B.Sc. Zoology 1st Semester

Course Title: Invertebrate-I: Non-Chordates (Theory)

Course code : ZOO-C-01 Credit: 3

Course Outcome:
1: To know the basic concept of biosystematics and procedure in taxonomy.
2: Identify the taxonomic status of the entire non chordates up to annelids and understand the evolutionary model of the group.
3: To understand the general biology of few selected non chordates useful to mankind.
4: To know about some of the important and common protozoan's, helminthes of parasitic nature causing diseases in human beings.
5: To Understand the importance of mesmerism in annelids.

Contents:

UNIT: I INVERTEBRATES: Concept, diversity, and outline classification- major and minor phyla

Protozoa: Classification up to order, Locomotion, nutrition, reproduction Structural organisation of Paramaecium/Euglena Protozoa and Human Disease

UNIT: II Porifera: Classification up to order and General Organisation Skeleton and canal system

Coelenterata: General characters and Classification up to order, Polymorphism, Coral reefs and their formation;

UNIT: III Ctenophora: General Characters & Classification upto order Affinities

Platyhelminthes: Classification up to order Features of significance in life-cycle of Fasciola hepatica Parasitic adaptations of Taenia

UNIT: IV Aschelminthes: General Characters and Classification up to order Some common Nematode Parasites of Man- Ascaris (common roundworm

Rotifera: Morphological and anatomical features Affinities

B.Sc. Zoology 1st Semester

Course Title: Invertebrate-I: Non-Chordates (Practical)

Course code: ZOO-C-01 Credit: 1

Course Outcome:
1: To get familiar with the different types of invertebrate with the help of the preserved animals available in the laboratory.
2: To learn the techniques how to prepare the temporary & permanent slides.

Contents:

1. Microscope and its practical use
2. Animal Diversity (identification from specimen/model) Protozoa: Euglena, Plasmodium, Paramecium; Porifera: Grantia, Spongilla; Cnidaria: Physalia, Aurelia, sea anemone ; Platyhelminthes: Taenia solium, liver fluke and tapeworm; Aschelminthes: Ascaris- male and female.
3. Identification of prepared slides: TS of sycon, Herdmania spicules, Sponge spicules, TS of Ascaris

B.Sc. Zoology 1st Semester

Course Title: Invertebrate-I: Non-Chordates (Theory)

Course Code: ZOO-M-01 **Credit: 3**

Course Outcome:
1: To know the basic concept of biosystematics and procedure in taxonomy.
2: Identify the taxonomic status of the entire nonchordates up to annelids and understand the evolutionary model of the group.
3: To understand the general biology of few selected nonchordates useful to mankind.
4: To know about some of the important and common protozoans, helminthes of parasitic nature causing diseases in human beings.
5: To Understand the importance of mesmerism in annelids.

Contents:

UNIT: I INVERTEBRATES: Concept, diversity, and outline classification- major and minor phyla

Protozoa: Classification up to order, Locomotion, nutrition, reproduction Structural organisation of Paramaecium/Euglena Protozoa and Human Disease

UNIT: II Porifera: Classification up to order and General Organisation Skeleton and canal system

Coelenterata: General characters and Classification up to order, Polymorphism, Coral reefs and their formation;

UNIT: III Ctenophora: General Characters & Classification upto order Affinities

Platyhelminthes: Classification up to order Features of significance in life-cycle of Fasciola hepatica Parasitic adaptations of Taenia

UNIT: IV Aschelminthes: General Characters and Classification up to order Some common Nematode Parasites of Man- Ascaris (common roundworm

Rotifera: Morphological and anatomical features Affinities

B.Sc. Zoology 1st Semester

Course Title: Invertebrate-I: Non-Chordates (Practical)
Course Code: ZOO-M-01 Credit: 1

Course Outcome:
1: To get familiar with the different types of invertebrate with the help of the preserved animals available in the laboratory.
2: To learn the techniques how to prepare the temporary & permanent slides.

Contents:

1. Microscope and its practical use
2. Animal Diversity (identification from specimen/model) Protozoa: Euglena, Plasmodium, Paramecium; Porifera: Grantia, Spongilla; Cnidaria: Physalia, Aurelia, sea anemone; Platyhelminthes: Taenia solium, liver fluke and tapeworm; Aschelminthes: Ascaris- male and female.
3. Identification of prepared slides: TS of sycon, Herdmania spicules, Sponge spicules, TS of Ascaris

B.Sc. 2nd semester

Course Title: Invertebrate-II: Non-Chordates (Theory)

Course code: ZOO-C-02 Credit: 3

1: To understand the general characters and classification up to orders in Annelids with coelom and metamerism.
2: To understand the general characters and classification up to orders in Arthropoda. Also to understand the different larval forms of crustacia and different types of mouth parts in insect.
3: To understand the General characters and classification up to Orders in Mollusca and to understand the gastrovascular system, torsion and detorsion.
4: To understand the General characters and classification up to Orders in Echinodermata and their water vascular system.
5: To know about the significance of Phylogenetic status of Limulus &Peripatus

Contents:

UNIT I:

Annelida: General characters and classification upto orders with example. Coelom and metamerism in annelids. Excretion, reproduction and importance of Earthworm, General features and reproductive system of Leech. Trochophore larva and its significance.

UNIT II:

Arthropoda General characters and classification upto orders with example, Larval forms of crustacean, respiration in arthropods (cockroach), different types of mouth parts in insects (Cockroach, mosquito), compound eye. Insect metamorphosis, social organization of termites. Phylogenetic status of Limulus.

UNIT III :

Mollusca: General characters and classification upto orders with example, digestive, respiratory and excretory system of Pila, shell diversity, torsion and detorsion in Gastropoda.

UNIT IV:

Echinodermata: General characters and Classification upto orders with example, water vascular system of starfish. Regeneration of echinodermata, larval forms Affinities with chordates.

B.Sc. 2nd Semester
Course Title: Invertebrate-II: Non-Chordates (Practical)

Course code : ZOO-C-02 Credit: 1

Course Outcome:
1: To visualised the different types of invertebrate with the help of different Museum specimen.
2: To observe the life cycle of Muga silk worm or Eri Silk worm at laboratory and also in the field.
3: To observe and understand the differences of mouth parts of different types of Mosquitoes.
4. To understand the salivary apparatus of insect with the help of dissecting the Cockroach.

Contents:

1. Study of Museum Specimens- (Identification and Classification upto order. Generic name must be given). Leech, Earthworm, Cockroach, Spider, Honey bee, Grasshopper, Stick insect, , Prawn, Crab, Sepia, Pila, Octopus, Antedon, Clypeaster, Starfish,ophiura, Sea cucumber.

2. Study of the life cycle of Muga Silk worm.

3. Study of the mouth parts of Mosquito.

4. To dissect and study the Salivary Apparatus of Cockroach.

5. Mounting (Permanent) – Euglena, Hydra

B.Sc. 2nd semester

Course Title: Invertebrate-II: Non-Chordates (Theory)

Course code : ZOO-M-02 Credit: 3

1: To understand the general characters and classification up to orders in Annelids with coelom and metamerism.
2: To understand the general characters and classification up to orders in Arthropoda. Also to understand the different larval forms of crustacia and different types of mouth parts in insect.
3: To understand the General characters and classification up to Orders in Mollusca and to understand the gastrovascular system, torsion and detorsion.
4: To understand the General characters and classification up to Orders in Echinodermata and their water vascular system.
5: To know about the significance of Phylogenetic status of Limulus &Peripatus

Contents:

UNIT I:

Annelida: General characters and classification upto orders with example. Coelom and metamerism in annelids. Excretion, reproduction and importance of Earthworm, General features and reproductive system of Leech. Trochophore larva and its significance.

UNIT II:

Arthropoda General characters and classification upto orders with example, Larval forms of crustacean, respiration in arthropods (cockroach), different types of mouth parts in insects (Cockroach, mosquito), compound eye. Insect metamorphosis, social organization of termites. Phylogenetic status of Limulus.

UNIT III :

Mollusca: General characters and classification upto orders with example, digestive, respiratory and excretory system of Pila, shell diversity, torsion and detorsion in Gastropoda.

UNIT IV:

Echinodermata: General characters and Classification upto orders with example, water vascular system of starfish. Regeneration of echinodermata, larval forms Affinities with chordates.

B.Sc. 2nd semester

Course Title: Invertebrate-II: Non-Chordates (Practical)

Course code: ZOO-M-02 Credit: 1

Course Outcome:
1: To visualised the different types of invertebrate with the help of different Museum specimen.
2: To observe the life cycle of Muga silk worm or Eri Silk worm at laboratory and also in the field.
3: To observe and understand the differences of mouth parts of different types of Mosquitoes.
4. To understand the salivary apparatus of insect with the help of dissecting the Cockroach.

