lab
C10T: Immunology:
➢ Unit 4: Immunoglobulins
➢ Unit 5: Major Histocompatibility Complex
➢ Unit 6: Cytokines
C10P: Immunology Lab</td></tr>
<tr><td rowspan="15">C8T,
C9T,
C10T</td><td>Lecture No.</td><td>Topics to be covered</td></tr>
<tr><td colspan="2">Term-I</td></tr>
<tr><td>01</td><td>Course outcome and structure of Ig molecule. Proteolytic diestion of IgG.</td></tr>
<tr><td>02</td><td>Ig classes: isotype, allotype and idiotype. Ig superfamily.</td></tr>
<tr><td>03</td><td>Function of different Ig molecules. Opsonization, ADCC.</td></tr>
<tr><td>04</td><td>Concept about Ag-Ab interaction: Affinity, avidity. Agglutination and precipitation reactons. Zone phenomenon, Titer.</td></tr>
<tr><td>05</td><td>Agglutination inhibition, Complement fixation and their applications.</td></tr>
<tr><td>06</td><td>Classification of receptors. Olfactory and auditory receptors in vertebrate</td></tr>
<tr><td>07</td><td>Structure of mammalian heart: Valves. Coronary Circulation.</td></tr>
<tr><td>08</td><td>Structure and working of conducting myocardial fibres.</td></tr>
<tr><td colspan="2">Term-II</td></tr>
<tr><td>09</td><td>Origin and conduction of cardiac impulses Cardiac Cycle, ECG.</td></tr>
<tr><td>10</td><td>Cardiac output , blood pressure and its regulation.</td></tr>
<tr><td>11</td><td>Structure and functions of MHC molecules. Structure of T cell Receptor and its signaling.</td></tr>
<tr><td>12</td><td>T cell development & selection. T cell – B cell cooperation.</td></tr>
<tr><td>13</td><td>Cytokines: Types, properties and functions.</td></tr>
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	Term-III	
	14	Comparative account of brain, Cranial nerves in mammals.
	15	Problem discussion.
	16	Problem discussion.
C9P & C10P	**Lab No.**	**Topics to be covered**
	Term-I	
	01	Determination of ABO Blood group.
	02	Preparation of haemin and haemochromogen crystals.
	03	Preparation of stained blood film to study various types of blood cells.
	Term-II	
	04	Demonstration of ELISA.
	05	Enumeration of red blood cells and white blood cells using haemocytometer.
	Term-III	
	06	Practical revision.
	07	Practical revision.
	08	Practical revision.
	09	Practical revision.
Semester-VI		
Syllabus Allotted	C13T: Developmental Biology ➢ Unit-2 (from Planes and patterns of cleavage ….. till end) ➢ Unit 3: Late Embryonic Development C13P: Developmental Biology Lab C14T: Evolutionary Biology ➢ Unit-4: Sources of variations. ➢ Unit-5: Population genetics. C14P: Evolutionary Biology Lab DSE3T: Endocrinology: ➢ Unit-4: Regulation of Hormone Action DSE3P: Endocrinology Lab DSE4T: Biology of Insects ➢ Unit-4: physiology of insect.	
C13T	**Lecture No.**	**Topics to be covered**
	Term-I	

	01	Course outcome and Planes and patterns of cleavage; Types of Blastula.
	02	Fate maps: Definition, method, application.
	03	Early development of frog Cleavage and gastrulation.
	04	Early development of chick Cleavage and gastrulation.
	Term-II	
	05	Embryonic induction and chemistry of organizers.
	06	Transplantation experiment: Speaman – Mangold experiment
	07	Fate of Germ Layers; Extra-embryonic membranes in birds.
	Term-III	
	08	Implantation of embryo in humans, Placenta (Structure, types and functions of placenta)
	09	Problem solving
	10	Problem solving
C13P	**Lab No.**	**Topics to be covered**
	Term-I	
	01	Study of the developmental stages and life cycle of Drosophila from stock culture.
	02	Study of different sections of placenta from photomicropgraph.
	Term-II	
	03	Project report on Drosophila culture.
	Term-III	
	04	Practical revision.
	05	Practical revision.
C14 T	**Lecture No.**	**Topics to be covered**
	Term-I	
	01	Course outcome and idea about population genetics. Hardy-Weinberg Law: statement and derivation of equation, application Of law to bi-allelic Population.
	02	Evolutionary forces upsetting H-W equilibrium; Natural selection (concept of fitness, types of selection, selection coefficient, mode of selection heterozygous superiority).
	03	Role of Migration and Mutation in changing allele

