

## SCHEME AND SYLLABUS FOR CHOICE BASED CREDIT SYSTEM

### FOR B.Sc. HONOURS ZOOLOGY

| Semester | Core Course(14)                                 | Ability Enhancement Compulsory Course AECC(2) | Skill Enhancement Course SEC(2) | Discipline Specific Elective DSE(4) | Generic Elective GE(4) |
|----------|---|---|---------------------------------|-------------------------------------|------------------------|
| I        | Non-chordates<br>I:Protista to Pseudocoelomate  | English Communication                         |                                 |                                     | Chem/Bot               |
|          | Principles of Ecology                           |   |                                 |                                     |                        |
| II       | Non-chordates<br>II:Coelomates                  | Environmental Science                         |                                 |                                     | Chem/Bot               |
|          | Cell Biology                                    |   |                                 |                                     |                        |
| III      | Diversity of Chordates                          |   | SEC-1                           |                                     | Chem/Bot               |
|          | Physiology:Controlling and Coordinating Systems |   |                                 |                                     |                        |
|          | Fundamentals of Biochemistry                    |   |                                 |                                     |                        |
| IV       | Comparative Anatomy of Vertebrates              |   | SEC-2                           |                                     | Chem/Bot               |
|          | Physiology:Life Sustaining Systems              |   |                                 |                                     |                        |
|          | Biochemistry of Metabolic Process               |   |                                 |                                     |                        |
| V        | Molecular Biology                               |   |                                 | DSE-1                               |                        |
|          | Principles of Genetics                          |   |                                 | DSE-2                               |                        |
| VI       | Developmental Biology                           |   |                                 | DSE-3                               |                        |
|          | Evolutionary Biology                            |   |                                 | DSE-4                               |                        |

| Semester | Course Opted                                      | Course Name                                      | Credits |
|----------|---|--|---------|
| I        | Ability Enhancement Compulsory Course-I           | English Communications                           | 2       |
|          | Core course-I                                     | Non-chordates I:Protista to Pseudocoelomate      | 4       |
|          | Core course-I Practical                           |  | 2       |
|          | Core course-II                                    | Principles of Ecology                            | 4       |
|          | Core course-II Practical                          |  | 2       |
|          | Generic Elective-I                                | Botany or Chemistry                              | 4       |
|          | Generic Elective-I Practical/Tutorial             |  | 2       |
| II       | Ability Enhancement Compulsory Course-II          | Environmental Science                            | 2       |
|          | Core course-III                                   | Non-chordates II:Coelomates                      | 4       |
|          | Core course-III Practical                         |  | 2       |
|          | Core course-IV                                    | Cell Biology                                     | 4       |
|          | Core course-IV Practical                          |  | 2       |
|          | Generic Elective-2                                | Botany or Chemistry                              | 4       |
|          | Generic Elective-2 Practical                      |  | 2       |
| III      | Core course-V                                     | Diversity of Chordates                           | 4       |
|          | Core course- V Practical                          |  | 2       |
|          | Core course-VI                                    | Physiology: Controlling and Coordinating Systems | 4       |
|          | Core course-VI Practical                          |  | 2       |
|          | Core course-VII                                   | Fundamentals of Biochemistry                     | 4       |
|          | Core course-VII Practical                         |  | 2       |
|          | Skill Enhancement Course-I                        | SEC-I  | 4       |
|          | Generic Elective-3                                | Botany or Chemistry                              | 4       |
|          | Generic Elective-3 Practical                      |  | 2       |
| IV       | Core course-VIII                                  | Comparative Anatomy of vertebrates               | 4       |
|          | Core course-VIII Practical                        |  | 2       |
|          | Core course-IX                                    | Physiology: Life Sustaining Systems              | 4       |
|          | Core course-IX Practical                          |  | 2       |
|          | Core course-X                                     | Biochemistry of Metabolic Process                | 4       |
|          | Core course-X Practical                           |  | 2       |
|          | Skill Enhancement Course-2                        | SEC-2  | 4       |
|          | Generic Elective-4                                | Botany or Chemistry                              | 4       |
|          | Generic Elective-4 Practical                      |  | 2       |
| V        | Core course-XI                                    | Molecular Biology                                | 4       |
|          | Core course-XI Practical                          |  | 2       |
|          | Core course-XII                                   | Principles of Genetics                           | 4       |
|          | Core course-XII Practical                         |  | 2       |
|          | Discipline Specific Elective-I                    | DSE-1  | 4       |
|          | Discipline Specific Elective-I Practical          |  | 2       |
|          | Discipline Specific Elective-2                    |  | 4       |
|          | Discipline Specific Elective-2 Practical/Tutorial |  | 2       |
| VI       | Core Course-XIII                                  | Developmental Biology                            | 4       |
|          | Core Course-XIII Practical/Tutorial               |  | 2       |
|          |   |  |         |
|          | Core Course-XIV                                   | Evolutionary Biology                             | 4       |

| Semester           | Course Opted   | Course Name | Credits |
|--------------------|--|-------------|---------|
|                    | Core Course-XIV Practical/Tutorial                   |             | 2       |
|                    | Discipline Specific Elective-3                       | DSE-3       | 4       |
|                    | Discipline Specific Elective-3<br>Practical/Tutorial |             | 2       |
|                    | Discipline Specific Elective-4                       | D SE-4      | 4       |
|                    | Discipline Specific Elective-4<br>Practical/Tutorial |             | 2       |
| <b>Total : 140</b> |  |             |         |

| <b>CORE COURSES</b> |  |
|---------------------|--|
| <b>I</b>            | Non-chordates I:Protista to Pseudocoelomate      |
| <b>II</b>           | Perspectives in Ecology                          |
| <b>III</b>          | Non-chordates II:Coelomates                      |
| <b>IV</b>           | Cell Biology                                     |
| <b>V</b>            | Diversity of Chordates                           |
| <b>VI</b>           | Physiology: Controlling and Coordinating Systems |
| <b>VII</b>          | Fundamentals of Biochemistry                     |
| <b>VIII</b>         | Comparative Anatomy of Vertebrates               |
| <b>IX</b>           | Physiology : Life Sustaining Systems             |
| <b>X</b>            | Biochemistry of Metabolic Processes              |
| <b>XI</b>           | Molecular Biology                                |
| <b>XII</b>          | Principles of Genetics                           |
| <b>XIII</b>         | Developmental Biology                            |
| <b>XIV</b>          | Evolutionary Biology                             |

## CORE COURSE I

### NON-CHORDATES 1: PROTISTS TO PSEUDOCOELOMATES

#### THEORY

**Unit 1: Protista, Parazoa and Metazoa** **19**

General characteristics and Classification up to classes  
Study of *Paramecium*  
Life cycle and pathogenicity of *Plasmodium vivax*  
Locomotion, Osmoregulation, Nutrition and Reproduction in Protista

