**UNIT – III**

3.1 Platyhelminthes General characters and classification up to classes with suitable examples
3.2 Parasitic Adaptations in helminths
3.3 Nemathelminthes General characters and classification up to classes with suitable examples
3.4 Life cycle and pathogenicity of *Ascaris lumbricoides*

***Activity: Assignment /Seminar /Quiz/Project/Peer teaching on the above***
***Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity***

**UNIT – IV**

4.1 Annelida General characters and classification up to classes with suitable examples
4.2 Vermiculture - Scope, significance, earthworm species, processing, Vermicompost, economic importance of vermicompost
4.3 Arthropoda General characters and classification up to classes with suitable examples
4.4 *Peripatus* - Structure and affinities

***Activity: Assignment /Seminar /Quiz/Project/Peer teaching on the above***
***Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity***

**UNIT – V**

5.1 Mollusca General characters and classification up to classes with suitable examples
5.2 Pearl formation in Pelecypoda
5.3 Echinodermata General characters and classification up to classes with suitable examples
Water vascular system in star fish
5.4 Hemichordata General characters and classification up to classes with suitable examples
*Balanoglossus* - Structure and affinities

***Activity: Assignment /Seminar /Quiz/Project/Peer teaching on the above***
***Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity***

**CO-CURRICULAR ACTIVITIES:**

- Preparation of chart/model of phylogenic tree of life, 5-kingdom classification
- Visit to Zoology Museum or Coral Island as part of Zoological tour
- Charts on polymorphism
- Clay models of canal system in sponges
- Plaster-of-paris model of *Peripatus*
- Construction of a vermicompost in each college, manufacture of manure by students and donating to local farmers
- Chart on pearl forming layers using clay
- Visit to a pearl culture rearing industry/institute
- Live model of water vascular system
- Observation of Balanoglossus for its tubicolous habit

**REFERENCE BOOKS:**


- L.H. Hyman „*The Invertebrates' Vol I, II and V.* – M.C. Graw Hill Company Ltd.
- Kotpal, R.L. 1988 - 1992 Protozoa, Porifera, Coelenterata, Helminthes, Arthropoda, Mollusca, Echinodermata. Rastogi Publications, Meerut.
- E.L. Jordan and P.S. Verma „*Invertebrate Zoology*' S. Chand and Company.

SEMESTER-I

## COURSE 1: ANIMAL DIVERSITY-I BIOLOGY OF NON-CHORDATES

**Practical** **Credits: 1** **2 hrs/week**

**COURSE OBJECTIVES:**

- To understand the importance of preservation of museum specimens
- To identify animals based on special identifying characters
- To understand different organ systems through demo or virtual dissections
- To maintain a neat, labelled record of identified museum specimens

**SYLLABUS:**

1. Study of museum slides / specimens / models (Classification of animals up to orders)
2. Protozoa: Amoeba, *Paramoecium, Paramoecium Binary fission and Conjugation, Vorticella, Entamoeba histolytica, Plasmodium vivax*
3. Porifera: *Sycon, Spongilla, Euspongia, Sycon*- T.S & L.S, Spicules, Gemmule
4. Coelenterata: *Obelia – Colony & Medusa, Aurelia, Physalia, Velella, Corallium, Gorgonia, Pennatula*
5. Platyhelminthes: *Planaria, Fasciola hepatica, Fasciola* larval forms – *Miracidium, Redia,* Cercaria, *Echinococcus granulosus, Taenia solium, Schistosoma haematobium*
6. Nemathelminths: *Ascaris (Male & Female), Drancunculus, Ancylostoma, Wuchereria*
7. Annelida: *Nereis, Aphrodite, Chaetopteurs, Hirudinaria,* Trochophore larva
8. Arthropoda: Cancer, *Palaemon,* Scorpion, *Scolopendra, Sacculina, Limulus, Peripatus,*
9. Larvae - Nauplius, Mysis, Zoea, Mouth parts of male &female *Anopheles* and *Culex,* Mouthparts of Housefly and Butterfly.
10. Mollusca: *Chiton, Pila, Unio, Pteredo, Murex, Sepia, Loligo, Octopus, Nautilus,* Glochidium larva
11. Echinodermata: *Asterias, Ophiothrix, Echinus, Clypeaster, Cucumaria, Antedon,* Bipinnaria larva
12. Hemichordata: *Balanoglossus,* Tornaria larva