Contents:

1. Study of Museum Specimens- (Identification and Classification upto order. Generic name must be given). Leech, Earthworm, Cockroach, Spider, Honey bee, Grasshopper, Stick insect, , Prawn, Crab, Sepia, Pila, Octopus, Antedon, Clypeaster, Starfish,ophiura, Sea cucumber.

2. Study of the life cycle of Muga Silk worm.

3. Study of the mouth parts of Mosquito.

4. To dissect and study the Salivary Apparatus of Cockroach.

5. Mounting (Permanent) – Euglena, Hydra

B.Sc. Zoology 3rd Semester

Course Title: Diversity of Chordates (Theory)

Course code: ZOO-C-03 **Credit: 3**

1: To understand the General Characteristics and Classification of different types of Chordates and to differentiate between Chordates and Non-chordates and to understand the affinities of Urochordata, Cephalochordata and Vertebrata.
2: To understand the Biological significance of Cyclostomata, Ostracodermi and Placodermi and To understand the significance of air bladder of Pisces and the migration pattern of Pisces.
3: To understand the skull types of Reptiles and biting mechanism of poisonous snakes.
4: To understand the Flight adaptation, Mechanism of flights and the migration of Birds.
5: To understand about the egg laying mammals, pouched mammals and primates.

Contents:

UNIT I:

1. An introduction to the Phylum Chordata, Three fundamental Chordate characteristics, Comparison between Chordates and Non-Chordates
2. Protochordata: General features, Classification.
3. Subphyllum-I: Hemichordata, Systematic position, Phylogeny and Affinities of Blanoglossus.

UNIT II:

1. Subphyllum-II: Urochordata, Affinities and Systematic position of Herdmania.
2. Subphullum-III: Cephalochordata, Primitive, Degenerate and Specialized characters of Branchiostoma (=Amphioxus)
3. Subphyllum-IV: Vertebrata, General Characteristics, Chordates versus Vertebrates.

UNIT III:

1. Biological significance of Ostracodermi, Affinities of Cyclostomata, Biological significance of Placodermi.
2. Pisces: Classification up to order; Air bladder and its signification and migration.
3. Amphibia: Classification up to order; respiration, parental care.

UNIT IV:

1. Reptilia: Classification up to order; skull types, status of Sphenodon, Biting mechanism of poisonous snakes.
2. Aves: Classification up to order; Flight adaptation and mechanism of flight and perching in birds, migration in birds.
3. Mammalia: Classification up to order; dentition, general features of egg laying mammals, pouched-mammals, aquatic mammals and primates.

B.Sc. Zoology 3rd Semester

Course Title: Diversity of Chordates (Practical)

Course code: ZOO-C-03 Credit: 1

To understand the mounting procedure of various tissue like blood film, epithelial tissue. 2: To make student capable of making permanent slides and studying the internal structure. 3: Study of skeletal system of vertebrate
4: To understand the taxonomic classification through museum specimens of vertebrates.

Contents:

1. Mounting: Blood film of Frog and mammal, scales of fish , Squamous and ciliated epithelium, striated and non-straiated muscle.
2. Identification of Permanent slide & bones:
T.S. through pharyngeal region of Amphioxus, T.S. of skin, stomach, intestine, liver pancreas, kidney, testis, ovary of mammals.
Axial and appendicular skeleton of fowl, Guineapig/Rat. Different types of skull in birds.
3. Study of Museum Specimens (Identification and classification up to order): Balanoglossus, Herdmania, Amphioxus, Petromyzon, Myxine, Torpedo (Electric Ray), Hippocampus (Sea horse), Cyprinus (Common carp), Hypopthalmichthys (Silver carp), Clarias (Magur), Axolotl larva, Polypedates, Hoplobatrachus (Indian Bull frog), Draco, Chemeleon, Naja, Hydrophis, Bungarus, Amphiesma, Echis, Lonchura (Spotted mayna), Alcedo (King Fisher), Pteropus.

B.sc Zoology 3rd Semester

Course Title – Immunology

Course code – ZOO-C-04 (Theory)

Credit -3

Learning Outcomes: At the end of the course, the students should be able to:

1. Understand the immune modulator strategies essential for generating or suppressing immune responses as required in hypersensitivity reactions, transplantation, autoimmune diseases and cancer.

1. . Design new methods to improve existing vaccines and other immune other aphetic strategies. Advanced Parasitology and Vector Biology

Contents:

Unit1.Cells of the immune system: T-cell generation activation and differentiation, B-cell- generation activation and differentiation;

Unit 2.Antibody: types, structure, function, production and diversity;

Unit 3. Epitopes and hapten;

Unit- 4. Major Histocompatibility Complex (MHC)- general organization and inheritance of the MHC,MHC molecules and genes;

4. Complement system – classical, alternative and lectin pathways, regulation of complement system, biological consequence of complement activation ;

5. Cytokine receptors-properties of cytokines, cytokine receptors, cytokine

Books recommended:

1. Immunology, Kuby, W.F.Freeman, U.S.A
2. Fundamentals of Immunology, W.Paul

B.sc Zoology 3rd Semester

Course Title – Immunology (Practical)

Course code – ZOO-C-04

Credit -1

1. Histological identification : Primary and secondary lymphoid organs through prepared slide.
2. Preparation of single cell suspension from bone marrow and spleen of mice.
3. Performing the agglutination or precipitation test in ABO blood group

Microbial science: 1. Media preparation for microbial culture .Gram staining of bacteria (Lactobacilus)

B.Sc. Zoology 3rd Semester

Course Title: Diversity of Chordates (Theory)

Course code: ZOO-M-03

Credit: 3

Course Outcome:

1: To understand the General Characteristics and Classification of different types of Chordates and to differentiate between Chordates and Non-chordates and to understand the affinities of Urochordata, Cephalochordata and Vertebrata.
2: To understand the Biological significance of Cyclostomata, Ostracodermi and Placodermi and To understand the significance of air bladder of Pisces and the migration pattern of Pisces.
3: To understand the skull types of Reptiles and biting mechanism of poisonous snakes.
4: To understand the Flight adaptation, Mechanism of flights and the migration of Birds.
5: To understand about the egg laying mammals, pouched mammals and primates.

Contents:

UNIT I:

1.An introduction to the Phylum Chordata, Three fundamental Chordate characteristics, Comparison between Chordates and Non-Chordates
2.Protochordata: General features, Classification.
3.Subphyllum-I: Hemichordata, Systematic position, Phylogeny and Affinities of Blanoglossus.

UNIT II:

4. Subphyllum-II: Urochordata, Affinities and Systematic position of Herdmania.
5. Subphullum-III: Cephalochordata, Primitive, Degenerate and Specialized characters of Branchiostoma (=Amphioxus)
6. Subphyllum-IV: Vertebrata, General Characteristics, Chordates versus Vertebrates.

UNIT III:

7.Biological significance of Ostracodermi, Affinities of Cyclostomata, Biological significance of Placodermi.
8.Pisces: Classification up to order; Air bladder and its signification and migration.
9.Amphibia: Classification up to order; respiration, parental care.

UNIT IV:

10.Reptilia: Classification up to order; skull types, status of Sphenodon, Biting mechanism of poisonous snakes.
11.Aves: Classification up to order; Flight adaptation and mechanism of flight and perching in birds, migration in birds.
12.Mammalia: Classification up to order; dentition, general features of egg laying mammals, pouched-mammals, aquatic mammals and primates.

B.Sc. Zoology 3rd Semester

Course Title: Diversity of Chordates (Practical)

Course code: ZOO-M-03 Credit: 1

Course Outcome:

1: To understand the mounting procedure of various tissue like blood film, epithelial tissue.
2: To make student capable of making permanent slides and studying the internal structure.
3: Study of skeletal system of vertebrate
4: To understand the taxonomic classification through museum specimens of vertebrates.

Contents:

1.Mounting: Blood film of Frog and mammal, scales of fish , Squamous and ciliated epithelium, striated and non-straiated muscle.

2.Identification of Permanent slide & bones:

T.S. through pharyngeal region of Amphioxus, T.S. of skin, stomach, intestine, liver pancreas, kidney, testis, ovary of mammals.

Axial and appendicular skeleton of fowl, Guineapig/Rat. Different types of skull in birds.

3.Study of Museum Specimens (Identification and classification up to order): Balanoglossus, Herdmania, Amphioxus, Petromyzon, Myxine, Torpedo (Electric Ray), Hippocampus (Sea horse), Cyprinus (Common carp), Hypopthalmichthys (Silver carp), Clarias (Magur), Axolotl larva, Polypedates, Hoplobatrachus (Indian Bull frog), Draco, Chemeleon, Naja, Hydrophis, Bungarus, Amphiesma, Echis, Lonchura (Spotted mayna), Alcedo (King Fisher), Pteropus.