**Unit 2: Porifera** **7**

General characteristics and Classification up to classes  
Canal system and spicules in sponges

**Unit 3 : Cnidaria** **12**

General characteristics and Classification up to classes  
Metagenesis in Obelia  
Polymorphism in Cnidaria  
Corals and coral reefs

**Unit 4 : Ctenophora** **4**

General characteristics and Evolutionary significance

**Unit 5 : Platyhelminthes** **10**

General characteristics and Classification up to classes  
Life cycle and pathogenicity of *Fasciola hepatica*

**Unit 6 : Nematelminthes** **8**

General characteristics and Classification up to classes  
Life cycle and pathogenicity of *Ascaris lumbricoides*  
Parasitic adaptations in helminthes

## NON-CHORDATES 1: PROTISTS TO PSEUDOCOELOMATES

### PRACTICALS

(Credits 2)

1. Study of whole mount of *Euglena*, *Amoeba* and *Paramecium*, Binary fission and Conjugation in *Paramecium*.
2. Examination of pond water collected from different places for diversity in protista.
3. Study of *Sycon* (T.S. and L.S), *Hyalonema*, *Euplectella*, *Spongilla*.
4. Study of *Obelia*, *Physalia*, *Millepora*, *Aurelia*, *Tubipora*, *Corallium*, *Alcyonium*, *Gorgonia*, *Meridium*, *Pennatula*, *Fungia*, *Meandrina*, *Madrepora*.
5. One specimen/slide of any Ctenophore.
6. Study of adult *Fasciola hepatica*, *Taenia solium* and their life cycles (Slides/micro-photographs).
7. Study of adult *Ascaris lumbricoides* and its life stages (Slides/micro-photographs).

## PRINCIPLES OF ECOLOGY

### PRACTICALS

(Credits 2)

1. Determination of population density in a natural/hypothetical community by quadrat method and calculation of Shannon-Weiner diversity index for the same community.
2. Study of an aquatic ecosystem : Phytoplankton and zooplankton, Measurement of area, temperature, turbidity/penetration of light, determination of pH, and Dissolved oxygen content (Winkler's method).
3. Report on a visit to National Park/Biodiversity Park/Wild life sanctuary.

**CORE COURSE II  
PRINCIPLES OF ECOLOGY**

**THEORY** **(Credits 4)**

**Unit 1 : Introduction to Ecology** **6**

History of ecology, Autoecology and synecology, Levels of organization, Laws of limiting factors, Study of physical factors

**Unit 2 : Population** **24**

Unitary and Modular populations

Unique and group attributes of population : Density, natality, mortality, life tables, fecundity tables, survivorship curves, age ratio, sex ratio, dispersal and dispersion

Exponential and logistic growth, equation and patterns, r and K strategies

Population regulation – density-dependent and independent factors

Population interactions, Gause's Principle with laboratory and field examples,

Lotka-Volterra equation for competition and Pradation, functional and numerical responses

**Unit 3 : Community** **12**

Community characteristics : species richness, dominance, diversity, abundance, vertical stratification, Ecotone and edge effect ; Ecological succession with one example

Theories pertaining to climax community

**Unit 4 : Ecosystem** **14**

Types of ecosystem with one example in detail, Food chain: Detritus and grazing food chains, Linear and Y-shaped food chains, Food web, Energy flow through the ecosystem, Ecological pyramids and Ecological efficiencies

Nutrient and biogeochemical cycle with one example of Nitrogen cycle

Human modified ecosystem

**Unit 5 : Applied Ecology** **4**

Ecology in Wildlife Conservation and Management

### CORE COURSE III

#### NON-CHORDATES II : COELOMATES

##### THEORY

(Credits 4)

##### **Unit 1 : Annelida**

**10**

General characteristics and Classification up to classes  
Excretion in Annelida

##### **Unit 2 : Arthropoda**

**17**

General characteristics and Classification up to classes  
Respiration in Arthropoda  
Larval forms in Crustacea  
Metamorphosis in Insects  
Social life in bees and termites

##### **Unit 3 : Onychophora**

**4**

General characteristics and Evolutionary significances of Peripatus.

##### **Unit 4 : Mollusca**

**12**

General characteristics and Classification up to classes  
Respiration in Mollusca  
Torsion and detorsion in Gastropoda  
Pearl formation in bivalves

##### **Unit 5 : Echinodermata**

**12**

General characteristics and Classification up to classes  
Water-vascular system in Asteroidea  
Larval forms in Echinodermata  
Affinities with Chordates

## CORE COURSE IV

### CELL BIOLOGY

| <b>THEOR</b>   | <b>(Credits 4)</b> |
|--|--------------------|
| <b>Unit 1 : Overview of Cells</b>  | <b>3</b>           |
| Prokaryotic and Eukaryotic cells, Virus.   |                    |
| <b>Unit 2 : Plasma Membrane</b>  | <b>7</b>           |
| Various models of plasma membrane structure<br>Transport across membrane : Active and Passive transport, Facilitated transport<br>Cell junction : Tight junctions, Desmosomes, Gap junctions |                    |
| <b>Unit 3 : Endomembrane System</b>  | <b>10</b>          |
| Structure and Function : Endoplasmic Reticulum, Golgi Apparatus, Lysosomes   |                    |
| <b>Unit 4 : Mitochondria and Peroxisomes</b>   | <b>8</b>           |
| Mitochondria : Structure, Semi-autonomous nature, End symbiotic hypothesis, Mitochondrial Respiratory Chain<br>Peroxisomes   |                    |
| <b>Unit 5 : Cytoskeleton</b>   | <b>8</b>           |
| Structure and Function : Microtubules, Microfilaments and Intermediate filaments   |                    |
| <b>Unit 6 : Nucleus</b>  | <b>12</b>          |
| Structure of Nucleus : Nuclear envelope, Nuclear pore complex, Nucleolus<br>Chromatin : Euchromatin and Heterochromatin and packaging (nucleosome)   |                    |
| <b>Unit 7 : Cell Division</b>  | <b>8</b>           |
| Mitosis, Meiosis, Cell cycle and its regulation  |                    |



## NON-CHORDATES II : COELOMATES & CELL BIOLOGY

### PRACTICAL

(Credits 2)

#### Non-Chordates

1. Study of following specimen :

Annelids – *Aphrodites, Nereis, Heteronereis, Sabella, Serpula, Chaetopterus, Pheritima, Hirudinaria*

Arthropods – *Limulus, Palamnaeus, Palaemon, Daphnia, Balanus, Sacculina, Cancer, Eupagurus, Scolopendra, Julus, Bombyx, Periplaneta*, termites and honey bees

Onychophora – *Peripatus*

Molluscs – *Chiton, Dentalium, Pila, Doris, Helix, Unio, Ostrea, Pinctada, Sepia, Octopus, Nautilus*  
Echinodermites – *Pantaceros/Asterias, Ophiura, Clypeaster, Echinus, Cucummaria and Antedon*

2. Study of digestive system, septal nephridia and pharyngeal nephridia of earthworm

3. T.S through pharynx, gizzard and typhlosolar intestine of earthworm

4. To submit a Project Report on any related topic to larval forms (crustacean, mollusc and echinoderm)

#### Cell Biology

1. Preparation of temporary stained squash of onion root tip to study various stages of mitosis

2. Study of various stages of meiosis/mitosis.

**CORE COURSE V  
DIVERSITY OF CHORDATA**

**THEORY** **(Credits 4)**

**Unit 1 : Introduction to chordates** **2**

General characteristics and outline classification

**Unit 2 : Protochordata** **8**

General characteristics of Hemichordata, Urochordata and Cephalochordata , Retrogressive metamorphosis in Urochordata.

