CHANDIDAS MAHAVIDYALAYA
DEPARTMENT OF ZOOLOGY

A Govt. Aided Degree College Affiliated to the University of Burdwan
UGC Accrediated under section 2(f) & 12(B) [1979] * NAAC Accrediated in 2016
KHUJUTIPARA, BIRBHUM, WEST BENGAL, INDIA- 731215
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TEACHING MODULE
ZOOLOGY THREE YEAR MAJOR PROGRAMME
SESSION: 2023-24

COURSE: NON-CHORDATES (MAJOR & MINOR)
TOTAL LECTURES: 45

SL. NO.	TOPICS (CREDITS:3)	NO. OF LECTURES
1	**Unit1:Basics of Animal Classification** Definition: Classification, Systematics, and Taxonomy,Code of Zoological Nomenclature.	2
2	**Unit2:Protista and Metazoa** **Protozoa:** General Characteristics and Schematic Classification up to phylum (Levine et al. 1980) Locomotion in *Amoeba*, Conjugation in *Paramoecium*	5
3	**Unit3: Porifera** General characteristics and schematic classification uptoorder (Hyman,1951) Canal System and Spicules Of Sponges	5
4	**Unit4:Cnidaria** General characteristics and schematic classification upto class (Ruppert and Barnes.1994); Metagenesis of *Obelia*, Coral Reef Types And Formation	4
5	**Unit5:Ctenopra** General Characteristic only	1
6	**Unit 6:Platyhelminthes** General characteristics and schematic classification uptoclass (Ruppert and Barnes 1994)	2
7	**Unit7:Nematoda** General characteristics and schematic classification upto class (Ruppert and Barnes, 1994)	2

Deptt. of Zoology
Chandidas Mahavidyalaya
Khujutipara, Birbhum

8	**Unit 8:Annelida** General characteristics and schematic classification upto class (Ruppert and Barnes1994), Metamerism, Nephridia: Structure And Function	4
9	**Unit9:Arthroda** General characteristics and schematic classification upto class (Ruppert & Barnes, 1994), Vision In Insects, Metamorphosis in Lepidopteran insect	6
10	**Unit10:Onychophora** Evolutionary Significance	2
11	**Unit11:Mollua** General characteristics and schematic classification upto class (Ruppert and Barnes1994), Modification Of foot, Nervous system and torsion in Gastropods	5
12	**Unit 12:Echinodermata** General characteristics and schematic classification up to class (Ruppert and Barnes1994), Water Vascular System of *Asteroidea*, Structure Of Tube Feet, Larval forms in Echinodermata.	4
13	**Unit13:Hemichordata** General characteristics phylum Hemichordata, Relationship of non-chordates and chordates.	3

COURSE-CHORDATES (MAJOR & MINOR)
TOTAL LECTURES: 45

SL. NO.	TOPICS (CREDITS:3)	NO. OF LECTURES
1	**Origin of Chordata** Dipleura concept and the Echinoderm theory of Chordata	2
2	**Introduction to Chordates** General characteristics and outline classification of Phylum Chordata Upto living Subclasses Advanced features of Vertebrates over Protochordata Retrogressive Metamorphosis In *Ascidia,* Feeding Mechanism In *Branchiostoma*	6
3	**Agnatha** General characteristics and classification ofCyclostomes upto Sub-class	2
4	**Pieces** General characteristics and classification of Chondrichthyes and Osteichthyes Upto Subclasses Accessory respiratory organs and swim bladder in fishes Osmoregulation And Parental Care in fishes	6
5	**Amphibia** General characteristics and classification upto living Sub-classes Metamorphosis and Parental care in Amphibia	4

Deptt. of Zoology
Chandidas Mahavidyalaya
Khujutipara, Birbhum

6	**Reptilia** General characteristics and classification upto living Sub-classes General features of poisonous and non-poisonous snakes, Poison Apparatus And Biting Mechanism InSnakes	6
7	**Aves** General characteristics and classification upto living Sub-classes Exoskeleton and migration in Birds Principles and aerodynamics of flight in Birds	5
8	**Mammalia** General characteristics and classification uptoliving Sub-classes, Affinities of Prototheria, Exoskeletal derivatives of Mammals Echolocation in Bat and Whale, Adaptive radiation in mammals with reference, To Locomotory Organs.	10
9	**Zoogeographical Realms** Distribution of Birds and Mammals different realms	4