B.Sc. Zoology 4th Semester

Course Title: Ecology (Theory)

Course Code: ZOO-C-05 Credit: 3

Course Outcome:

1: To know the distribution of fauna in different realms and their interaction.
2: To understand Animal behavior and response to different instincts
3: To understand the various ecosystem of different animals.
4: To understand the different aspect of pollution
5: To understand the importance of Wildlife conservation & management.

Contents:

UNIT: I

1. Concept and Scope of Ecology, Important terminologies and Approaches to Ecology

2. Ecological factors- Abiotic and Biotic
3. Components of ecosystems, Food chain – detritous and grazing, ecosystem energetics.
4. Ecosystem and its types

UNIT: II

5. Population ecology: Basic concept, Population Character, Population dynamics.
6. Community ecology: Definition and characteristics; Composition, structure, origin. Methods of study of communities; classification of communities.
7. Ecological succession and concept of climax

UNIT: III

8. Biogeochemical cycles –carbon, nitrogen, sulphur cycles, impact of human activity on nutrient cycles.
9. Environmental Pollution- Air, Water, Soil.
10. Natural resource and their conservation.
11. Major environmental regimes of Earth, Environmental monitoring, Environmental impact assessment and environmental management plan.

UNIT: IV

12. Study and concept of different protected areas.

13. Wildlife Management with special reference to Northeast India.

14. National and International efforts for conservation: Indian Wildlife Protection Act, Indian Forest Act, IUCN and criteria for Extinct (EX), Extinct in the wild (EW), critically endangered (CE), Low risk (LR).

B.Sc. Zoology 4th Semester

Course Title: Ecology (Practical)

Course Code: ZOO-C-05 **Credit: 1**

Course Outcome

1: To learn the procedure of determination of pH, DO and CO2 in pond water.
2: To learn how to how to determine the air temperature and humidity.
3: To learn the estimation of Primary productivity in ecosystem, estimation of Chloride of water sample and estimation of total alkalinity and hardness.
4. Study of Zooplanktons and its role in pond ecosystem.

Contents:

1. Determination of PH of pond water and Turbidity of water.
2. Estimation of DO and CO2 in pond water
3. Determination of air temperature and humidity.
4. Estimation of primary productivity in aquatic ecosystem.
5. Estimation of total alkalinity and hardness.
6. Study of zooplanktons and its role in a pond ecosystem.

B.Sc. Zoology 4th Semester

Course Title: Cell Biology (Theory)

Course Code: ZOO-C-06 Credit: 3

Course Outcome

1: To understand the Cell, cell diversity- shape and size. Cell structure- prokaryotes and eukaryotes.
2: To understand the different cell components like Mitochondria, Golgi Complex, Endoplasmic reticulum, Ribosome, Lysosomes and Nucleus.
3: To understand cellular membrane structure and function, fine structure and function of cell organelles.
4: Understand the scope of cell biology as cell is the basic unit of life.
5: To know the basic cytoskeletal structure of cell components.

Contents:

UNIT-I

1. Introduction to cell, cell diversity- size and shape

2. Cell theory and its modern interpretation

3. Cell structure- prokaryotic and eukaryotic

4. Protoplasm- physical and chemical properties

5. Plasma membrane- structure and function.

UNIT-II

1. Cell components- structure and functions of :a) Mitochondria, b) Golgi bodies, c) Endoplasmic reticulum, d) Ribosome, e) Lysosome, f) Nucleus

2. Cell division- types, cell cycle and its mechanics

3. Structure and function of chromosome

4. Cytoskeleton- types, its structure and function. Role of cytoskeleton in formation of mitotic apparatus and chromosome movements.

5. Structure and function of cilia, flagella. Its role in cellular movement.

B.Sc. Zoology 4th Semester

Course Title: Cell Biology (Practical)
Course Code: ZOO-C-06 **Credit: 1**

Course Outcome:

1: To make aware and understand the different types of cells with the help of observing the different types of histological slides of liver, intestine, kidney, testis ovary and lungs.
2: To understand the mitotic stages with the help of onion root tip.
3: To make aware about the different types of instruments for the study of different types of cells. Example- Different types of Microscope, Centrifuge machine, Micropipette, etc.
4: To make aware in the laboratory about the Sex chromatin from buccal epithelium, basic fixatives and stains, etc.

Contents:

1. Histological slides- Liver, Pancreas, Stomach, Intestine, Kidney, Testis, Ovary and Lungs.
2. Study of cell division stages-mitosis and meiosis.
3. Preparation and identification of mitotic stages in onion root tip. .
4. Study of sex chromatin from buccal epithelium.
5. Preparation of basic fixatives and stains.
6. Study of nucleated and non-nucleated RBC.
7. Instrumentation-Principle/function and laboratory use of microscope, centrifuge and micropipette.

B.Sc. Zoology 4th Semester

Course Title: Physiology: Controlling and Coordinating Systems (Theory)

Course code : ZOO-C-07 Credit: 3

Course Outcome:

1: Understand the Importance of physiology and branches of it.
2: To understand the General characteristics of Endocrine system and classification of Hormones.
3: To understand the structure of different endocrine glands like pituitary gland, Thyroid gland, pancreas, Adrenal and the functions of their different hormones.
4: To understand the different functions of steroid and peptide hormones.
5: To understand the structure and function of Testis and Ovary.

Contents:

UNIT I:

1. Nutritional Requirements, Digestion and absorption of dietary Components (Carbohydrates, fats, proteins, vitamins and minerals).

2. Types of respiration: Anaerobic and aerobic, Properties and function of respiratory pigments, Exchange of gases, breathing, Oxygen dissociation curve, control of breathing.

UNIT II:

3. Type of body fluids, Composition and function of different body fluids, Haemopoiesis, Buffer system in blood, Chloride shift, Blood groups and blood clotting mechanism.

4. Types of Heart- Myogenic & Neurogenic, Origin, conduction and regulation of heart beat, Cardiac cycle, Blood pressure.

UNIT III:

5. Types of Nitrogenous wastes- ammonotelic, urotelic and uricotelic, Physiology of urine formation, Regulation of Urine formation.

6. Initiation and conduction of nerve impulse, Synapse and synaptic transmission ytrough myelinated and non-myelinated nerve fibres, Neuro-mascular coordination.

UNIT IV:

7. Types of Muscle tissue, Muscle protein, Chemistry of muscle contraction.

8. Osmoregulation in Vertebrates.

B.Sc. Zoology 4th Semester

Course Title: Physiology: Controlling and Coordinating Systems (Practical)

Course code : ZOO-C-07 Credit: 1

Course Outcome:

1: To aware the knowledge of different cellular structure of different endocrine glands (Pituitary, Thyroid, pancreas, adrenal, Ovary and Testis) with the help of permanent slides.
2: To understand the structure and position of pituitary gland with the help of dissecting the pituitary gland of fishes.
3: To understand the Quantative detection of Carbohydrates, Protein and Lipid.
4: To understand the Enzyme activities with the help of Salivary amylase.

Contents:

1. Preparationoftemporarymounts:Squamousepithelium,Striatedm usclefibres and nervecells
2. Study of permanent slides of Mammalian skin, Cartilage, Bone, Spinal cord, Nervecell,Pituitary,Pancreas,Testis,Ovary,Adrenal,ThyroidandParathyr oid
3. Microtomy: Preparation of permanent slide of any five mammalian(Goat/ rat/mice)tissues

B.Sc. Zoology 4th Semester

Course Title: COMPARATIVE ANATOMY OF VERTEBRATES (Theory)

Course code : ZOO-C-08 Credit: 3

Course Outcome:

1: To understand the integumentary and skeletal system of different vertebrates.
2: To understand the Alimentary canal of different vertebrates and associated glands, dentition, etc.
3: To understand the Respiratory System of different terrestrial and aquatic animals and different structure of respiratory organs in different animals.
4: To understand the digestive system of lower to higher animals and their accessory organs.
5: To understand the General plan of circulation, evolution of heart and aortic arches.

Contents:

UNIT 1:
Integumentary system
Structure, function and derivatives of integument
Skeletal system
Overview of axial and appendicular skeleton, jaw suspension, Visceral arches
Unit 2:
Digestive system
Alimentary canal and associated glands, dentition
Respiratory system
Skin, gills, lungs and air sacs; Accessory respiratory organs
Unit 3:
Circulatory system
General plan of circulation, evolution of heart and aortic arches
Urinogenital system
Succession of kidney, evolution of Urinogenital ducts, types of mammalian uteri
Unit 4:
Nervous system
Comparative account of brain, Autonomic nervous system, spinal cord, cranial nerves in mammals
Sense organs
Classification of receptors, Brief account of visceral and auditory receptors in man

Course Title: COMPARATIVE ANATOMY OF VERTEBRATES (Practical)

Course code : ZOO-C-08 Credit: 1

Course Outcome:

1:Students would be able to know and compare the different anatomical aspect of various organisms.
2: Students will acquire the knowledge of functioning of different body parts.
3: To understand the position of gonads in fishes through dissection.
4: To make students capable to design assignments/models on skeletal system in vertebrates.