**Unit 3 : Origin & General characteristics of Chordata**

**Unit 4 : Agnatha** **2**

General characteristics and classification of cyclostomes up to class

**Unit 5 : Pisces** **8**

General characteristics of Chondrichthyes and Osteichthyes, classification up to order

**Unit 6 : Amphibia** **6**

General characteristics and classification up to order; Parental care in Amphibians

**Unit 7 : Reptilia** **7**

General characteristics and classification up to order;

Affinities of Sphenodon;

Poison apparatus and Biting mechanism in snakes

**Unit 8 : Aves** **8**

General characteristics and classification up to order, Origin of bird,

Flight adaptations and Migration in birds

**Unit 9 : Mammals** **8**

General characters and classification up to order

Affinities of Prototheria, Metatheria

**CORE COURSE VI**  
**ANIMAL PHYSIOLOGY : CONTROLLING AND COORDINATING SYSTEMS**

| <b>THEORY</b>   | <b>(Credits 4)</b> |
|---|--------------------|
| <b>Unit 1 : Tissues</b>   | <b>6</b>           |
| Structure, location, classification and functions of epithelial tissue, connective tissue, muscular tissue and nervous tissue   |                    |
| <b>Unit 2 : Bone and Cartilage</b>  | <b>4</b>           |
| Structure and types of bones and cartilages, Ossification, bone growth and resorption   |                    |
| <b>Unit 3 : Nervous system</b>  | <b>10</b>          |
| Structure of neuron, resting membrane potential, Origin of action potential and its propagation across the myelinated and unmyelinated nerve fibres; Types of synapse, Synaptic transmission and Neuromuscular junction; Reflex action and its types – reflex arc |                    |
| <b>Unit 4 : Muscle</b>  | <b>12</b>          |
| Histology of different types of muscle; Ultra structure of skeletal muscle; Molecular and chemical basis of muscle contraction.   |                    |
| <b>Unit 5 : Reproductive System</b>   | <b>10</b>          |
| Histology of testis and ovary; Physiology of male and female reproduction; Puberty, Methodology of contraception in male and female   |                    |
| <b>Unit 6 : Endocrine system</b>  | <b>18</b>          |
| Histology of endocrine glands – pineal, pituitary, thyroid, parathyroid, pancreas, adrenal; Hormones secreted by them and their mechanism of action, Hypothalamus (neuroendocrine gland), Placental hormones  |                    |

**CORE COURSE VII  
FUNDAMENTALS OF BIOCHEMISTRY**

**THEORY**

**(Credits 4)**

**Unit 1 : Carbohydrates**

**8**

Structure and Biological importance : Monosaccharides, Disaccharides, Polysaccharides and Glycoconjugates

**Unit 2 : Lipids**

**8**

Structure and significance : Physiologically important saturated and unsaturated fatty acids, Triacylglycerols, Phospholipids, Glycolipids, Steroids

**Unit 3 : Proteins**

**Amino Acids** : Structure, Classification and General properties.

**Proteins** : Structure, Classification and types

**Immunoglobulins** : Basic structure, Classes and Function.

**Unit 4 : Nucleic Acids**

**12**

Structure, function and types (DNA & RNA).

**Unit 5 : Enzyme**

Nomenclature and classification; Cofactors; Specificity of enzyme action; Isozymes; Mechanism of enzyme action.

## DIVERSITY OF CHORDATA

### PRACTICAL

(Credits 2)

#### 1. Protochordata

*Balanoglossus*, *Herdmania*, *Branchiostomata*, Colonial Urochordata sections of *Balanoglossus* through proboscis and branchiogenital regions, Sections of *Amphioxus* through pharyngeal regions, Sections of *Amphioxus* through pharyngeal, intestinal and caudal regions, Permanent slide of *Herdmania* spicules.

#### 2. Agnatha

*Petromyzon*, *Myxine*

#### 3. Fishes

*Scoliodon*, *Sphyrna*, *Pristis*, *Torpedo*, *Chimaera*, *Mystus*, *Heteropneustes*, *Labeo*, *Exocoetus*, *Echeneis*, *Anguilla*, *Hippocampus*, *Tetrodon/Diodon*, *Anabas*, Flat fish

#### 4. Amphibia

*Ichthyophis/Ureotyphlus*, *Necturus*, *Bufo*, *Hyla*, *Alytes*, *Salamandra*

#### 5. Reptilia

*Chelone*, *Trionyx*, *Hemidactylus*, *Varanus*, *Uromastrix*, *Chamaelon*, *Ophiosaurus*, *Draco*, *Bungarus*, *Vipera*, *Naja*, *Hydrophis*, *Zamenis*, *Crocodylus*, Key for identification of poisonous and non-poisonous snakes.

#### 6. Aves

Study of six common birds from different orders.

Types of beaks and claws

#### 7. Mammalia

Sorex, Bat (Insectivorous and Frugivorous), *Funambulus*, *Loris*, *Herpestes*, *Erinaceus*

Mount of weberian ossicles of *Mystus*, pecten from Fowl head

Power point presentation on study of any two animals from two different classes by students

## ANIMAL PHYSIOLOGY : CONTROLLING AND COORDINATING SYSTEMS

### PRACTICALS

(Credits 2)

1. Demonstration of the unconditioned reflex action (Deep tendon reflex such as knee jerk reflex).
2. Study of permanent slides of Mammalian skin, Cartilage, Bone, Spinal cord, Nerve cell, Pituitary, Pancreas, Testis, Ovary, Adrenal, Thyroid and Parathyroid .

## FUNDAMENTALS OF BIOCHEMISTRY

### PRACTICAL

(Credits 2)

1. Qualitative test of functional groups in carbohydrates, proteins and lipids.
2. Paper chromatography of amino acids.
3. Action of salivary amylase under optimum conditions.
4. Effect of pH, temperature and inhibitors on the action of salivary amylase.