SEC-1: APICULTURE **TOTAL LECTURES: 30**		
SL. NO.	**TOPICS (CREDITS:2)**	**NO. OF LECTURES**
1.	History and importance of apiculture; the systematic position of bees; different species of common honey bees and their Description.	3
2.	The life cycle of the honeybee ;genera morphology and anatomy of different castes of honeybees; emphasis on mouth parts; Non-Apis bee species.	4
3.	Structure Of Different Beehives Or Honeycomb; colonial Organization; bee language and communications.	3
4.	Methods Of Keeping: Indigenous methods and its Disadvantages.	2
5.	Apiary: selection of good apiary site; selection of good bee.	2
6.	Modern methods of Apiculture: Discovery of the movable hive; Langstroth and Newton hive; description of modern movable beehive; accessory equipment used in bee keeping industry. Extraction of honey; important points regarding the handling of bees.	4
7.	Products of Apiculture: Honey, wax, etc., chemical Compositions; use; other products like propolis, royal jelly, apitoxin,etc.	3
8.	Diseases And Enemies: parasitic diseases; other enemies.	3
9.	Types Of Beekeeping, economics: Stationary and migratory; Economics Of Beekeeping, the position of this industry from theIndian perspective.	3
10.	Entrepreneurship in Apiculture: Beekeeping as a source of employment and livelihood; the role of KVIC for beekeeping in India; proposal preparation for funding.	3

Deptt. of Zoology
Chandidas Mahavidyalaya
Khujutipara, Birbhum

SEC-1: VERMICULTURE TOTAL LECTURES: 30		
SL. NO.	**TOPICS (CREDITS:2)**	**NO. OF LECTURES**
1	Earthworm Morphology and Anatomy: Taxonomic Position, external features, internal anatomy.	3
2	Habitat Ecology and reproduction: Burrowers, casts, nocturnal, poikilothermic, ecologicalgrouping. Epigeic sp., Endogenics., Anecics.	3
3	Description of some important earthworm sp: *Eiseniafetida, Eudriluseugeniae, Lumbricusrubellus.*	3
4	Importance Of Earthworm In Agriculture: Role Of earthworm to increase fertility of soil.	3
5	Vermitechnology and Vermiculture: Definition, History At Different countries and India.	3
6	Vermiculture: Methods, wormery, breedingtechnique, indoor outdoor culture, mono-and Polyculture And Merits and Demerits.	5
7	Vermicomposting Of Wastes: Different Methods, storage. Vermiwash: preparation and application.	3
8	Diseases and Predators/pathogen of earthworm. Maintenance Wormeries.	3
9	Marketing and Future perspective: Marketing the products of Vermiculture, quality control, marketing techniques, demand study, advertisement, packing andtransport, and financial support.	4

SEC2: AQUARIUM FISHKEEPING TOTAL LECTURES: 30		
SL. NO.	**TOPICS (CREDITS:2)**	**NO. OF LECTURES**
1	**Introduction to Aquarium Fish Keeping** The potential scope of Aquarium Fish Industry as Cottage Industry, Exotic and Endemic species of Aquarium Fishes	2
2	**Types of Aquaria** (Salinity, Temperature, Species Selection & Location) 1. Aquarium Setup and Accessories. 2.Aquarium Filters and types of filtration methods (Mechanical, Chemical & Biological – Nitrogen Cycle); Precautions to be taken foran ideal aquarium;3.Criteria Of Selection For Aquarium Fishes	6