Contents:

1. Study of placoid, cycloid and ctenoid scales through permanent slides/photographs.

2. Study of articulated skeleton of human and rabbit.

3. Preparation of temporary slides from the scales.

4. Dissection of fish to study the pituitary gland.

5. Study of structure of any two organs –
Heart, lung, kidney, eye, ear through video recording

B.Sc. Zoology 4th Semester

Course Title: Ecology (Theory)

Course Code: ZOO-M-04 Credit: 3

Course Outcome:

1: To know the distribution of fauna in different realms and their interaction.
2: To understand Animal behavior and response to different instincts
3: To understand the various ecosystem of different animals.
4: To understand the different aspect of pollution
5: To understand the importance of Wildlife conservation & management.

Contents:

UNIT: I

15. Concept and Scope of Ecology, Important terminologies and Approaches to Ecology
16. Ecological factors- Abiotic and Biotic
17. Components of ecosystems, Food chain – detritous and grazing, ecosystem energetics.
18. Ecosystem and its types

UNIT: II

19. Population ecology: Basic concept, Population Character, Population dynamics.
20. Community ecology: Definition and characteristics; Composition, structure, origin. Methods of study of communities; classification of communities.
21. Ecological succession and concept of climax

UNIT: III

22. Biogeochemical cycles –carbon, nitrogen, sulphur cycles, impact of human activity on nutrient cycles.
23. Environmental Pollution- Air, Water, Soil.
24. Natural resource and their conservation.
25. Major environmental regimes of Earth, Environmental monitoring, Environmental impact assessment and environmental management plan.

UNIT: IV

26. Study and concept of different protected areas.

27. Wildlife Management with special reference to Northeast India.

28. National and International efforts for conservation: Indian Wildlife Protection Act, Indian Forest Act, IUCN and criteria for Extinct (EX), Extinct in the wild (EW), critically endangered (CE), Low risk (LR).

B.Sc. Zoology 4th Semester

Course Title: Ecology (Practical)

Course Code: ZOO-M-04 **Credit: 1**

Course Outcome

1: To learn the procedure of determination of pH, DO and CO2 in pond water.
2: To learn how to how to determine the air temperature and humidity.
3: To learn the estimation of Primary productivity in ecosystem, estimation of Chloride of water sample and estimation of total alkalinity and hardness.
5. Study of Zooplanktons and its role in pond ecosystem.

Contents:

7. Determination of PH of pond water and Turbidity of water.

8. Estimation of DO and CO2 in pond water

9. Determination of air temperature and humidity.

10. Estimation of primary productivity in aquatic ecosystem.

11. Estimation of total alkalinity and hardness.

12. Study of zooplanktons and its role in a pond ecosystem.

B.Sc. Zoology 5TH Semester

Course Title: Physiology: Life sustaining systems (Theory)

Course code: ZOO-C-09 Credit: 3

Course Outcome:

1: Understand the function of various systems
2: Seeks to understand the mechanisms that work to keep the human body alive and functioning.
3: Physiological and biochemical understanding through scientific enquiry into the nature of mechanical, physical, and biochemical functions of humans, their organs, and the cells of which they are composed.
4: Students gain fundamental knowledge of physiology and endocrine systems
5: Students gain fundamental knowledge of physiology of homeostasis.

Contents:

UNIT-I: Physiology of Digestion
Digestive System, Mechanical and Chemical Digestion, Absorption of carbohydrates, lipids, proteins, water, minerals and vitamins.

UNIT-II: Physiology of Excretion
Nature of Excretory products; Ammonotelic, Uricotelic and Ureotelic animals;
Functional Architecture of Mammalian Kidney; Structure of Uriniferous tubule; Mechanism of formation of urine.

UNIT-III: Physiology of Respiration
Respiratory System; The mechanism of Respiration: Inspiration and Expiration; Transport of Oxygen and Carbon dioxide; The dissociation curve of Oxyhaemoglobin; Respiratory pigments.

UNIT-IV: Physiology of Circulation
Structure of mammalian heart; Types of circulation; Systematic and Pulmonary circulation; The origin of heart beat; Conduction of heart beat; The cardiac cycle; Blood pressure; Factors affecting blood pressure.

UNIT-V: Blood
The Structure and Functions of Blood; Blood Groups: The ABO System and Rh factors; The clotting of Blood: Mechanisms, Factors and Natural Inhibitors.

UNIT-VI: Nerve Physiology

Functional Architecture of a Neuron; Morphological Classification of Nerve Cells; Nerve Fibres: Myelinated and Non-Myelinated Nerve Fibre; Propagation of Nerve impulse; The Synapse and Synaptic transmission.

B.Sc. Zoology 5TH Semester

Course Title: Physiology: Life sustaining systems (practical)

Course code: ZOO-C-09 Credit: 1

Course Outcome:

1: Understand the function of various systems
2: Seeks to understand the mechanisms that work to keep the human body alive and functioning.
3: Physiological and biochemical understanding through scientific enquiry into the nature of mechanical, physical, and biochemical functions of humans, their organs, and the cells of which they are composed.
4: Students gain fundamental knowledge of physiology and endocrine systems
5: Students gain fundamental knowledge of physiology of homeostasis.

Contents:

1. Determination of ABO Blood group
2. Enumeration of red blood cells and white blood cells using haemocytometer
3. Estimation of haemoglobin using Sahli'shaemoglobinometer
4. Preparation of haemin crystals

Course Title: Fundamentals of Biochemistry (Theory)

Course code : ZOO-C-10 Credit: 3

Course Outcome:

1: To understand the Chemical foundation of Biology, i.e., pH, Buffers, pK, Isomeristaion, etc.
2: To understand the Classification and Biological Significance of amino acids, carbohydrates, peptides, protein, lipids and nucleic acid.
3: To understand the metabolism of carbohydrates, protein and Lipids.
4:. Understand about the agencies responsible for Production of various products using biochemistry.
5: To understand the mechanism of Oxidation with special reference to mitochondrial electron transport system.

Contents:

UNIT-I:
1. Chemical foundation of biology- pH, pK, acids, bases, buffers free energy, isomerisation

2. Classification & biological significance of carbohydrate, amino acids and peptides, protein, lipids and nucleic acids

UNIT-II:
3. Enzymes- Nature and classification, Mechanism of enzyme action, Enzyme kinetics, Enzyme inhibition.

4. Metabolism- Underlying theoretical Principles: Thermodynamics, Redox reactions, ATP and its role in Bioenergetics

UNIT-III:
5. Carbohydrate Metabolism: Glycolysis, fate of pyruvate

6. The Citric acid cycle: Energetics and regulation of Citric Acid Cycle

UNIT-IV:
7. Lipid Metabolism: Lipid digestion, oxidation of Fatty acids, fate of Acetyl-CoA

8. Oxidation- reduction potential with special reference to mitochondrial electron transport system. ATP in metabolism and in free energy production

Course Title: Fundamentals of Biochemistry (practical)

Course code : ZOO-C-10 Credit: 1

Course Outcome:

1: Demonstrate basic principles in physiology Objectives of the course.
2: Learn clinical procedures for blood & urine analysis.
3: Develop skill in simple biochemical laboratory procedures.
4: Recognise the importance of various databases

Contents:

1. Preparation of fixatives, stains and other reagents.

2. Preparation of haemin crystal of blood.

3. Detection of blood glucose by glucose meter.

4. Quantitative estimation of total protein in given solution by Lowry's method.

Course Title: Developmental Biology (Theory)

Course code : ZOO-C-11 Credit: 3

Course Outcome:

1:Understand the process of organogenesis of selected organs, development of extra embryonic membrane and the nature and physiology of placenta.
2:Come to know the inducer and inductor role in embryogenesis and knowledge about metamorphosis and the process of regeneration.
3:Get familiar with various stages involved in the developing embryo and types of placenta.
4:Understand the initial developmental procedure involved in Amphioxus, frog and chick.
5: Familiarise with the principle of developmental biology and various Techniques and tools of Embryology.