**Dissections:**

Computer - aided techniques should be adopted or show virtual dissections Dissection of edible (Prawn/Pila) invertebrate as per UGC guidelines

An "Animal album" containing photographs, cut outs, with appropriate write up about the above- mentioned taxa. Different taxa/ topics may be given to different sets of students for this purpose

**RFERENCE WEB LINKS:**

- https://virtualmicroscopy.peabody.yale.edu/
- https://tnhm.in/category/assorted-gallery-for-vertebrates-and-invetebrates/invertebrates/
- http://www.nhc.ed.ac.uk/index.php?page=24.25.312
- https://biologyjunction.com/invertebrate-notes/
- https://lanwebs.lander.edu/faculty/rsfox/invertebrates/
- https://www.youtube.com/watch?v=iqrVmz625WA
- https://www.youtube.com/watch?v=5VlJ59oX7G0
- https://www.youtube.com/watch?v=sMutOON6zHE
- https://www.youtube.com/watch?v=zSTYRtliac0

**UNIT - III**

3.1 General characters of Amphibia, General characters of Reptilia
3.2 *Rana hexadactyla*: External features, Respiratory system, Structure and function of Heart
3.3 *Rana hexadactyla* structure and functions of the Brain
3.4 *Calotes*: External features, Digestive system, structure and function of Brain
3.5 Identification of Poisonous snakes

***Activity: Model preparation /Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above***
***Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity***

**UNIT - IV**

4.1 General characters of Aves
4.2 *Columba livia*: External features, Digestive system, Respiratory system
4.3 *Columba livia*: Structure and function of Heart, structure and function of Brain
4.4 Migration in Birds, Flight adaptation in birds

***Activity: Model preparation/Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above***
***Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity***

**UNIT - V**

5.1 General characters of Mammalia
5.2 Classification of Mammalia up to sub - classes with examples
5.3 Comparison of Prototherians, Metatherians and Eutherians
5.4 Dentition in mammals, Aquatic mammals Adaptations

***Activity: Model preparation/Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above***
***Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity***

**CO-CURRICULAR ACTIVITIES**

- Preparation of charts on Chordate classification (with representative animal photos) and retrogressive metamorphosis
- Clay models of Herdmania and Amphioxus
- Visit to local fish market and identification of local cartilaginous and bony fishes
- Maintaining of aquarium by students
- Model of fish heart and brain
- Preparation of slides of scales of fishes
- Visit to local/nearby river to identify migratory fishes and prepare study notes
- Preparation of Charts on above topics by students (Eg: comparative account of vertebrate heart/brain/lungs, identification of snakes etc.)
- Collecting and preparation of Museum specimens with dead frogs/snakes/lizards etc., and/or their skeletons
- Additional input on types of snake poisons and their antidotes (student activity).
- Collection of bird feathers and submission of report on Plumology
- Taxidermic preparation of dead birds for Zoology Museum
- Map pointing of prototherian and metatherian mammals
- Chart preparation for dentition in mammals

**SEMESTER-I**

**COURSE 2: ANIMAL DIVERISTY-II BIOLOGY OF CHORDATES**

**Practical** **Credits: 1** **2 hrs/week**

**COURSE OBJECTIVES:**

- To understand the importance of preservation of museum specimens
- To identify animals based on special identifying characters
- To understand different organ systems through demo or virtual dissections
- To maintain a neat, labeled record of identified museum specimens