Deptt. of Zoology
Chandidas Mahavidyalaya
Khujutipara, Birbhum

3	**Biology Of Aquarium Fish** Aquarium Fish biology (Breeding, Feeding economic importance etc),sexual dimorphism of Freshwater and marine aquarium fish.	2
4	**Aquarium Fishes** 1. Freshwater ornamental fishes -Guppy, Gold fish and Angelfish. 2. Brackish ornamental fishes - Black Molly, Sword tail & Rayfish. 3. Marine ornamental fishes- Anemone fish, Moorish idol, Butterfly fish.	6
5	**Food And Feeding Of Aquarium Fishes** 1. Use of Live Fish Food Organisms (Advantages AndDisadvantages Of Livefood), 2. Preparation And Composition Of Formulated Fish Feeds 3. Aquarium Fish As Larval Predator	4
6	**Aquarium Fish Diseases** Parasitic, Bacterial, Viral, Protozoan, Fungal & Deficiency Diseases.	2
7	1. Breeding Habits. 2. Hatching and production of monosex fishes.	1
8	**Maintenance of Aquarium** General Aquarium maintenance; Water quality requirements: Maintenance and Temperature control; Budget for setting up an Aquarium/ornamental Fish Farm as a Cottage Industry	2
9	**Fish Transportation** 1. Live Fish Transport. 2.Conditioning, Packaging and forwarding technique andquarantine methods. 3. Factors associated with live fish transport.	3
10	**Maintenance** 1. General Aquarium maintenance. 2. Budget for setting up an Aquarium Fish Farm as a CottageIndustry.	2

Deptt. of Zoology
Chandidas Mahavidyalaya
Khujutipara, Birbhum

SEC2: SERICULTURE TOTAL LECTURES: 30		
SL. NO.	**TOPICS (CREDITS:2)**	**NO. OF LECTURES**
1.	History Of Sericulture; the systematic position of silk moths; differentspecies of silk moths, their description.	3
2.	Biology of Mulberry Plants: Description Mulberry. Salient Features of family Moraceae; Phyto-geography and systematic of the genus *Morus* L. And Its Species; Morphology and anatomy of mulberry plant; Different cultivars of mulberry; Floral Biology of mulberry: Structure of male and female flowers, catkins	4
3	Mulberry Cultivation: Processes Of Cultivation, irrigation process, application of fertilizer both inorganic and organic likes vermicomposting. Diseases of mulberry plants Leaf: Leaf spot, Powdery mildew, Leaf Rust, Leaf Blight. Diseases Of Mulberry Root: Root rot disease, Root knot disease. Pest management of Mulberry plants, Major and Minor: Name, patternattack, prevention and control.	4
4.	Silkworm Morphology: of the egg, larva, pupa, adult of *Bombyx mori*. Silkworm Anatomy *Bombyx mori*: Digestive System: Larva,Circulatory system: Larva, pupa, adult, Nervous System: Larva, adult, Silk Gland: Larva, Reproductive System: Adult.	3
5.	Silkworm Diseases of *Bombyx mori*: Protozoan disease, Bacterial Disease, Fungal disease, Viral Disease, Sotto, Silkworm Pests of *Bombyx mori*: Uzifly, Ants, Dermestid Beetles.	3
6.	Mulberry Silkworm Rearing: Model rearing house, Rearing appliances, disinfection, disinfectants, bed cleaning, feeding of worms. Rearing of larvae: techniques of rearing of different tages of larvae.	4
7.	Harvesting of cocoon: Sex determination of cocoon, harvesting of cocoon.	2
8.	Post Cocoon And Silk Collection Technology: Cocoon Stifling (sundrying, steam stifling, hot air stifling) and storage. Deflossing, cocoon riddling, mixing or blending, cocoon cooking, brushing. Types Of Reeling Machines, reeling operation, reeling end formation.Degumming, bleaching, dyeing silk yarn. Twisting, Reeling, Re-reeling, lacing, skeining and testing of raw silkmaterial, Weaving Of silk.	4
9.	Entrepreneurship Sericulture: Sericulture Sasource Of Employment and livelihood; the role of CSB in supporting and guiding entrepreneurship.	3