### SUGGESTED READINGS

- Young, J.Z.(2004). The Life of Vertebrates. III Edition. Oxford university press.
- Pough H. Vertebrate life, VIII Edition, Pearson International .
- Darlington P.J. The Geographical Distribution of Animals, R.E. Krieger Pub Co.
- Hall B.K. and Hallgrimsson B.(2008). Strickberger's Evolution. IV Edition. Jones and Bartlett Publishers Inc.
- Guyton, A.C. & Hall, J.E. (2006). Textbook of Medical Physiology. XI Edition. Hercourt Asia PTE Ltd./W.B. Saunders Company
- Tortora, G.J. & Grabowski, S. (2006). Principles of Anatomy & Physiology. XI Edition John Wiley & sons
- Victor P.Eroschenko. (2008).diFiore's Atlas of Histology with Functional correlations. XII Edition. Lippincott W. & Wilkins.

**CORE COURSE VIII  
COMPARATIVE ANATOMY OF VERTEBRATES**

**THEORY**

**(Credits 4)**

**Unit 1: Integumentary Systems**

Structure, functions and derivatives of integument

Unit 2 :Skeletal System

Overview of axial and appendicular skeleton, Jaw suspensorium, Visceral arches

Unit 3 : Digestive System

Alimentary canal and associated glands, dentition

Unit 4 : Respiratory system

Skin, gills,lungs and air sacs; Accessory respiratory organs

Unit 5 : Circulatory Systems

General plan of circulation, evolution of heart and aortic arches

Unit 6 : Urinogenital System

Succession of kidney, Evolution of urinogenital ducts, Types of mammalian uteri

Unit 7 : Nervous System

Comparative account of brain

Autonomic nervous system, Spinal cord, Cranial nerves in mammals.

## SUGGESTED READING

- Cox, M.M and Nelson, D.L.(2008). Lehninger's Principles of Biochemistry, V Edition, W.H. Freeman and Co., New York.
- Berg, J.M., Tymoczko, J.L. and Stryer, L. (2007). Biochemistry, VI Edition, W.H. Freeman and Co., New York.
- Murray, R.K., Bender, D.A., Botham, K.M., Kennelly, P.J., Rodwell, V.W. and Well, P.A. (2009). Harper's Illustrated Biochemistry, XXVIII Edition, International Edition, The McGraw-Hill .
- Hames, B.D. and Hooper, N.M. (2000). Instant Notes in Biochemistry, II Edition, BIOS Scientific Publishers Ltd., U.K.
- Watson, J.D., Barker, T.A., Bell, S.P., Gann, A., Levine, M. And Losick, R.(2008). Molecular Biology of the Gene, VI Edition, Cold Spring Harbor Lab.Press, Pearson Pub.
- Kardong, K.V. (2005) Vertebrate's Comparative Anatomy . Function and Evolution. IV Edition. McGraw-Hill Higher Education
- Kent,G.C. and Carr R.K (2000). Comparative Anatomy of the Vertebrates. IX Edition. The McGraw-Hill Companies
- Hilderbrand, M and Gaslow G.E. Analysis of Vertebrate Structure, John Wiley and Sons
- Walter, H.E. and sayles, L.P; Biology of Vertebrates, Khosla Publishing House
- Guyton, A.C. & Hall, J.E.(2006). Textbook of Medical Physiology.XI Edition. Hercourt Asia PTE Ltd. W.B. Saunders Company.
- Tortora, G.J. & Grabowski, S.(2006). Principles of anatomy & Physiology.XI EditionJohn Wiley & sons.
- Victor P. Eroschenko. (2008). diFiore's Atlas of Histology with Functional correlations. XII Edition. Lippincott W. & Wilkins.
- Vander A, Sherma J. And Luciano D. (2014). Vander's Human Physiology : The Mechanism of Body Function. XIII Edition, McGraw Hills



**CORE COURSE IX**  
**ANIMAL PHYSIOLOGY : LIFE SUSTAINING SYSTEMS**

**THEORY**

**(Credits 4)**

**Unit 1 : Physiology of Digestion**

**14**

Structural organization and functions of gastrointestinal tract and associated glands; Mechanical and chemical digestion of food; Absorption of carbohydrates, lipids, proteins, water, minerals and vitamins; Hormonal control of secretion of enzymes in Gastrointestinal tract.

**Unit 2 : Physiology of Respiration**

**12**

Histology of trachea and lung; Mechanism of respiration, Pulmonary ventilation; Respiration volumes and capacities; Transport of oxygen and carbon dioxide in blood; Respiratory pigments,

**Unit 3: Renal Physiology**

**8**

Structure of kidney and its functional unit; Mechanism of urine formation; Regulation of water balance; Regulation of acid-base balance

**Unit 4 : Blood**

**12**

Components of blood and their functions; Structure and functions of haemoglobin  
Blood clotting mechanism  
Blood groups; Rh factor, ABO and MN

**Unit 5 : Physiology of Heart**

**14**

Structure of mammalian heart; Coronary circulation; Structure and working of conducting myocardial fibres. Origin and conduction of cardiac impulses  
Cardiac cycle; Cardiac output and its regulation.

**CORE COURSE X**  
**BIOCHEMISTRY OF METABOLIC PROCESSES**

## **THEORY**

**(Credits 4)**

### **Unit 1 :Overview of Metabolism (in brief)**

**10**

Catabolism vs Anabolism, Stages of catabolism, Compartmentalization of metabolic pathways, Shuttle systems and membrane transporters; ATP as "Energy Currency of cell"; coupled reaction; Use of reducing equivalents and cofactors.

### **Unit 2 : Carbohydrate Metabolism**

**16**

Sequence of reaction and regulation of glycolysis, Citric acid cycle, Phosphate pentose pathway, Gluconeogenesis, Glycogenolysis and Glycogenesis

### **Unit 3 : Lipid Metabolism--Basics**

Beta-oxidation and omega-oxidation of saturated fatty acids with even and odd number of carbon atoms; Biosynthesis of palmitic acid; Ketogenesis

### **Unit 4 : Protein Metabolism--Basics**

**10**

Catabolism of amino acids : Transamination, Deamination, Urea cycle; Fate of C-skeleton of Glucogenic and Ketogenic amino acids

### **Unit 5 : Oxidative Phosphorylation**

**10**

Redox systems; Review of mitochondrial respiratory chain, inhibitors and un-couplers of Electron Transport System

## **COMPARATIVE ANATOMY OF VERTEBRATES**

### **PRACTICAL**

1. Study of placoid, cycloid and ctenoid scales through permanent slides/photographs
2. Disarticulated skeleton of Frog, *Varanus*, fowl, rabbit
3. Carapace and plastron of turtle/tortoise
4. Mammalian skulls : One herbivorous and carnivorous animal