Contents:

UNIT 1: Introduction

Historical perspective and basic concepts: Phases of development, Cell-Cell interaction, Pattern formation, Differentiation and growth, Differential gene expression, Cytoplasmic determinants and asymmetric cell division

UNIT 2: Early Embryonic Development

Gametogenesis, Spermatogenesis, Oogenesis; Types of eggs, Egg membranes; Fertilization (External and Internal): Changes in gametes, Blocks to polyspermy; Planes and patterns of cleavage; Types of Blastula; Fate maps (including Techniques); Early development of frog and chick up to gastrulation; Embryonic induction and organizers

UNIT 3: Late Embryonic Development

Fate of Germ Layers; Extra-embryonic membranes in birds; Implantation of embryo in humans, Placenta (Structure, types and functions of placenta)

UNIT 4: Post Embryonic Development

Metamorphosis: Changes, hormonal regulations in amphibians and insects; Regeneration: Modes of regeneration, epimorphosis, morphallaxis and compensatory regeneration (with one example each); Ageing: Concepts and Theories

UNIT 5:

Implications of Developmental Biology 8 Teratogenesis: Teratogenic agents and their effects on embryonic development; In vitro fertilization, Stem cell (ESC), Amniocentesis

Course Title: Internship

Course code : ZOO-C-12 Credit: 04

Course Outcome:

Course Title: Developmental Biology (practical)

Course code : ZOO-C-11 Credit: 1

Course Outcome:

1:Understand the process of organogenesis of selected organs, development of extra embryonic membrane and the nature and physiology of placenta.
2:Come to know the inducer and inductor role in embryogenesis and knowledge about metamorphosis and the process of regeneration.
3:Get familiar with various stages involved in the developing embryo and types of placenta.
4:Understand the initial developmental procedure involved in Amphioxus, frog and chick.
5: Familiarize with the principle of developmental biology and various Techniques and tools of Embryology.

Contents:

- 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)
- Study of the developmental stages and life cycle of Drosophila
- from stock culture
- Study of different sections of placenta (photomicrography/slides)

.

B.Sc. Zoology 5th Semester

Course Title: Fundamentals of Biochemistry (Theory)

Course code : ZOO-M-10 Credit: 3

Course Outcome:

1: To understand the Chemical foundation of Biology, i.e., pH, Buffers, pK, Isomeristaion, etc.
2: To understand the Classification and Biological Significance of amino acids, carbohydrates, peptides, protein, lipids and nucleic acid.
3: To understand the metabolism of carbohydrates, protein and Lipids.
4:. Understand about the agencies responsible for Production of various products using biochemistry.
5: To understand the mechanism of Oxidation with special reference to mitochondrial electron transport system.

Contents:

UNIT-I:
9. Chemical foundation of biology- pH, pK, acids, bases, buffers free energy, isomerisation

10. Classification & biological significance of carbohydrate, amino acids and peptides, protein, lipids and nucleic acids

UNIT-II:
11. Enzymes- Nature and classification, Mechanism of enzyme action, Enzyme kinetics, Enzyme inhibition.

12. Metabolism- Underlying theoretical Principles: Thermodynamics, Redox reactions, ATP and its role in Bioenergetics

UNIT-III:
13. Carbohydrate Metabolism: Glycolysis, fate of pyruvate

14. The Citric acid cycle: Energetics and regulation of Citric Acid Cycle

UNIT-IV:
15. Lipid Metabolism: Lipid digestion, oxidation of Fatty acids, fate of Acetyl-CoA

16. Oxidation- reduction potential with special reference to mitochondrial electron transport system. ATP in metabolism and in free energy production

Course Title: Fundamentals of Biochemistry (practical)

Course code : ZOO-M-10 Credit: 1

Course Outcome:

1: Demonstrate basic principles in physiology Objectives of the course.
2: Learn clinical procedures for blood & urine analysis.
3: Develop skill in simple biochemical laboratory procedures.
4: Recognise the importance of various databases

Contents:

5. Preparation of fixatives, stains and other reagents.

6. Preparation of haemin crystal of blood.

7. Detection of blood glucose by glucose meter.

8. Quantitative estimation of total protein in given solution by Lowry's method.

B.Sc. Zoology 6 th Semester

Course Title: BIOCHEMISTRY OF METABOLIC PROCESSES (Theory)

Course code: ZOO-C-13 Credit: 3

Course Outcome:

1: Interactions and interdependence of physiological and biochemical processes. Also understand the chemical nature of life and life process.
2: Get an idea on structure and functioning of biologically important molecules.
3: Help to explore new developments in biochemistry.
4: Enable the students to illustrate various Biochemical pathways.
5: Develop an interest in the debates and discussions associated with Lifestyle Diseases.

Contents:

UNIT I: Overview of Metabolism
Metabolic pathways, types of metabolic pathways, site of different metabolic pathways, anabolic, catabolic and amphibolic pathways, concepts of metabolic control.

UNIT II: Carbohydrate metabolism
Review of glycolysis and Citric acid cycle, Phosphate pentose pathway, Gluconeogenesis, Glycogenolysis and Glycogenesis

UNIT III: Lipid metabolism
Beta oxidation and omega oxidation of saturates fatty acids with even and odd number of carbon atoms, Biosynthesis of palmitic acid, Ketogenesis

UNIT IV: Protein metabolism
Biosynthesis of amino acid, Catabolism of amino acid, Fate of C-skeleton of Glucogenic and Ketogenic amino acid

UNIT V: Oxidative phosphorylation
Review of mitochondrial respiratory chain, inhibitors and uncouplers of Electron transport

System

B.Sc. Zoology 6th Semester

Course Title: BIOCHEMISTRY OF METABOLIC PROCESSES (practical)

Course code: ZOO-C-13 Credit: 1

Course Outcome:

1: Demonstrate basic principles in physiology Objectives of the course.
2: Learn clinical procedures for blood & urine analysis.
3: Develop skill in simple biochemical laboratory procedures.
4: Recognise the importance of various databases

Contents:

1. Quantitative estimation of total carbohydrate by Anthrone method.
2. Quantitative estimation of lipid by colorimetric method.
3. To study the enzymatic activity of Trypsin and Lipase.
4. Qualitative estimation of amino acid using Ninhydrin reagent.

B.Sc. Zoology 6 th Semester

Course Title: Molecular Biology **(Theory)**

Course code: ZOO-C-14 Credit: 3

Course Outcome:

1: Develop deeper understanding of what life is and how it functions at cellular level.

2: Describe cellular membrane structure and function, fine structure and function of cell organelles.

3: Perform a variety of molecular and cellular biology techniques

.4: To understand about the Knowledge of genetics, developmental biology and organogenesis.

5: To understand the Application of DNA technology and molecular biology for research

Contents:

UNIT I:

1. Introduction: Concept,significance and historical background of moleculer biology.
2. Identification of genetic material: Direct and indirect evidences of DNA and RNA as genetic material.

UNIT II:

3. Moleculer structure of genetic material DNA and RNA.
4. DNA replication- experimental evidence of semi conservative nature of DNA replication,unidirectional and bidirectional replication,mechanism of replication in prokaryotes, DNA replicative enzymes.

UNIT III:

5. RNA- mechanism of transcriptiion in prokaryotes .
6. Genetic code and its characteristics

UNIT IV:

7. Mechanism of protein synthesis. 8. Regulation of gene expression in prokaryotes

B.Sc. Zoology 6th Semester

Course Title: Molecular Biology (practical)

Course code: ZOO-C-14 Credit: 1

Course Outcome:

1:Acquire knowledge of principles and working mechanisms of different microscopes.

2:Understands the mechanism of mitosis and meiosis.

3:Learn slide preparation to observe of giant chromosome, epithelial and blood cells.

4: Understand the concept of chromatography.

Contents:

1. Quantitative estimation of DNA using diphenylamine reagent.
2. Quantitative estimation of RNA using orcinol reagent.
3. Study of polytene chromosome from drosophila larvae
4. Isolation of protein.
5. Preparation of agarose gel medium for gel electrophoresis.
6. Temporary squash preparation of onion root tip cells to study the stages of mitosis.
7. Study and interpretation of Electronmicrographs or photographs showing:

(i) DNA replication (ii) Transcription (iii) Split genes

B.Sc. Zoology 6 th Semester

Course Title: Principles of Genetics **(Theory)**

Course code : ZOO-C-15 Credit: 3

Course Outcome:

1:To understand the basic concept of genetics, laws of inheritance and central dogma of biology.
2:Would gain knowledge about gametogenesis, cleavage mechanisms, gastrulation and role of hormones in metamorphosis and regeneration.
3: Understand the theories of classical genetics and blood group inheritance in man.
4: To understand the genetic variation through linkage and crossing over, chromosomal aberrations and sex determination.
5: Understand the genetic defects and inborn errors of metabolism and genetic counselling and role of inbreeding and outbreeding

Contents:

Unit-I:

1. Mendelian Laws of Inheritance, Back cross and Test cross
2. Varieties of gene expression- multiple alleles, lethal genes, pleiotropic genes, gene interactions, epitasis.
3. Linkage- its mechanism and significance, experiment of linkage, linkage map.