Deptt. of Zoology
Chandidas Mahavidyalaya
Khujutipara, Birbhum

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Ref No: *Date:*

Three-Year Zoology General Degree Course (CBCS)
Module

CORE COURSE I: ANIMAL DIVERSITY (Theory)		No. of Classes
Module 1	• General characters and classification of Subkingdom Protozoa up to Phylum (Levine et al., 1980). • Locomotory Organelles and locomotion in Protozoa.	3
Module 2	• General characters and classification up to classes of Phylum Porifera. • Canal System in *Sycon sp.*	3
Module 3	• General characters and classification up to classes of Phylum Cnidaria. • Polymorphism in Hydrozoa.	3
Module 4	• General characters and classification up to classes of Phylum Platyhelminthes. • Life history of *Taenia solium.*	3
Module 5	• General characters and classification up to classes of Phylum Nematoda. • Life history of *Ascaris lumbricoides* and its parasitic adaptations.	3
Module 6	• General characters and classification up to classes of Phylum Annelida. • Nephridia in Annelida.	3
Module 7	• General characters and classification up to classes of Phylum Arthropoda. • Vision in insect. • Metamorphosis in Insects.	5
Module 8	• General characters and classification up to classes of Phylum Mollusca. • Respiration in *Pila sp.*	3
Module 9	• General characters and classification up to classes of Phylum Echinodermata. • Water-vascular system in *Asterias sp.*	4
Module 10	• General features of Protochordates. • Feeding in *Branchiostoma sp.*	2
Module 11	• General features and classification up to classes of Agnatha.	2
Module 12	• General features of Pisces and Classification up to Subclasses (Romer, 1959). • Osmoregulation in Fishes.	3
Module 13	• General features of Amphibia and Classification up to living orders (Duellman & Trueb, 1986).	3

Deptt. of Zoology
Chandidas Mahavidyalaya
Khujutipara, Birbhum

	• Metamorphosis in Toad.	
Module 14	• General features of Reptiles and Classification up to living Subclass (Young, 1981). • Poisonous and non-poisonous snakes & biting mechanism in snakes.	4
Module 15	• General features and Classification up to orders (Young, 1981) of Aves. • Flight adaptations in birds.	3
Module 16	• Classification up to Subclasses of Mammals (Young, 1981). • Origin & distribution of Cranial nerves in *Cavia sp.*	3
CORE COURSE I: ANIMAL DIVERSITY (Practical)		
Module 1	• Identification of Invertebrate specimens.	4
Module 2	• Identification of Vertebrate specimens.	4
Module 3	• Study of transverse section of male and female *Ascaris sp.* • Identification of poisonous and non-poisonous snakes.	3
CORE COURSE II: COMPARATIVE ANATOMY AND DEVELOPMENTAL BIOLOGY OF VERTEBRATES (Theory)		
Module 1	• Derivatives of integument with reference to glands and digital tips.	3
Module 2	• Evolution of visceral arches.	2
Module 3	• Brief account of alimentary canal and digestive glands.	4
Module 4	• Brief account of gills, lungs, air sacs and swim bladder.	3
Module 5	• Evolution of heart and aortic arches.	4
Module 6	• Evolution of kidney and urinogenital ducts.	3
Module 7	• Comparative account of brain.	2
Module 8	• Classification of receptors. • Brief account of auditory receptors in vertebrate.	3
Module 9	• Gametogenesis. • Fertilization. • Early development of frog and chick. • Types of morphogenetic movements. • Neurulation in frog embryo.	12
Module 10	• Implantation of embryo in humans. • Formation of human placenta and functions. • Types of placenta on the basis of histology. • Metamorphic events in frog life cycle and its hormonal regulation.	6
Module 11	• Fundamental processes in development. • Intercellular communication. • Cell movements and cell death.	8
CORE COURSE II: COMPARATIVE ANATOMY AND DEVELOPMENTAL BIOLOGY OF VERTEBRATES (Practical)		
Module 1	• Identification of skull, limb bones and girdles of *Columba sp.* and *Cavia sp.*	3
Module 2	• Study of developmental stages in Frog - whole mounts and sections through permanent slides or photomicrographs.	3