## **ANIMAL PHYSIOLOGY : LIFE SUSTAINING SYSTEMS**

### **PRACTICALS**

1. Determinations of ABO Blood group.
2. Enumeration of red blood cells and white blood cells using haemocytometer.
3. Recording of blood pressure using a sphygmomanometer.
4. Examination of sections of mammalian oesophagus, stomach, duodenum, ileum, rectum, liver, Trachea, lung, kidney

## **BIOCHEMISTRY OF METABOLIC PROCESS**

### **PRACTICALS**

1. Estimation of total protein in given solution by Lowry's method.

### **SUGGESTED READING**

- Kardong, K.V. (2005) *Vertebrate's Comparative Anatomy, Function and Evolution*. IV Edition. McGraw Hill Higher Education
- Kent, G.C. and Carr R.K. (2000). *Comparative Anatomy of the Vertebrates*. IX Edition. The McGraw-Hill Companies
- Hilderbrand, M and Gaslow G.E. *Analysis of Vertebrate Structure*, John Wiley and Sons
- Walter, H.E. and Sayles, L.P; *Biology of Vertebrates*, Khosla Publishing House.
- Guyton, A.C. & Hall, J.E.(2006). *Textbook of Medical Physiology*. XI Edition. Herculourt Asia PTE Ltd. W.B. Saunders Company.

- Tortora, G.J. & Grabowski, S. (2006). Principles of Anatomy & Physiology. XI Edition John Wiley & sons.
- Victor P. Eroschenko. (2008). diFiore's Atlas of Histology with Functional correlations. XII Edition. Lippincott W. & Wilkins.
- Vander A, Sherman J. And Luciano D. (2014). Vander's Human Physiology : The Mechanism of Body Function. XIII Edition, McGraw hills.
- Cox, M.M and Nelson, D.L. (2008). *Lehninger Principles of Biochemistry*, V Edition, W.H. Freeman and Co., New York.
- Berg, J.M., Tymoczko, J.L. and Stryer, L. (2007). *Biochemistry*, VI Edition, W.H. Freeman and Co., New York.
- Murray, R.K., Bender, D.A., Botham, K.M., Kennelly, P.J., Rodwell, V.W and Well, P.A. (2009). *Harper's Illustrated Biochemistry*. XXVIII Edition, International Edition, The McGraw-Hill Companies Inc.
- Hames, B.D. and Hooper, N.M. (2000). *Instant Notes in Biochemistry*, II Edition, BIOS Scientific Publishers Ltd., U.K.

## CORE COURSE XI MOLECULAR BIOLOGY

### THEORY

#### Unit 1 : Nucleic acids

Salient features of DNA

Watson and Crick model of DNA

#### Unit 2 : DNA Replication

DNA Replication in prokaryotes and eukaryotes, mechanism of DNA replication, Semi-conservative, bidirectional and semi-discontinuous replication.

### **Unit 3 : Transcription**

RNA polymerase and transcription Unit, mechanism of transcription in prokaryotes and eukaryotes, synthesis of rRNA and mRNA, transcription factors

### **Unit 4 : Translation**

Genetic code, Process of protein synthesis in prokaryotes, Protein involved in initiation, elongation and termination of polypeptide chain; Inhibitors of protein synthesis; Difference between prokaryotic and eukaryotic translation

### **Unit 5 : Gene Regulation**

Transcription regulation in prokaryotes : Principles of transcriptional regulation with examples from lac operon and trp operon ; Transcription regulation in eukaryotes : Activators, repressors, enhancers, silencer elements; Gene silencing, Genetic imprinting

## **CORE COURSE XII PRINCIPLES OF GENETICS**

**THEORY**

**(Credits 4)**

### **Unit 1 : Mendelian Genetics and its Extension**

**8**

Principles of Inheritance, Incomplete dominance and co-dominance, Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, Sex-linked, sex influenced and sex-limited characters inheritance.

**Unit 2 : Linkage, Crossing Over and Chromosomal Mapping** **12**

Linkage and crossing over, Cytological basis of crossing over & chromosomal mapping,

**Unit 3 : Mutations** **10**

Types of gene mutations (Classification), Types of chromosomal aberrations (Classification, figures and with one suitable example of each),Molecular basis of mutations.

**Unit 4 : Sex Determination** **4**

Chromosomal mechanism of sex determination in Drosophila and man.

**Unit 6 : Polygenic Inheritance** **3**

Polygenic inheritance with suitable examples; simple numerical based on it.

**Unit 7 : Recombination in Bacteria and Viruses** **9**

Conjugation, Transformation, Transduction.

## **MOLECULAR BIOLOGY**

### **PRACTICALS**

**(Credits 2)**

1. Study of Polytene chromosome from Chironomous / Drosophila larvae.
2. Preparation of liquid culture medium (LB) and raise culture of E.coli
3. Preparation of solid culture medium (LB) and growth of E.coli by spreading and streaking.

**CORE COURSE XIII  
DEVELOPMENTAL BIOLOGY**

**THEORY**

**(Credits 2)**

**Unit 1 : Introduction**

**4**

Cell-Cell interaction, Pattern formation, Differentiation and growth, Cytoplasmic determinants and asymmetric cell division.

**Unit 2 : Early Embryonic Development**

**28**

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; Early development of frog and chick up to gastrulation.

**Unit 3 : Late Embryonic Development**

**8**

Fate of germ layers; Extra-embryonic membranes in birds, Placenta (Structure,types and functions of placenta).

**Unit 4 : Post Embryonic Development**

**12**

Ageing : Concepts and Theories.

**Unit 5 : Implications of Developmental Biology**

**8**

In vitro fertilization, Stem cell (ESC),Amniocentesis.

**CORE COURSE XIV  
EVOLUTIONARY BIOLOGY**

**THEORY**

**(Credits 4)**

**Unit 1 :**

**4**

Historical review of evolutionary concept : Lamarckism, Darwinism, Neo-Darwinism



|   |           |
|---|-----------|
| <b>Unit 2:</b>  | <b>10</b> |
| Evidences of Evolution : Fossil record (types of fossils, transitional forms, geological time scale, evolution of horse).   |           |
| <b>Unit 3:</b>  | <b>8</b>  |
| Sources of variations : Heritable variations and their role in evolution  |           |
| <b>Unit 4:</b>  | <b>13</b> |
| Population genetics : Hardy-Weinberg Law (statement and derivation of equation, application of law to human population); Evolutionary forces upsetting H-W equilibrium; Natural selection.  |           |
| <b>Unit 6 :</b>   | <b>7</b>  |
| Product of evolution : Micro evolutionary changes (inter-population variations, clines, races, Species concept, Isolating mechanism, modes of speciation—allopatric, sympatric, Adaptive radiation/macroevolution (exemplified by Galapagos finches). |           |
| <b>Unit 8:</b>  | <b>6</b>  |
| Origin and evolution of man   |           |

## DEVELOPMENTAL BIOLOGY

### PRACTICALS

1. Study of whole mounts and sections of developmental stages of frog through permanent slides : Cleavage stages, blastula, gastrula, neurula, tail-bud stage, tadpole (external and internal gill stages).
2. 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).