		frequencies.
	04	Genetic Drift mechanism (founder's effect, bottleneck phenomenon).
	Term-II	
	05	Numerical problems solving in HWE.
	06	Sources of variations: Heritable variations and their role in evolution.
	Term-III	
	07	Problem solving
	08	Problem solving
C14 P	**Lab No.**	**Topics to be covered**
	Term-I	
	01	Study of homology and analogy from suitable specimens.
	02	Study and verification of Hardy-Weinberg Law by chi square analysis.
	Term-II	
	03	Graphical representation and interpretation of data of height/ weight of a sample of 100 humans in relation to their age and sex.
	Term-III	
	04	Practical revision.
	05	Practical revision.
DSE3T	**Lab No.**	**Topics to be covered**
	Term-I	
	01	Course outcome and mechanism of action of steroidal, non-steroidal hormones with receptors.
	02	Bioassays of hormones using RIA & ELISA.
	03	Estrous cycle in rat and menstrual cycle in human.
	Term-II	
	04	Multifaceted role of Vasopressin & Oxytocin.
	05	Hormonal regulation of parturition.
	Term-III	
	06	Problem solving
DSE3P	**Lab No.**	**Topics to be covered**

	Term-I	
	01	Estimation of plasma level of any hormone using ELISA.
	02	Practical revision
DSE4 T	**Lab No.**	**Topics to be covered**
	Term-I	
	01	Course outcome and Structure and physiology of Insect integumentary system.
	02	Structure and physiology of Insect digestive and respiratory system.
	03	Structure and physiology of Insect excretory and circulatory system.
	04	Structure and physiology of Insect endocrine and reproductive system.
	Term-II	
	05	Structure and physiology of Insect nervous system.
	06	Photoreceptors: Types, Structure and Function
	Term-III	
	07	Metamorphosis: Types and Neuroendocrine control of metamorphosis.
	08	Problem solving

Teaching plan for Academic Session 2022-2023(Even Semester)
Department of Zoology
KHARAGPUR COLLEGE
(SUBHOJEET BANERJEE)

Name of Teacher:	Class/Semester 2nd SEM Hons.	Name of the Paper : CC-3	Topics/ Unit Plan	Syllabus Allotted
SUBHOJEET BANERJEE		Non-Chordates II:Theory	Unit 3:Arthropoda	1.General characteristics and Classification up to classes 2.Vision in Insecta only. 3.Respiration in Arthropoda (Gills in prawn and trachea in cockroach) 4.Metamorphosis in Lepidopteran Insects. 5.Social life in termite
			Unit 7: Hemichordata	1.General characteristics of phylum Hemichordata. 2.Relationship with non-chordates and chordates
SUBHOJEET BANERJEE		C3 P – Non-Chordates II Practical		1.T.S. through pharynx, gizzard, and typhlosolar intestine of earthworm 2.To submit a Project Report on any related topic to larval forms (crustacean, mollusc and echinoderm)

Name of Teacher:	Class/Semester 2nd SEM Hons.	Name of the Paper :CC-4 : Cell Biology Theory	Topics/ Unit Plan	Syllabus Allotted
SUBHOJEET BANERJEE			Unit 3: Cytoplasmic organelles I	1.Structure and Functions: Endoplasmic Reticulum, Golgi Apparatus, Lysosomes

				2. Protein sorting and mechanisms of vesicular transport
			Unit 2: Plasma Membrane	1.Ultra structure and composition of Plasma membrane: Fluid mosaic model 2.Transport across membrane: Active and Passive transport, Facilitated transport 3.Cell junctions: Tight junctions, Gap junctions, Desmosomes
			Unit 5: Cytoskeleton	1. Type, structure and functions of cytoskeleton Accessory proteins of microfilament & microtubule A brief idea about molecular motors
SUBHOJEET BANERJEE		C4P–Cell Biology (Lab) Practical		Preparation of permanent slide to demonstrate: a. DNA by Feulgen reaction b. Cell viability study by Trypan Blue staining c. Mitochondria identification through vital staining

Name of Teacher:	Class/Semester 4th SEM. Hons.	Name of the Paper : CC-8:	Topics/ Unit Plane	Syllabus Allotted
SUBHOJEET BANERJEE		Comparative Anatomy of Vertebrates Theory	Unit 4: Respiratory System	Respiratory organs in fish, amphibian, birds and mammals