Deptt. of Zoology
Chandidas Mahavidyalaya
Khujutipara, Birbhum

Module 3	• Study of the different types of placenta- histological sections through permanent slides or photomicrographs.	3
Module 4	• Examination of gametes - frog/rat - sperm and ova through permanent slides or photomicrographs.	3
CORE COURSE III: PHYSIOLOGY AND BIOCHEMISTRY (Theory)		
Module 1	• Structure of a neuron. • Action potential and its propagation in myelinated and non-myelinated nerve fibres.	5
Module 2	• Ultra-structure of skeletal muscle. • Molecular and chemical basis of muscle contraction.	5
Module 3	• Physiology of digestion in the alimentary canal. • Absorption of carbohydrates, proteins, lipids.	5
Module 4	• Pulmonary ventilation, Respiratory volumes and capacities. • Transport of Oxygen and carbon dioxide in blood.	5
Module 5	• Structure of nephron. • Mechanism of Urine formation.	6
Module 6	• Composition of blood & Homeostasis. • Structure of Heart, Origin and conduction of the cardiac impulse. • Cardiac cycle.	7
Module 7	• Hormonal control of spermatogenesis. • Hormonal control of menstrual cycle. • Structure and function of pituitary, thyroid, pancreas and adrenal.	8
Module 8	• Structure & Types of Carbohydrates. • Metabolism of Carbohydrates. • Electron transport chain.	5
Module 9	• Fats and oils; classes of lipids; Lipoproteins. • Biosynthesis and β oxidation of palmitic acid.	5
Module 10	• Proteins and their biological functions. • Functions & physicochemical properties of amino acids. • Peptides – structure and properties. • Primary, secondary, tertiary and quaternary structures of protein. • Transamination, Deamination and Urea Cycle.	5
Module 11	• Classification of Enzymes and their mechanism of action. • Enzyme Kinetics- Inhibition and Regulation.	4
CORE COURSE III: PHYSIOLOGY AND BIOCHEMISTRY (Practical)		
Module 1	• Preparation of hemin crystals.	2
Module 2	• Identification of permanent histological sections of mammalian pituitary, thyroid, pancreas, adrenal gland, small intestine, liver, lung, kidney.	2
Module 3	• Qualitative tests to identify functional groups of carbohydrates in given solutions: Glucose (Benedict's test), Sucrose (Iodine test).	3
Module 4	• Quantitative estimation of total protein in given solutions by Lowry's method.	2

Deptt. of Zoology
Chandidas Mahavidyalaya
Khujutipara, Birbhum

Module 5	• Study of activity of salivary amylase under optimum conditions.	1
CORE COURSE IV: GENETICS AND EVOLUTIONARY BIOLOGY(Theory)		
Module 1	• Mendel's work on transmission of traits. • Genetic Variation & molecular basis of Genetic Information.	3
Module 2	• Principles of Inheritance and chromosome theory of inheritance. • Extension of Mendelian Genetics.	5
Module 3	• 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.	5
Module 4	• Chromosomal Mutations. • Gene mutations.	7
Module 5	• Chromosomal mechanisms of sex determination. • Dosage compensation (human).	4
Module 6	• Origin of biomolecules. • Origin of Life.	2
Module 7	• Lamarckism. • Darwinism, Neo-Darwinism.	3
Module 8	• Types of fossils. • Incompleteness of fossil record. • Dating of fossils. • Phylogeny of horse.	3
Module 9	• Organic variations. • Isolating Mechanisms. • Types of natural selection (Directional, Stabilizing, Disruptive). • Artificial selection.	5
Module 10	• Biological species concept (Advantages and Limitations). • Modes of speciation (Allopatric, Sympatric).	4
Module 11	• Macro-evolutionary principles (Darwin's Finches).	5
Module 12	• Mass extinction (Causes, Names of five major extinctions, K-T extinction in detail). • Role of extinction in evolution.	4
CORE COURSE IV: GENETICS AND EVOLUTIONARY BIOLOGY (Practical)		
Module 1	• Study of Mendelian Inheritance and gene interactions using suitable examples. Verify the results using Chi-square test.	2
Module 2	• Study of Linkage, recombination, gene mapping using the data.	2
Module 3	• Study of Human Karyotypes; normal and abnormal (Turner's, Down's and Klinefelter syndrome) from photographs.	2