3. Study of the developmental stages and life cycle of *Drosophila* from stock culture.
4. Project report on *Drosophila* culture/chick embryo development.
5. Study of fossil from models/pictures.
6. Study of homology and analogy from suitable specimens.

### **SUGGESTED READINGS**

- Gilbert, S.F. (2010). *Developmental Biology*, IX Edition, Sinauer Associates, Inc. Publishers, Sunderland, Massachusetts, USA.
- Balinsky B.I. and Fabian B.C. (1981). *An Introduction to Embryology*, V Edition, International Thompson Computer Press
- Carlson, R.F. *Patten's Foundations of Embryology*.
- Kalthoff (2008). *Analysis of Biological Developmental*, II Edition, McGraw-Hill Publishers
- Lewis Wolpert (2002). *Principles of Development*. II Edition, Oxford University Press

- Ridley, M(2004) Evolution III Edition Blackwell publishing
- Hall, B.K. and Hallgrimson, B (2008). Evolution IV Edition.Jones and Barlett Publishers
- Campbell, N.A. and Reece J.B(2011). Biology IX Edition,Pearson, Benjamin, Cummings
- Douglas, J.Futuyma (1977). Evolutionary Biology. Sinauer Associates.
- Snustad. S Principles of Genetics.
- Pevsner, J (2009). Bioinformatics and Functional Genomics. II Edition Wiley-Blackwell

**DSE 1  
FISH AND FISHERIES**

**THEORY**

**(Credits 4)**

**Unit 1 :Introduction and Classification**

General description of fish; Account of systematic classification of fishes (upto classes)

**Unit 2 : Morphology and Physiology**

Types of fins and their modifications;Locomotion in fishes, Types of Scales, Gills and gas exchange;  
Swim bladder: Types and role in respiration, Electric organs, Parental care.

### **Unit 3 : Fisheries**

Inland Fisheries; Marine Fisheries; Fishing crafts and Gears; Depletion of fisheries resources; Fisheries law and regulations.

### **Unit 4 : Aquaculture**

Sustainable Aquaculture; Extensive, semi-intensive and intensive culture of fish; Pen and cage culture; Polyculture; Composite fish culture; Brood stock management; Induced breeding of fish; Management of finfish hatcheries; Preparation and maintenance of fish aquarium; Preparation of compound diets for fish; Role of water quality in aquaculture; Fish diseases : Bacterial, viral and parasitic; Preservation and processing of harvested fish, Fishery by-products.

### **Unit 5 : Fish in research**

Zebrafish as a model organism in research.

## **FISH AND FISHERIES**

PRACTICAL

(Credits 2)

1. Study of Petromyzon, Myxine, Pristis, Chimaera, Exocoetus, Hippocampus, Gambusia, Labeo, Heteropneustus, Anabas.
2. Study of different types of scales (through permanent slides/photographs).
3. Study of crafts and gears used in Fisheries.
4. Demonstration of induced breeding in Fishes(video).
5. Demonstration of parental care in fishes (video).
6. Project Report on a visit to any fish farm/ pisciculture unit/ Zebrafish rearing lab.

### **SUGGESTED READINGS**

- Q Bone and R Moore, Biology of Fishes, Taylor and Francis Group, CRC Press, U.K.
- D.H. Evans and J.D. Claiborne, The Physiology of Fishes, Taylor and Francis Group, CRC press, UK von der Emde, R.J. Mogdans and B.G. Kapoor. The Senses of Fish : Adaptions for the Reception of Natural Stimuli, Springer, Netherlands
- C.B.L. Srivastava, Fish Biology, Narendra Publishing House
- J.R. Norman, A history of Fishes, Hill and Wang Publishers
- S.S. Khanna and H.R. Singh, A text book of Fish biology and Fisheries, Narendra Publishing House.
- Jhingeran-Fish and Fisheries, Latest Edition

## **DSE--2 IMMUNOLOGY**

### **THEORY**

**(Credits 4)**

#### **Unit 1 : Overview of Immune System**

Historical perspective of Immunology, early theories of Immunology, Cells and organs of the Immune system.

#### **Unit 2 : Innate and adaptive Immunity--Basics**

Anatomical barriers, Inflammation, Cell and molecules involved in innate immunity, Adaptive immunity (Cell mediated and humoral), Passive : Artificial and natural immunity, Active : Artificial and natural immunity, Immune dysfunctions (brief account of autoimmunity with reference to Rheumatoid Arthritis and tolerance, AIDS).

### **Unit 3 : Antigens**

Antigenicity and immunogenicity, Immunogens, B and T-cell epitopes

### **Unit 4 : Immunoglobulins**

Structure and functions of different classes of immunoglobulins, Antigen-antibody interactions,

### **Unit 5 : Cytokines**

Properties and functions of cytokines, Therapeutics Cytokines.

### **Unit 6 : Vaccines**

Various types of vaccines.

## **IMMUNOLOGY**

### **PRACTICAL**

**(Credits 2)**

1. Demonstration of lymphoid organs.
2. Histological study of spleen , thymus and lymph nodes through slides/photographs.
3. Preparation of stained blood film to study various types of blood cells.
4. ABO blood group determination.
6. Cell counting and viability test from splenocytes of farm bred animals/ cell lines.
7. Demonstration of :
  - a.ELISA
  - b.Immunoelectrophoresis

\* The experiments can be performed depending upon usage of animal in UG courses.

### **SUGGESTED READING**

- Kindt, T.J., Goldsby, R.A., Osborne, B.A. and Kuby, J (2006). *Immunology*, VI Edition. W.H. Freeman and Company.
- David, M., Jonathan, B., David, R.B. and Ivan R. (2006). *Immunology*, VII Edition, Mosby, Elsevier Publication.
- Abbas, K. Abul and Lechtman H. Andrew (2003). *Cellular and Molecular Immunology*. V Edition. Saunders Publication.

### **DSE 3 PARASITOLOGY**

#### **THEORY**

**(Credits 4)**

#### **Unit 1 : Introduction to Parasitology**

**3**

Brief introduction of Parasitism, Parasite, Parasitoid and Vectors (mechanical and biological vector) Host parasite relationship.

#### **Unit II : Parasitic Protists**

**15**

Study of Morphology, Life Cycle, prevalence, Epidemiology, Pathogenicity, Diagnosis, Prophylaxis and Treatment of *Entamoeba histolytica*, *Trypanosoma gambiense*, *Leishmania donovani*, *Plasmodium vivax*.