Unit-II:

1. Nucleic acids- DNA and RNA, chemical structure and function.
2. Structural changes in chromosomes (Chromosomal aberration), Numerical changes in chromosomes, Genetic consequences of changes in Chromosome.
3. Extra chromosomal Inheritance.

Unit-III:

1. Crossing-over: types and mechanism, synaptinemal complex and genetic recombination, significance of crossing over.
2. Genetic basis of sex determination.
3. Genetic diseases in man

Unit-IV:

1. Regulation of gene expression.
2. Mutation- Molecular basis of mutation. Consequences of mutation.
3. Recombination in Bacteria and Viruses: Conjugation, Transportation, Transduction, Complementation test in Bacteriophage. Transposable Genetic elements.

B.Sc. Zoology 6 th Semester

Course Title: Principles of Genetics **(Practical)**

Course code : ZOO-C-15 Credit: 1

Course Outcome:

1: Understand the inheritance of mendelian traits by direct observation among students.

2: Acquire knowledge, skill development, observation of blood group identification and pedigree chart preparations.

3: Understood of the mechanism of phenotypic expression in Drosophila.

4: Gained genetic knowledge on the observation of specimens and models.

Contents:

1. Study of different stages of mitosis through permanent slides
2. Study of different stages of meiosis through permanent slides
3. Preparation of temporary slides for mitosis in onion root tip
4. Staining of Barr body from buccal epithelium.
5. Pedigree chart analysis

B.Sc. Zoology 6 th Semester

Course Title- Fish and Fishery (Theory)

Course code: ZOO-C-16 Credit: 3

Course Outcome:

1: To understand the fish and fishery industries.

2: Understand the various types and method of aquaculture practices.

3: Understands the physiology and reproductive mechanisms of important fishes.

4: Understands the modern techniques and methods of fishery industries.

5: Attained knowledge about important cultivable fin fishes, shell fishes and importance of value added fishery products

Contents:

UNIT I: General description of fish, Introduction and Classification, Account of systematic classification of fishes (upto classes); Classification based on feeding habit, habitat and manner of reproduction.

UNIT II: Morphology and Physiology: Types of fins and their modifications; Locomotion in fishes, Types of Scales, Use of scales in Classification and determination of age of fish; Gills and gas exchange; Swim Bladder: Types and role in Respiration, Osmoregulation in Elasmobranchs; Electric organs; Bioluminiscience; Migration in fishes.

UNIT III: Inland Fisheries; Marine Fisheries. Non-piscian fisheries, Fishing crafts and Gears; Depletion of fishery resources; Fishery laws and regulations

UNIT IV: Sustainable Aquaculture; Extensive, semi-intensive and intensive culture of fish; Pen and cage culture; Composite fish culture; Induced breeding of fish; Preparation and maintenance of fish aquarium; Role of water quality in aquaculture; Fish diseases: Bacterial, viral and parasitic; Fish Preservation,.

UNIT V: Transgenic fish, application of Biotechnology in fishery.

B.Sc. Zoology 6 th Semester

Course Title- Fish and Fishery (Practical)

Course code: ZOO-C-16 Credit: 1

Course Outcome:

1: To identify the different species of Indigenous Indian Major Carps and Exotic Carps.

2: To identify the commercial fish species in the lab and as well as in the field.

3: To understand the knowledge of fish industry by visiting the major fish market.

4: To understand the knowledge of fish farming by visiting the Fish farmers.

Contents:

1. (i) Identification of commercially important edible fishes : Labeo rohita, Labeo gonius, Labeo bata, Cirrhinus reba , Catla catla, Puntius sophore, Wallago attu, Sperata seenghala, Mystus vittatus, Clarius batrachus, Heteropneustes fossilis, Channa marulius, Channa striatus, Notopterus notopterus, Hilsa ilisha, Anabus testudineus, Puntius javanicus, Cyprinus carpio, Hypothalmichthys molitrix. (ii) Identification of some important ornamental fishes
2. Study of different types of scales (through permanent slides/ photographs).
3. Study of fishing crafts and gears used in Fisheries
4. Study of air breathing organs /Accessory respiratory organs in Channa, Heteropneustes, Anabas and Clarias spp.
5. Project Report on a visit to any fish farm/ pisciculture unit/ Induced Breeding in Fishes

B.Sc. Zoology 6 th Semester

Course Title: Principles of Genetics **(Theory)**

Course code : ZOO-M-06 Credit: 3

Course Outcome:

1:To understand the basic concept of genetics, laws of inheritance and central dogma of biology.
2:Would gain knowledge about gametogenesis, cleavage mechanisms, gastrulation and role of hormones in metamorphosis and regeneration.
3: Understand the theories of classical genetics and blood group inheritance in man.
4: To understand the genetic variation through linkage and crossing over, chromosomal aberrations and sex determination.
5: Understand the genetic defects and inborn errors of metabolism and genetic counselling and role of inbreeding and outbreeding

Contents:

Unit-I:

4. Mendelian Laws of Inheritance, Back cross and Test cross
5. Varieties of gene expression- multiple alleles, lethal genes, pleiotropic genes, gene interactions, epitasis.
6. Linkage- its mechanism and significance, experiment of linkage, linkage map.

Unit-II:

1. Nucleic acids- DNA and RNA, chemical structure and function.
2. Structural changes in chromosomes (Chromosomal aberration), Numerical changes in chromosomes, Genetic consequences of changes in Chromosome.
3. Extra chromosomal Inheritance.

Unit-III:

1. Crossing-over: types and mechanism, synaptinemal complex and genetic recombination, significance of crossing over.
2. Genetic basis of sex determination.
3. Genetic diseases in man

Unit-IV:

1. Regulation of gene expression.
2. Mutation- Molecular basis of mutation. Consequences of mutation.
3. Recombination in Bacteria and Viruses: Conjugation, Transportation, Transduction, Complementation test in Bacteriophage. Transposable Genetic elements.

Course Title: Principles of Genetics **(Practical)**

Course code : ZOO-M-06 Credit: 1

Course Outcome:

1: Understand the inheritance of mendelian traits by direct observation among students.

2: Acquire knowledge, skill development, observation of blood group identification and pedigree chart preparations.

3: Understood of the mechanism of phenotypic expression in Drosophila.

4: Gained genetic knowledge on the observation of specimens and models.

Contents:

6. Study of different stages of mitosis through permanent slides
7. Study of different stages of meiosis through permanent slides
8. Preparation of temporary slides for mitosis in onion root tip
9. Staining of Barr body from buccal epithelium.
10. Pedigree chart analysis

B.SC ZOOLOGY 7TH SEMESTER
COURSE TITLE: HISTOLOGY
COURSE CODE: ZOO-C-17 (THEORY)
CREDIT: 03

Learning objectives: To know the microscopic structure and organization of animal tissues, organs and their functions.

Unit 1: Epithelial Tissue and Connective Tissue

1. Types, structure, location, and functions of epithelial tissue. 2. Types, structure, location, and functions of connective tissue proper (Loose and Dense).

Unit 2: Specialised Connective Tissue

1. Blood: Components and their functions. 2. Structure and functions of haemoglobin. 3. Blood as a buffer system; Blood groups: ABO, Rh factor, MN, Golden blood 4. Structure types and functions of bones and cartilages

Unit 3: Muscular Tissues

1. Types and functions of muscles; 2. Ultrastructure of skeletal muscle 3. Molecular and chemical basis of skeletal muscle contraction; isotonic and isometric contraction 4. Characteristics of muscle twitch; treppe, summation and tetanus; Electromyography.

Unit 4: Nervous Tissues

1. Neurons: Structure, types and functions; Neuron doctrine 2. Classification and properties of nerve fibres 3. Glia Cells: Structure, types and functions 4. Synapse: Structure and types; Neuromuscular junction

Unit 5: Histology of Organs

1. Structural organization of gastrointestinal tract and functions of associated glands 2. Structure of salivary glands, liver, pancreas and lungs 3. Structural organisation of mammalian heart, histology of blood vessels 4. Structure of kidney and its functional unit Course Outcome: Students will be able to analyze and classify animal tissues, comprehend their functions, and apply histological techniques for research and diagnostic purposes.