Deptt. of Zoology
Chandidas Mahavidyalaya
Khujutipara, Birbhum

Module 4	• Study of fossil evidences from plaster cast models /pictures.	1
Module 5	• Study of homology and analogy from suitable specimens/ pictures.	1
Module 6	• Phylogeny of horse with diagrams. • Darwin's Finches with diagrams.	1
DISCIPLINE SPECIFIC ELECTIVE COURSE 1: APPLIED ZOOLOGY (Theory)		
Module 1	• Introduction to Host-parasite Relationship.	3
Module 2	• Transmission, Prevention and control of Tuberculosis. • Transmission, Prevention and control of Typhoid.	7
Module 3	• Brief account of *Rickettsia prowazekii.* • Brief account of *Borrelia recurrentis.* • Brief account of *Treponema pallidum.*	3
Module 4	• Life history and pathogenicity of *Entamoeba histolytica.* • Life history and pathogenicity of *Plasmodium vivax.* • Life history and pathogenicity of *Trypanosoma gambiense.*	6
Module 5	• Life history and pathogenicity of *Ancylostoma duodenale.* • Life history and pathogenicity of *Wuchereria bancrofti.*	4
Module 6	• Biology, Control and damage caused by different pests.	8
Module 7	• Medical importance and control of *Pediculus humanus corporis, Xenopsylla cheopis.* • Medical importance and control of *Anopheles, Culex, Aedes sp.*	8
Module 8	• Preservation of semen and artificial insemination in cattle.	3
Module 9	• Principles of poultry breeding. • Management of breeding stock and broilers. • Processing and preservation of eggs.	4
Module 10	• Genetic improvements in aquaculture industry. • Induced breeding and transportation of fish seed.	4
DISCIPLINE SPECIFIC ELECTIVE COURSE 1: APPLIED ZOOLOGY (Practical)		
Module 1	• Identification of *Plasmodium vivax, Entamoeba histolytica, Ancylostoma duodenale* and *Wuchereria bancrofti* and their life stages through permanent slides/photomicrographs or specimens.	3
Module 2	• Identification of arthropod vectors associated with human diseases: *Pediculus, Culex,Anopheles, Aedes* and *Xenopsylla.*	2
Module 3	• Study and Identification of insect damage to different plant parts/stored grains through damaged products/photographs.	2
Module 4	• Identifying features and economic importance of *Nilaparvata lugens, Apion corchori, Scirpophaga incertulus, Callosobruchus chinensis, Sitophilus oryzae* and *Tribolium castaneum.*	3

Deptt. of Zoology
Chandidas Mahavidyalaya
Khujutipara, Birbhum

DISCIPLINE SPECIFIC ELECTIVE COURSE 1 (OR): AQUATIC BIOLOGY(Theory)		
Module 1	• Brief introduction to the aquatic biomes. • Fresh water ecosystem (lakes, wetlands, streams and rivers). • Estuary and marine eco system (inter-tidal zones, oceanic pelagic zone, marine benthic zone and coral reefs).	10
Module 2	• Origin and classification of lakes. • Lake as an Ecosystem. • Different stages of stream development. • Adaptation of hill- stream fishes.	20
Module 3	• Salinity and density of Sea water, Continental shelf. • Adaptations of deep-sea organisms. • Coral reefs. • Seaweeds.	10
Module 4	• Causes of pollution: Agricultural, Industrial, Sewage, Thermal and Oil spills. • Eutrophication, Management and conservation (legislations). • Sewage treatment. • Water quality assessment- BOD and COD.	10
DISCIPLINE SPECIFIC ELECTIVE COURSE 1 (OR): AQUATIC BIOLOGY(Practical)		
Module 1	• Determination of the area of a lake using graphimetric and gravimetric method	03
Module 2	• Identification of the important macrophytes, phytoplanktons and zooplanktons present in a lake ecosystem	03
Module 3	• Determination of the amount of transparency, Dissolved Oxygen, and Free Carbon dioxide, in water collected from a nearby lake / water body.	03
Module 4	• Instruments used in limnology (Secchi disc, Van Dorn Bottle, Conductivity meter, Turbidity meter, PONAR grab sampler) and their significance.	03