			Unit 5: Circulatory System	General plan of circulation, Comparative account of heart and aortic arches
			Unit 6: Urinogenital System Unit 8: Sense Organs	Succession of kidney, Evolution of urinogenital ducts, Types of mammalian uteri Classification of receptors, Brief account of olfactory and auditory receptors in vertebrate
SUBHOJEET BANERJEE		C8P: Comparative Anatomy of Vertebrates Practical		1.Demonstration of Carapace and plastron of turtle. 2. Dissection of *Tilapia*: Circulatory system, Brain, pituitary, urinogenital system. .

Name of Teacher:	Class/Semester 4th SEM. Hons.	Name of the Paper : CC-9: Animal	Topics/ Unit Plane	Syllabus Allotted
SUBHOJEET BANERJEE		Physiology: Life Sustaining Systems Theory	Unit 4: Physiology of Heart Unit 5: Thermoregulation & Osmoregulation	Structure of mammalian heart, Coronary Circulation, Structure and working of conducting myocardial fibres, Origin and conduction of cardiac impulses Cardiac Cycle and cardiac output Blood pressure and its regulation 1.Physiological classification based on thermal biology.

				2.Thermal biology of endotherms 3.Osmoregulation in aquatic vertebrates 4. Extrarenal osmoregulatory organs in vertebrates
SUBHOJEET BANERJEE		C9P: Animal Physiology: Life Sustaining Systems Lab Practical		1.Enumeration of red blood cells and white blood cells using haemocytometer 2. Recording of blood pressure using a sphygmomanometer.

Name of Teacher:	Class/Semester 4^{th} SEM. Hons.	Name of the Paper :	Topics/ Unit Plan	Syllabus Allotted
SUBHOJEET BANERJEE		CC-10: Immunology Theory	Unit 6: Cytokines Unit 7: Complement System Unit 8: Hypersensitivity Unit 9: Immunology of diseases	Types, properties and functions of cytokines. Components and pathways of complement activation. Gell and Coombs' classification and brief description of various types of hypersensitivities. Malaria, Filariasis, Dengue and Tuberculosis

SUBHOJEET BANERJEE	C9P: C10P: Immunology Lab Practical		1. Histological study of spleen, thymus and lymph nodes through slides/ photographs 2. Demonstration of ELISA

Name of Teacher:	Class/Semester 4th SEM. Hons.	Name of the Paper : SEC-2:	Topics/ Unit Plane	Syllabus Allotted
SUBHOJEET BANERJEE		Sericulture Theory	Unit 3: Rearing of Silkworms	Selection of mulberry variety and establishment of mulberry garden Rearing house and rearing appliances. Disinfectants: Formalin, bleaching powder, RKO Silkworm rearing technology: Early age and Late age rearing Types of mountages Spinning, harvesting and storage of cocoons

Name of Teacher:	Class/Semester 6th Sem Hons.	Name of the Paper : CC-13:	Topics/ Unit Plane	Syllabus Allotted
SUBHOJEET BANERJEE		Developmental Biology Theory	Unit 4: Post Embryonic Development Unit 5: Implications of	Development of brain and Eye in Vertebrate. Regeneration: Modes of regeneration, epimorphosis, morphallaxis and compensatory regeneration (with one example each) Teratogenesis: Teratogenic agents and

			Developmental Biology	their effects on embryonic development; In vitro fertilization, Stem cell (ESC), Amniocentesis.
SUBHOJEET BANERJEE		C13P: Developmental Biology Lab Practical		1.Study of different sections of placenta (photomicropgraph/ slides). 2. Project report on *Drosophila* culture/chick embryo development.

Name of Teacher:	Class/Semester 6th Sem Hons.	Name of the Paper : CC-14:	Topics/ Unit Plane	Syllabus Allotted
SUBHOJEET BANERJEE		Evolutionary Biology Theory	Unit-7	Extinctions, Back ground and mass extinctions (causes and effects), detailed example of K-T extinction.
			Unit-8	Origin and Evolution of Man, Unique Hominin characteristics contrasted with primate characteristic Molecular analysis of human origin.
			Unit-9	Phylogenetic trees, Construction & interpretation of Phylogenetic tree using parsimony, Convergent & Divergent evolution.
SUBHOJEET BANERJEE		C14P: Evolutionary Biology Lab Practical		1.Study of fossils from models/ pictures. 2. Study of homology and analogy from suitable specimens.