Suggested Readings:

Pushpalatha K and Bhat D (2022). Inderbir Singh's Textbook of Human Histo y X Jaypee Brothers Medical Publishers 24 Ø Kim E. Barrett KE, Barman SM, Yuan J X.-J., Brooks H (2019). Ganong's Review of Medical y y McGraw-Hill Education / Medical; 26th Edition. Ø Guyton, A.C. and Hall, J.E. (2011). Textbook of Medical Physiology, XII Edition, Harcourt Asia Pvt. Ltd/ W.B. Saunders Company Ø Eric R. Kandel ER, Koester JD, Mack SH (2021). Principles of Neural Science. VI Edition, McGraw Hill Med

B.SC ZOOLOGY 7TH SEMESTER
COURSE TITLE: HISTOLOGY
COURSE CODE: ZOO-C-17 (PRACTICAL)
CREDIT: 01

Learning objectives: To know the principles and mechanisms of genetics, ecology, histology, and biochemistry in relation to living organisms.
Course outcome: Students will have a comprehensive understanding of the genetic, ecological, histological, and biochemical aspects of organisms and their interactions with the environment.
Contents:
1. Recording of simple muscle twitch with electrical stimulation through PowerPoint presentation
2. Demonstration of the unconditioned reflex action (Deep tendon reflex such as knee jerk reflex)
3. Study of permanent slides/micro-photographs of Mammalian skin, Cartilage, Bone, Spinal cord and brain tissue.
4. Study of permanent slide/micro-photographs of mammalian Pituitary, Testis, Ovary, Adrenal, Thyroid and Parathyroid
5. Microtomy: Preparation of permanent slides of Goat/Fish tissues.

B.SC ZOOLOGY 7TH SEMESTER
COURSE TITLE: VECTOR BIOLOGY AND VECTOR BORNE DISEASES
COURSE CODE: ZOO-C-18 (THEORY)
CREDIT: 03

Course Outcomes: 1. Analyze the concept of insects as vectors of diseases 2. Evaluate the general features of insects 3. Examine the role of different insects in transmission of diseases

Learning Outcomes: • Explain the concept of insects as vectors of diseases

Introduction to insects: General features of insects; Morphological features- Head, Eyes, Antenna, Mouthparts

Concept of Vectors: Brief introduction of Carrier and Vectors (mechanical and biological vector), Reservoirs, Host-vector relationship, Vectorial capacity, Adaptations as vectors, Host Specificity

Insect as vectors: Classification of insects up to orders, detailed features of orders with insects as vectors – Diptera, Siphonaptera, Siphunculata, Hemiptera

Dipterans as important insect vectors – Mosquitoes, Sand fly, Houseflies;

Study of mosquito-borne diseases – Malaria, Dengue, Chikungunya, Viral encephalitis, Filariasis; Control of mosquitoes Study of sand fly-borne diseases – Leishmaniasis, Phlebotomus fever; Control of Sand fly Study of house fly as important mechanical vector, Control of house fly

Siphonaptera and Siphunculata as disease vectors: Fleas as important insect vectors; Host-specificity, Study of Flea-borne diseases – Plague, Typhus fever; Control of fleas. Human louse (Head, Body and Pubic louse) as important insect vectors; Study of louse- borne diseases –Typhus fever.

Hemiptera as Disease vectors: Bugs as insect vectors; Blood-sucking bugs; Chagas disease, Bed bugs as mechanical vectors, Control and prevention Measures.

SUGGESTED READINGS: • Imms, A.D. (1977). A General Text Book of Entomology. Chapman & Hall, UK • Chapman, R.F. (1998). The Insects: Structure and Function. IV Edition, Cambridge,University Press, UK • Pedigo L.P. (2002). Entomology and Pest Management. Prentice Hall Publication. • Mathews, G. (2011). Integrated Vector Management: Controlling Vectors of Malaria and Other Insect Vector Borne Diseases. Wiley-Blackwell

B.SC ZOOLOGY 7TH SEMESTER
COURSE TITLE: VECTOR BIOLOGY AND VECTOR BORNE DISEASES
COURSE CODE: ZOO-C-18 (PRACTICAL)
CREDIT: 01

Contents:

1. Identification of adult and larval stage of disease sprading vectors- House fly, Ades, Anopheles, Cockroach, Mites, Ticks.
2. Preparation of temporary slide of mouth part, proboscis of Mosquito.
3. Strategies for prevention and control of Vector born diseases (Malaria, Dengue)

B.SC ZOOLOGY 7TH SEMESTER
COURSE TITLE: EVOLUTIONARY BIOLOGY
COURSE CODE: ZOO-C-19 (THEORY)
CREDIT: 03

Learning Objective: To understand the principles of **evolutionary biology** and their application to the diversity and adaptation of animal species.

Unit 1: Origin, Theories and Evidences
1 Life's beginnings: Chemogeny, RNA world, Biogeny 2. Origin of photosynthesis, Evolution of eukaryotes y 3. Historical review of evolutionary concept: Lamarckism, Darwinism, Neo-Darwinism 4. Evidences of Evolution: Fossil record (types, transitional forms, geological time scale)
Unit 2: Population Genetics
1. Concept of gene pool, gene frequency and genotype frequency 2. Hardy-Weinberg Law: statement and derivation of equation 3. G ' p 4. Role of Migration and Mutation in changing allele frequencies
Unit 3: Mechanism of Speciation
1. Product of evolution: Micro evolutionary changes (inter-population variations, clines, Races; Species concept) 2. Isolating mechanisms, modes of speciation—allopatric, sympatric 3. Adaptive radiation / macroevolution (exemplified by Galapagos finches and mammals)
Unit 4: Evolution of Horse and Human
1. Evolution of horse 2. Origin and evolution of man, Unique hominid characteristics contrasted with primate characteristics, primate phylogeny from Dryopithecus leading to Homo sapiens 3. Phylogenetic trees, Construction of phylogenetic trees and their interpretation
Unit 5: Zoogeography
1. Zoogeographical realms, geographic range, Physical features and faunal composition; Distribution of animals, types; Continental drift 2. Barriers: Extrinsic and intrinsic barriers 3. Animal Dispersal – means of dispersal 36 Course Outcome: Students will demonstrate a comprehensive understanding of evolutionary biology, its relevance to the study of life, and the ability to critically evaluate and explain evolutionary processes and patterns.

Suggested Readings:
Douglas, J. Futuyma (2006). Evolutionary Biology. Sinauer Associates Inc.,US.; III Revised Edition Ø Ridley, M (2004). Evolution. III Edition Blackwell publishing Ø Hall, B.K. and Hallgrimson, B (2008). Evolution. IV Edition. Jones and Barlett Publishers. Ø Campbell, N.A. and Reece J.B (2011). Biology. IX Edition. Pearson, Benjamin, Ø Rastogi VB (2018). Organic Evolution. III Edition. MedTech Ø Pevsner, J (2009). Bioinformatics and Functional Genomics. II Edition Wiley-Blackwell Ø Darlington PJ (1980). Zoogeography: The Geographical Distribution of Animals. R. E. Krieger Publishing Company

B.SC ZOOLOGY 7TH SEMESTER
COURSE TITLE: EVOLUTIONARY BIOLOGY
COURSE CODE: ZOO-C-19 (PRACTICAL)
CREDIT: 01

Learning Objectives: To develop practical skills on fundamental concepts of evolutionary biology

Course Outcome: Students will be able to apply their knowledge and skills to analyze and interpret biological phenomena at evolutionary biology.

1: To understand the different evolutionary process of human with the help of chart and PPT.
2: To understand the Palaentology with the demonstration of different fossil record with the help of PPT.
3: To make aware about the different types of era with the help of demonstration through PPT.
4: Student will learn about the sedimentation by visiting the national museum.

Contents:

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

Construction of phylogenetic trees with the help of bioinformatics tools (Clustal X, Phylip, NJ) and its interpretation

4. Study of fossil evidences from plaster cast models and pictures
5. Study of homology and analogy from suitable specimens/ pictures Molecular Biology.

B.SC ZOOLOGY 7TH SEMESTER
COURSE TITLE: RESEARCH METHODOLOGY
COURSE CODE: ZOO-C-20 (THEORY)
CREDIT: 04

Course Outcome: To understand the different types of Research. Demonstrate knowledge of research processes (reading, evaluating, and developing);Perform literature reviews using print, explain, compare, and prepare the key elements of a research proposal/report; Compare and contrast quantitative and qualitative research.

Contents:

UNIT-I

Basic concept of research: Meaning of research, Objectives of research, Significance in research, Research versus Research methodology. Types of research: Description/ Analytical, Applied/ Fundamental, Quantitative /Qualitative, Conceptual/ Empirical.

UNIT-II.

Research formulation and Designs: Observation and Facts, Prediction and Explanation, Induction, Basic principle of Research design; Meaning, Need and features of good design, Types of Research design.

UNIT –III

Defining research problem, Selection of problem, Necessity of Defining the problem,Techniques involved in defining a problem, Conclusion.

UNIT-IV

Literature Review: Importance of literature review, Critical Literature review, Identifying gap areas from literature review. 4. Intellectual Property Rights (IPR): Copy right, Designs, Patents, Trademarks, Geographical Indication. 5. Bioethics: Laws in India, Working with man and animals, Consent, Animal Ethical Committees and Constitution.