Deptt. of Zoology
Chandidas Mahavidyalaya
Khujutipara, Birbhum

DISCIPLINE SPECIFIC ELECTIVE COURSE 2: IMMUNOLOGY (Theory)		
Module 1	• Introduction to basic concepts in immunology. • Components of immune system. • Principles of innate and adaptive immune system.	5
Module 2	• Haematopoiesis. • Cells of immune system and organs (primary and secondary lymphoid organs) of the immune system.	8
Module 3	• Basic properties of antigens, B and T cell epitopes. • Haptens and adjuvants.	5
Module 4	• Structure, classes and function of antibodies. • Monoclonal antibodies. • Antigen antibody interactions as tools for research and diagnosis	8
Module 5	• Structure and functions of MHC. • Exogenous and endogenous pathways of antigen presentation and processing. • Basic properties and functions of cytokines. • Complement system: Components and pathways.	12
Module 6	• Gell and Coombs' classification and brief description of various types of hypersensitivities. • Introduction to concepts of autoimmunity and immunodeficiency.	10
Module 7	• General introduction to vaccines. • Types of vaccines.	2
DISCIPLINE SPECIFIC ELECTIVE COURSE 2: IMMUNOLOGY (Practical)		
Module 1	• Demonstration of lymphoid organs in human through model/ photograph.	2
Module 2	• Histological study of spleen, thymus and lymph nodes through slides/photographs.	2
Module 3	• Preparation of stained blood film to study various types of blood cells.	2
Module 4	• ABO blood group determination.	2

Deptt. of Zoology
Chandidas Mahavidyalaya
Khujutipara, Birbhum

DISCIPLINE SPECIFIC ELECTIVE COURSE 2 (OR) : INSECT, VECTORS AND DISEASES (Theory)		
Module 1	• General Features of Insects. • Morphological features, Head – Eyes, Types of antennae. • Mouth parts with respect to feeding habit.	6
Module 2	• Brief introduction to Vectors (mechanical and biological). • Reservoirs & Host-vector relationship. • Adaptations as vectors & Host specificity.	6
Module 3	• Detailed features of insect orders as vectors – Diptera, Siphonoptera, Siphunculata, Hemiptera.	8
Module 4	• Study of important Dipteran vectors – Mosquitoes, Sand fly, Houseflies. • Study of mosquito-borne diseases – Malaria, Dengue, Chikungunya, Viral encephalitis, Filariasis. • Control of mosquitoes.	14
Module 5	• Fleas as important insect vectors. • Study of Flea-borne diseases – Plague, Typhus fever. • Control of fleas.	6
Module 6	• Human louse (Head, Body and Pubic louse) as important insect vectors. • Control of human louse.	4
Module 7	• Bugs as insect vectors. • Blood sucking bugs. • Chagas disease. • Bed bugs as mechanical vectors. • Control and prevention measures of bugs.	6
DISCIPLINE SPECIFIC ELECTIVE COURSE 2 (OR) : INSECT, VECTORS AND DISEASES (Practical)		
Module 1	• Mounting and Study of different kinds of mouthparts of insects.	3
Module 2	• Identification of following insect vectors through permanent slides/photographs.	3
Module 3	• Study of different diseases transmitted by above insect vectors.	3

Deptt. of Zoology
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Khujutipara, Birbhum