**Unit III : Parasitic Platyhelminthes 15**

Study of Morphology, Life Cycle, Prevalence, Epidemiology, Pathogenicity, Diagnosis, Prophylaxis and Treatment of *Fasciolopsis buski*, *Taenia solium*.

**Unit IV : Parasitic Nematodes 15**

Study of Morphology, Life Cycle, Prevalence, Epidemiology, Pathogenicity, Diagnosis, Prophylaxis and Treatment of *Ascaris Lumbricoides*, *Wuchereria bancrofti* and *Trichinella spiralis*.

**Unit V : Parasitic Arthropoda 10**

Biology, importance and control of ticks, mites, *Pediculus humanus* (head and body louse).

**Unit VI : Parasitic Vertebrates 2**

A brief account of parasitic vertebrates.

**PARASITOLOGY**

**PRACTICAL**

**(Credits 2)**

- Study of life stages of *Entamoeba histolytica*, *Trypanosoma gambiense*, *Leishmania donovani* and *Plasmodium vivax* through permanent slides/ micro photographs.
- Study of adult and life stages of *Fasciola buski*, *Schistosoma haematobium*, *Taenia solium* through permanent slides/micro photographs.
- Study of adult and life stages of *Ascaris lumbricoides*, *Wuchereria bancrofti* through permanent slides/ micro photographs.



- Study of plant parasitic Meloidogyne from the soil sample.
- Study of Pediculus humanus (Head louse and Body louse) through permanent slides/photographs.
- Study of monogenea from the gills of fresh/marine fish [Gills can be procured from fish market as by product of the industry].

**Submission of a brief report on parasitic vertebrates.**

### **SUGGESTED READING**

- Arora, D.R. and Arora, B. (2001) *Medical Parasitology*. II Edition. CBS Publications and Distributors.
- E.R. Noble and G.A. Noble (1982) *Parasitology : The biology of animal parasites*. V Edition, Lea & Febiger.
- Ahmed, N., Dawson, M., Smith, C. And Wood, Ed.(2007) *Biology of Disease*. Taylor and Francis Group.
- Parija, S.C. *Textbook of medical parasitology, protozoology & helminthology (Text and Colour Atlas)*, II Edition, All India Publishers & Distributors, Medical Books Publishers, Chennai, Delhi.
- Rattan Lal Ichhpujani and Rajesh Bhatia. *Medical Parasitology*, III edition, Jaypee Brothers Medical Publishers (P) Ltd., New Delhi
- Meyer, Olsen & Schmidt's *Essential of Parasitology*, Murray, D. Dailey, W.C. Brown Publishers
- K.D. Chatterjee (2009). *Parasitology : Protozoology and Helminthology*. XIII Edition, CBS Publishers & Distributors (P) Ltd.
- C.C. Chatterjee

### **DSE 4**

### **WILD LIFE CONSERVATION AND MANAGEMENT**

#### **THEORY**

**(Credits 4)**

#### **Unit 1 : Introduction to Wild Life**

Values of wild life-positive and negative; Conservation ethics; importance of conservation; Causes of depletion; World conservation strategies.

#### **Unit 2 : Evaluation and management of wild life**

Habit analysis, Physical parameters : Topography, Geology, Soil and water; Biological Parameters : food, cover, forage, browse and cover estimation; Standard evaluation procedure :remote sensing and GIS.

### **Unit 3 : Management of habitats**

Setting back succession; Grazing logging; Mechanical treatment; Advancing the succession process; Cover construction.

### **Unit 4 : Population estimation**

Population density, Natality, Birth rate, Mortality, Fertility schedules and sex ratio computation;

### **Unit 5 : Management planning of wild life in protected areas**

Estimation of carrying capacity; Eco tourism/wild life tourism in forests ; Concept of climax persistence; Ecology of perturbation.

### **Unit 6 : Protected areas**

National parks & sanctuaries, Community reserve; Important features of protected areas in India; Tiger conservation- Tiger reserves in India; Management challenges in Tiger reserve.

## **WILD LIFE CONSERVATION AND MANAGEMENT**

### **PRACTICALS**

**(Credits2)**

1. Identification of flora, mammalian fauna, avian fauna, herpeto-fauna.
2. Demonstration of basic equipment needed in wildlife studies use, care and maintenance. (Compass, Binoculars, Spotting scope, Range Finders, Global Positioning System, Various types of cameras and lenses).
3. Familiarization and study of animal evidences in the field; identification of animals through pug marks, hoof marks, scats, pellet groups, nest, antlers.
4. Demonstration of different field techniques for flora and fauna.

## **SUGGESTED READINGS**

- Caughley, G., and Sinclair, A.R.E. (1994). Wildlife Ecology and Management. Blackwell Science.
- Woodroffe R., Thirgood, S. And Rabinowitz, A. (2005). People and Wildlife, Conflict or Co-existence? Cambridge University.
- Bookhout, T.A. (1996). Research and Management Techniques for Wildlife and Habitats, 5<sup>th</sup> edition. The Wildlife Society, Allen Press.
- Sutherland, W.J.(2000). The Conservation Handbook : Research, Management and Policy. Blackwell Sciences.
- Hunter M.L., Gibbs, J.B. and Sterling, E.J. (2008). Problem-Solving in Conservation Biology and Wildlife Management : Exercise for Class, Field, and Laboratory. Blackwell Publishing.

## **SKILL ENHANCEMENT COURSES**

### **SEC 1**

#### **AQUARIUM FISH KEEPING**

**(Credits 2)**

##### **Unit 1 : Introduction to Aquarium Fish Keeping**

The potential scope of Aquarium Fish Industry as a Cottage Industry, Exotic and Endemic species of Aquarium Fishes.

##### **Unit 2 : Biology of Aquarium Fishes**

Common characters and sexual dimorphism of Fresh water and Marine Aquarium fishes such as Guppy, Molly, Sword tail, Gold fish, Angel fish, Blue morph, Anemone fish and Butterfly fish.

**Unit 3 : Food and feeding of Aquarium fishes**

Use of live fish feed organisms. Preparation and composition of formulated fish feeds.

**Unit 4 : Fish Transportation**

Live fish transport – Fish handling, packing and forwarding techniques.

**Unit 5 : Maintenance of Aquarium**

General Aquarium maintenance – budget for setting up an Aquarium Fish Farm as a Cottage Industry.