B.SC ZOOLOGY 7TH SEMESTER
COURSE TITLE: INSECT VECTORS AND DISEASES
COURSE CODE: ZOO-M-07 (THEORY)
CREDIT: 03

Course Outcomes: 1. Analyze the concept of insects as vectors of diseases 2. Evaluate the general features of insects 3. Examine the role of different insects in transmission of diseases

Learning Outcomes: • Explain the concept of insects as vectors of diseases

Introduction to insects: General features of insects; Morphological features- Head, Eyes, Antenna, Mouthparts
Concept of Vectors: Brief introduction of Carrier and Vectors (mechanical and biological vector), Reservoirs, Host-vector relationship, Vectorial capacity, Adaptations as vectors, Host Specificity
Insect as vectors: Classification of insects up to orders, detailed features of orders with insects as vectors – Diptera, Siphonaptera, Siphunculata, Hemiptera
Dipterans as important insect vectors – Mosquitoes, Sand fly, Houseflies;
Study of mosquito-borne diseases – Malaria, Dengue, Chikungunya, Viral encephalitis, Filariasis; Control of mosquitoes Study of sand fly-borne diseases – Leishmaniasis, Phlebotomus fever; Control of Sand fly Study of house fly as important mechanical vector, Control of house fly
Siphonaptera and Siphunculata as disease vectors: Fleas as important insect vectors; Host-specificity, Study of Flea-borne diseases – Plague, Typhus fever; Control of fleas. Human louse (Head, Body and Pubic louse) as important insect vectors; Study of louse- borne diseases –Typhus fever.
Hemiptera as Disease vectors: Bugs as insect vectors; Blood-sucking bugs; Chagas disease, Bed bugs as mechanical vectors, Control and prevention Measures.

SUGGESTED READINGS: • Imms, A.D. (1977). A General Text Book of Entomology. Chapman & Hall, UK • Chapman, R.F. (1998). The Insects: Structure and Function. IV Edition, Cambridge,University Press, UK • Pedigo L.P. (2002). Entomology and Pest Management. Prentice Hall Publication. • Mathews, G. (2011). Integrated Vector Management: Controlling Vectors of Malaria and Other Insect Vector Borne Diseases. Wiley-Blackwell

B.SC ZOOLOGY 7TH SEMESTER
COURSE TITLE: INSECT VECTORS AND DISEASES
COURSE CODE: ZOO-M-07 (PRACTICAL)
CREDIT: 01

Contents:

1. Identification of adult and larval stage of disease sprading vectors- House fly, Ades, Anopheles, Cockroach, Mites, Ticks.
2. Preparation of temporary slide of mouth part, proboscis of Mosquito.
3. strategies for prevention and control of Vector born diseases (Malaria, Dengue)

B.SC ZOOLOGY 8TH SEMESTER
COURSE TITLE: ANIMAL BEHAVIOUR
COURSE CODE: ZOO-C-21 (THEORY)
CREDIT: 03

Learning Objective: To understand principles and mechanisms underlying animal behaviour.

Course Outcome: Students will be able to explain and predict animal behaviour patterns, and understand the importance of chronobiology in maintaining biological rhythms.

Unit 1: Introduction to Animal Behaviour
1. Origin and history of Ethology 2. Brief profiles of Karl Von Frisch, Ivan Pavlov, Konrad Lorenz and Niko Tinbergen, Proximate and ultimate causes of behaviour, 3. Methods and recording of animal behaviour
Unit 2: Patterns of Behaviour
1. Stereotyped Behaviours (Orientation, Reflexes); Individual Behavioural patterns; 2. Instinct vs. Learnt Behaviour; 3. Associative learning, classical and operant conditioning, Habituation, Imprinting
Unit 3: Social and Sexual Behaviour
1. Social Behaviour: Concept of Society; Communication and the senses; 3. Sexual Behaviour: Asymmetry of sex, Sexual dimorphism, Mate choice, 4. Intra-sexual selection (male rivalry), Inter-sexual selection (female choice)
Unit 4: Introduction to Chronobiology
1. Historical developments in chronobiology; Biological oscillation: the concept of Average, amplitude, phase and period. 2. Biological clocks: Adaptive significance of biological clocks; 3. Chronopharmacology, Chronomedicine, Chronotherapy, Role of melatonin
Unit 5: Biological Rhythm
1. Types and characteristics of biological rhythms: Short- and Long- term rhythms; 2. Circadian rhythms, Tidal rhythms, Lunar rhythms, Circannual rhythms; Concept of synchronization and masking 3. Photoperiod and regulation seasonal reproduction of vertebrates

Suggested Readings: Ø Manning A. and Dawkins, MS (2016). An Introduction to Animal Behaviour, Cambridge University Press India Private Limited Ø Alcock J, Sherman PW (2005). Animal Behaviour, Sinauer Associate Inc Ø Dunlap JC (2004). Chronobiology Biological Timekeeping. Sinauer Associates, Inc. Ø Vinod Kumar (2002). Biological Rhythms: Narosa Publishing House, Delhi/ Springer-Verlag Ø Attenborough D (2022). The Trials of Life: A Natural History of Animal Behaviour. William

B.SC ZOOLOGY 8TH SEMESTER

COURSE TITLE: ANIMAL BEHAVIOUR

COURSE CODE: ZOO-C-21 (PRACTICAL)

CREDIT: 01

Contents:

1. Parabiosis (parabiotic behavior) in cockroach
2. Identification of gonadotropin in human urine sample
3. Recording & analysis of insect (cricket) & birds calls 8. Study of social insect colonies

B.SC ZOOLOGY 8TH SEMESTER
COURSE TITLE: DISSERTATION
COURSE CODE: ZOO-C-22 (THEORY)
CREDIT: 12

Course Outcome:

CO1: Student understand the concept of Research.
CO2: To understand how to prepare the method and methodology for a Research work.
To understand the future field of interest so that one student can extend their Research Work to Ph.D.
CO3: To understand the new findings in the Research work.
CO4: To understand the expansion of research work from the level of class room to the field.
CO5: To accountant students how formulate a research proposal and to generate innovative thinking

B.SC ZOOLOGY 8TH SEMESTER
COURSE TITLE: ANIMAL BEHAVIOUR
COURSE CODE: ZOO-M-08 (THEORY)
CREDIT: 03

Learning Objective: To understand principles and mechanisms underlying animal behaviour.

Course Outcome: Students will be able to explain and predict animal behaviour patterns, and understand the importance of chronobiology in maintaining biological rhythms.

Unit 1: Introduction to Animal Behaviour
1. Origin and history of Ethology 2. Brief profiles of Karl Von Frisch, Ivan Pavlov, Konrad Lorenz and Niko Tinbergen, Proximate and ultimate causes of behaviour, 3. Methods and recording of animal behaviour

Unit 2: Patterns of Behaviour
1. Stereotyped Behaviours (Orientation, Reflexes); Individual Behavioural patterns; 2. Instinct vs. Learnt Behaviour; 3. Associative learning, classical and operant conditioning, Habituation, Imprinting

Unit 3: Social and Sexual Behaviour
1. Social Behaviour: Concept of Society; Communication and the senses; 3. Sexual Behaviour: Asymmetry of sex, Sexual dimorphism, Mate choice, 4. Intra-sexual selection (male rivalry), Inter-sexual selection (female choice)

Unit 4: Introduction to Chronobiology
1. Historical developments in chronobiology; Biological oscillation: the concept of Average, amplitude, phase and period. 2. Biological clocks: Adaptive significance of biological clocks; 3. Chronopharmacology, Chronomedicine, Chronotherapy, Role of melatonin

Unit 5: Biological Rhythm
1. Types and characteristics of biological rhythms: Short- and Long- term rhythms; 2. Circadian rhythms, Tidal rhythms, Lunar rhythms, Circannual rhythms; Concept of synchronization and masking 3. Photoperiod and regulation seasonal reproduction of vertebrates

Suggested Readings: Ø Manning A. and Dawkins, MS (2016). An Introduction to Animal Behaviour, Cambridge University Press India Private Limited Ø Alcock J, Sherman PW (2005). Animal Behaviour, Sinauer Associate Inc Ø Dunlap JC (2004). Chronobiology Biological Timekeeping. Sinauer Associates, Inc. Ø Vinod Kumar (2002). Biological Rhythms: Narosa Publishing House, Delhi/ Springer-Verlag Ø Attenborough D (2022). The Trials of Life: A Natural History of Animal Behaviour. William

B.SC ZOOLOGY 8TH SEMESTER

COURSE TITLE: ANIMAL BEHAVIOUR

COURSE CODE: ZOO-M-08 (PRACTICAL)

CREDIT: 01

Contents:

1. Parabiosis (parabiotic behavior) in cockroach
2. Identification of gonadotropin in human urine sample
3. Recording & analysis of insect (cricket) & birds calls 8. Study of social insect colonies