SKILL ENHANCEMENT COURSE 1: APICULTURE		
Module 1	• History, Classification and Biology of Honey Bees. • Social Organization of Bee Colony.	4
Module 2	• Artificial Bee rearing (Apiary), Beehives – Newton and Langstroth. • Bee Pasturage. • Selection of Bee Species for Apiculture. • Methods of Extraction of Honey (Indigenous and Modern).	10
Module 3	• Diseases and Enemies of Honey bees. • Control and Preventive measures.	5
Module 4	• Products of Apiculture Industry and its Uses (Honey, Bees Wax, Propolis)	2
Module 5	• Bee Keeping Industry – Recent Efforts. • Modern Methods in employing artificial Beehives for cross pollination in horticultural gardens.	4
SKILL ENHANCEMENT COURSE 2: MEDICAL DIAGNOSTICS		
Module 1	• Introduction to Medical Diagnostics and its Importance.	2
Module 2	• Blood composition. • Preparation of blood smear and Differential Leucocyte Count (D.L.C) using Leishman's stain. • Platelet count using haemocytometer. • Erythrocyte Sedimentary Rate (E.S.R), Packed Cell Volume (P.C.V.).	10
Module 3	• Urine Analysis: Physical characteristics & abnormal constituents.	4
Module 4	• Causes, types, symptoms, complications, diagnosis and prevention of Diabetes (Type I and Type II), Hypertension (Primary and secondary). • Testing of blood glucose using Glucometer/Kit.	6
Module 5	• Causes, types, symptoms, diagnosis and prevention of Tuberculosis and Hepatitis, Malaria (Microscope based and ELISA based).	3
Module 6	• LFT & Lipid profiling.	3
Module 7	• Antibiotic Sensitivity Test.	3
Module 8	• Tumour detection and metastasis. • Medical imaging: X-Ray of Bone fracture, PET, MRI and CT scan (using photographs).	3

Deptt. of Zoology
Chandidas Mahavidyalaya
Khujutipara, Birbhum

SKILL ENHANCEMENT COURSE 3: SERICULTURE		
Module 1	• Sericulture: Definition, history and present status; Silk route. • Types of silkworms, Distribution and Races. • Exotic and indigenous races. • Mulberry and non-mulberry Sericulture.	3
Module 2	• Life cycle of *Bombyx mori*. • Structure of silk gland and secretion of silk.	3
Module 3	• 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.	13
Module 4	• Pests of silkworm: Uzi fly, demisted beetles and vertebrates. • Pathogenesis of silkworm diseases: Protozoan, viral, fungal and bacterial. • Control and prevention of pests and diseases.	4
Module 5	• Prospectus of Sericulture in India: Sericulture industry in different states, employment, potential in mulberry and non-mulberry sericulture.	2
SKILL ENHANCEMENT COURSE 4: COMMUNITY NUTRITION AND HEALTH STATISTICS		
Module 1	• Concept of community. • Types of community factors affecting health of community – environmental, social, political, cultural and economical.	3
Module 2	• Nutritional anthropometry. • Biochemical tests, biophysical methods.	3
Module 3	• Standard for reference & its importance in nutritional anthropometry. • Techniques of measuring height, weight, head, chest and arm circumference, interpretation of these measurements. • Use of growth chart.	6
Module 4	• Concept of disease (endemic, epidemic and pandemic, acute and chronic, communicable and non-communicable; zoonosis, epizootic, enzootic, vector-borne and nosocomial). • Rate of a disease in a population (attack rate, morbidity rate, mortality rate, incidence and prevalence). • Nature of infectious and communicable diseases, factors that influence the epidemiology of a disease. • Epidemiological methods: descriptive studies, analytical studies and experimental studies. • Epidemiology, mode of transmission, disease propagation, prevention and treatment of Tuberculosis.	12

Deptt. of Zoology
Chandidas Mahavidyalaya
Khujutipara, Birbhum

	• Malnutrition and Tuberculosis.	
Module 5	• Basic concepts of statistics – utility and limitations of Statistics. • Measures of central tendency & Quartiles. • Measures of Variation, Standard Deviation, Coefficient of Variation. • Presentation of data-Bar Diagram, Histogram, Frequency Polygon, Frequency Distribution Curves, Ogives.	10
Module 6	• Concepts and definitions of probability, Additive and Multiplicative laws. • Conditional probability. • Probability distributions & Applications to hospital environment.	4
Module 7	• Simple Correlation and Simple Regression. • Time Series – components, fitting a trend line by least squares method. • Testing of Hypothesis: Null and alternative hypotheses, Chi-Square and t-tests.	4
Module 8	• Analysis of Variance: One-way and two-way classification.	2
Module 9	• Health Informatics: Concept and applications.	2

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