Name of Teacher:	Class/Semester 6th Sem Hons.	Name of the Paper :	Topics/ Unit Plane	Syllabus Allotted
SUBHOJEET BANERJEE		DSE-3:Endocrinology Theory	Unit-2: Epiphysis, Hypothalamo-hypophysial Axis	Structure of pineal gland, Secretions and their functions in biological rhythms and reproduction. Structure and functions of hypothalamus and Hypothalamic nuclei, Regulation of neuroendocrine glands, Feedback mechanisms Structure of pituitary gland, Hormones and their functions, Hypothalamo-hypophysial portal system, Disorders of pituitary gland
SUBHOJEET BANERJEE		DSE3P: Endocrinology Lab Practical		1. Estimation of plasma level of any hormone using ELISA 2. Designing of primers of any hormone.

Name of Teacher:	Class/Semester 6th Sem Hons.	Name of the Paper :	Topics/ Unit Plane	Syllabus Allotted
SUBHOJEET BANERJEE		DSE-4: Biology of Insects Theory	Unit-6: Insect Plant Interaction	Theory of co-evolution, role of allelochemicals in host plant mediation Host-plant selection by phytophagous insects, Major insect pests in paddy.
SUBHOJEET BANERJEE		DSE4P: Biology of		1.Methodology of collection, preservation

	Insects Lab Practical		and identification of insects. 2. Morphological studies of various castes of *Apis*, *Camponotus Odontotermes*

Name of Teacher:	Class/Semester 2nd Sem Gen.	Name of the Paper :	Topics/ Unit Plane	Syllabus Allotted
SUBHOJEET BANERJEE		DSC-1B (CC-2): Comparative Anatomy and Developmental Biology of Vertebrates Theory	Unit 2: Skeletal System	Evolution of visceral arches
			Unit 4: Respiratory System	Brief account of gills, lungs, air sacs and swim bladder
SUBHOJEET BANERJEE		DSC1BP: Comparative Anatomy and Developmental Biology of Vertebrates (Practical)		1.Study of the different types of placenta-histological sections through permanent slides or photomicrographs. 2. Study of placental development in humans by ultrasound scans. 3. Examination of gametes - frog/rat - sperm and ova through permanent slides or photomicrographs.

Name of Teacher:	Class/Semester 4th Sem Gen.	Name of the Paper : Paper : DSC-1D (CC-4): Genetics and Evolutionary Biology Theory	Topics/ Unit Plane	Syllabus Allotted

SUBHOJEET BANERJEE			Unit 2: Mendelian Genetics and its Extension	Principles of Inheritance, Chromosome theory of inheritance, Incomplete dominance and codominance, Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, sex linked inheritance, extra-chromosomal inheritance
			Unit 3: Linkage, Crossing Over and Chromosomal Mapping	Linkage and crossing over, Recombination frequency as a measure of linkage intensity, two factor and three factor crosses, Interference and coincidence, Somatic cell genetics – an alternative approach to gene mapping
			Unit 12: Extinction	Mass extinction (Causes, Names of five major extinctions, K-T extinction in detail), Role of extinction in evolution
SUBHOJEET BANERJEE		DSC1DP: Genetics and Evolutionary Biology (Practical)		1. Study of Linkage, recombination, gene mapping using the data. 2. Study of Human Karyotypes (normal and abnormal). 3. Study of fossil evidences from plaster cast models and pictures 4. Study of homology and analogy from suitable specimens/ pictures 5. Charts: a. Phylogeny of horse with diagrams/ cut outs of limbs and teeth of horse ancestors b. Darwin's Finches with diagrams/ cut outs of beaks of different species

			7. Visit to Natural History Museum and submission of report.

Name of Teacher:	Class/Semester 6th sem Gen	Name of the Paper :	Topics/ Unit Plane	Syllabus Allotted
SUBHOJEET BANERJEE		DSE- 2: Insect, Vector and Diseases	Unit II: Concept of Vectors	Brief introduction of Carrier and Vectors (mechanical and biological vector), Reservoirs, Host-vector relationship, Vectorial capacity, Adaptations as vectors, Host Specificity
SUBHOJEET BANERJEE		DSE2P: Insect Vector and Diseases (Practical)		1. Study of different diseases transmitted by above insect vectors 2. Submission of a project report on any one of the insect vectors and disease transmitted.