**SEC – 2**

**SERICULTURE**

**(Credits 2)**

**Unit 1 : Introduction**

Sericulture : Definition, history and present status; Silk route  
Types of silkworms, Distribution and Races  
Exotic and indigenous races  
Mulberry and non-mulberry Sericultuire

**Unit 2 : Biology of Silkworm**

Life cycle of *Bombyx mori*

Structure of silk gland and secretion of silk

### **Unit 3 : Rearing of Silkworms**

Selection of mulberry variety and establishment of mulberry garden

Rearing house and rearing appliances

Disinfectants : Formalin, bleaching powder, RKO

Silkworm rearing technology : Early age and Late age rearing

Types of mountages

Spinning, harvesting and storage of cocoons

### **Unit 4 : Pests and Diseases**

Pests of silkworm : Uzi fly, dermestid beetles and vertebrates.

Pathogenesis of silkworm diseases : Protozoans, viral, fungal and bacterial

Control and prevention of pests and diseases

### **Unit 5 : Entrepreneurship in Sericulture**

Prospectus of Sericulture in India : Sericulture industry in different states, employment, potential in mulberry and non-mulberry sericulture. Visit to various sericulture centres.

## **SUGGESTED READING**

- Manual on sericulture; Food and agriculture Organisation, Rome 1976.
- Handbook of Practical Sericulture : S.R. Uliyal and M.N. Narasimhanna  
CSB, Bangalore
- Silkworm Rearing and Disease of Silkworm, 1956, Ptd. By Director of Ptg., Stn &  
Pub. Govt. Press, Bangalore
- Appropriate Sericulture Techniques; Ed. M.S. Jolly, Director, CSR & TI, Mysore
- Handbook of Silkworm rearing : Agriculture and Technical Manual-1, Fuzi Pub.  
Co. Ltd., Tokyo, Japan 1972
- Manual of Silkworm Egg Production; M.N. Narasimhana, CSB, Bangalore 1988.
- Silkworm Rearing; Wupang—Chun and Chen Da-Chung, Pub. By FAO, Rome 1988.
- A Guide for Bivoltine Sericulture; K. Sengupta, Director, CSR & TI, Mysore 1989.

- Improved Method of Rearing Young age silkworm; S. Krishnaswamy, reprinted CSB, Bangalore, 1986.

**Subsidiary / General**

**B.Sc. Part - 1**  
**Subsidiary/General**  
**1st Semester**

F.M-75

Time : 3 Hrs

**Group A – Non-Chordata**

1. Bionomics, general character and classification (upto orders) of the following phyla :  
Protozoa, Porifera, Coelenterata, Platyhelminthes, Aschelminthes.
2. Detailed study of the structure and life history of the following types :-
  - a. Protozoa – Paramecium
  - b. Porifera – Sycon
  - c. Coelenterata – Obelia
  - d. Platyhelminthes – Fasciola
  - e. Aschelminthes – Ascaris

**Group B - Ecology**

**Unit 1 : Introduction to Ecology**

History of ecology, Autoecology and synecology, Levels of organization, Laws of limiting factors, Study of physical factors.

**Unit 2 : Community**

Community characteristics : species richness, dominance, diversity, abundance, vertical stratification, Ecotone and edge effect ; Ecological succession with one example

**Unit 3: Ecosystem**

Types of ecosystem with one example in detail,  
Food chain : Detritus and grazing food chains, Linear and Y-shaped food chains.

**Practicals**

F.M- 25

Time : 3 Hrs

1. Dissection
2. Temporary mounting/Study of Planktons
3. Identification
  - (a) Permanent slides-2
  - (b) Museum specimen-2
  - (c) Plankton slides-1
4. Practical Record & Viva.

**B.Sc. Part - 1**  
**Subsidiary/General**  
**2nd Semester**

F.M-75

Time : 3 Hrs

**Group A-Nonchordates**

1. Binomials, General character and classification (upto orders) of the following phyla : Annelida, Arthropoda, Mollusca, Echinodermata.

2. Detailed study of the structure and life history of the following types

- (a) Annelida – Pheretima
- (b) Arthropoda—Palaemon
- (c) Mollusca—Pila
- (d) Echinodermata—Asterias

**Group B-Cell Biology**

1. Diversity of cell size & shape
2. Cell theory
3. Structure & function of Plasma membrane & cytoplasmic organelles.
4. Cell division.
5. Cell cycle.

**Practicals**

F.M-25

Time : 3 Hrs

1. Dissection
2. Temporary mounting/Cytology
3. Identification
  - (a) Permanent slides-2
  - (b) Museum specimens-2
  - (c) Cytological slides-1 (Meiosis/Mitosis.)
4. Practical Record & Viva.



**B.Sc. Part - 2**  
**Subsidiary/General**  
**3rd Semester**

F.M-75

Time : 3 Hrs

**Chordata**

1. Bionomics, general character and classification (upto order) of living chordates of the following groups: Protochordates, Cyclostomes, Pisces, Amphibia, Reptilia, Aves & Mammals.
2. Study the following types :
  - (a) Hemichordata : Balanoglossus
  - (b) Urochordata : Herdmania (including retrogressive metamorphosis)
  - (c) Cephalochordata : Amphioxus
  - (d) Fishes : Scoliodon , Pisciculture
  - (e) Reptiles : Biting & feeding mechanism of snakes
  - (f) Aves : Columba, flight adaptation
  - (g) Mammals : Characters, distribution and affinities of Prototheria & Metatheria

**Practical**

Marks : 25

Time : 3 hours

**Experiments**

1. Different adaptive features in vertebrates.
2. Temporary mounting
3. Identification:
  - (a) Permanent slides-2 (b) Museum specimens-2
4. Practical record & viva.

**Details of Experiment**

- 1.** Different adaptive features in vertebrates—e.g.-Exocoetus, Chamaleon, Draco, Bat etc.
- 2.** Mounting: Scales of fishes, ampulla of Lorenzini.
- 3.** Identification :-
  - (a) Slides from histology
  - (b) Museum Specimens

**B.Sc. Part - 2**  
**Subsidiary/General**  
**4rth Semester**

**1. Embryology**

Gametogenesis, Fertilization, Parthenogenesis

**2. Physiology**

Digestion, Respiration, Excretion.

**3. Endocrinology**

Histophysiology of following endocrine organs – Pituitary, Thyroid, Adrenal, Testis, Ovary and islets of Langerhans.

**4. Evolution**

- (a) Sources of hereditary variations and their role in evolution
- (b) Darwin's theory of natural selection & Neo Darwinism
- (c) Isolating mechanism & their role in evolution

**Practical**

Marks : 25

Time : 3 hours

Experiments

- 1. Haematology
- 2. Physiology
- 3. Identification
- 4. Record & Viva

Details of Experiments

- 1. Haematology – Bleeding & Clotting time, Blood group, Hb%
- 2. Physiology – Pulse Rate Counting (Mammal), Frog-Rate of Heartbeat by Chimograph, Earthworm reflex action (Photoreceptors)
- 3. Identification
  - Embryological Slides-3
  - Endocrinological Slides-2