**SYLLABUS:**

1. Protochordata: *Herdmania, Amphioxus, Amphioxus* T.S through pharynx.
2. Cyclostomes: *Petromyzon and Myxine.*
3. Pisces: *Pristis, Torpedo, Hippocampus, Exocoetus, Echeneis, Labeo, Cutla, Clarius, Channa, Anguilla.*
4. Amphibia: *Ichthyophis, Ambystoma, Axolotl larva, Hyla,*
5. Reptilia: *Draco, Chamaeleon, Uromastyx, Testudo. Trionyx, Russel's viper, Naja,* Krait, *Hydrophis, Crocodile.*
6. Aves: *Psittacula, Eudynamis, Bubo, Alcedo.*
7. Mammalia: *Ornithorhynchus, Pteropus, Funambulus.*
8. **Dissections-**As per UGC guidelines *Scoliodon IX* and X Cranial nerves, *Scoliodon* Brain
9. Mounting of fish scales

Note: 1. Dissections are to be demonstrated only by the faculty or virtual.
2.Laboratory Record work shall be submitted at the time of practical examination.

**REFERENCE WEB LINKS:**

- https://nt7-mhe-complex-assets.mheducation.com/nt7-mhe-complex-assets/Upload-20190715/InspireScience6-8CA/LS15/index.html
- https://themammallab.com/
- http://abacus.bates.edu/acad/depts/biobook/LabConCh.htm
- https://virtualzoology.wordpress.com/scoliodon/
- http://www.zoologyresources.com/uploadfiles/books/dc64b77d8769325515d17c945e461b45.pdf

SEMESTER-I

## COURSE 2: ANIMAL DIVERISTY-II BIOLOGY OF CHORDATES

**Theory** **Credits: 3** **3 hrs/week**

### COURSE OBJECTIVES:

- To understand the animal kingdom.
- To understand the taxonomic position of Protochordata to Mammalia.
- To understand the general characteristics of animals belonging to Fishes to Reptilians.
- To understand the body organization of Chordata.
- To understand the taxonomic position of Protherian mammals.

### LEARNING OUTCOMES:

By the completion of the course student will able to –

- Describe general taxonomic rules on animal classification of chordates
- Classify Protochordata to Mammalia with taxonomic keys
- Understand Mammals with specific structural adaptations
- Understand the significance of dentition and evolutionary significance
- Understand the origin and evolutionary relationship of different phyla from Prochordata to Mammalia.

### SYLLABUS:

**UNIT - I**

1.1 General characters and classification of Chordata up to classes
1.2 Salient features of Cephalochordata, Salient features of Urochordata
1.3 Structure and life history of *Herdmania*, Retrogressive metamorphosis –Process and Significance
1.4 Cyclostomata, General characters, Comparison of Petromyzon and Myxine

***Activity: Model preparation /Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above***
***Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity***

**UNIT - II**

2.1 General characters of Fishes, Salient features Dipnoi
2.2 *Scoliodon*: External features, Digestive system, Respiratory system
2.3 *Scoliodon* Structure and function of Heart, Structure and functions of the Brain.
2.4 Migration in Fishes, Types of Scales

***Activity: Model preparation /Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above***
***Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity***

SEMESTER-I

## COURSE 1: ANIMAL DIVERSITY-I BIOLOGY OF NON-CHORDATES

**Theory** **Credits: 3** **3 hrs/week**

**COURSE OBJECTIVES:**

- To understand the taxonomic position of protozoa to helminthes.
- To understand the general characteristics of animals belonging to Protozoa to Hemichordate.
- To understand the structural organization of animals phylum from protozoa to Hemi Chordata.
- To understand the origin and evolutionary relationship of different phyla from Protozoa to Hemi Chordata.
- To understand the origin and evolutionary relationship of different phylum from annelids to hemichordates.

**LEARNING OUTCOMES:**

By the completion of the course student will able to –

- Describe concept of animal kingdom classification and general characters of Protozoa
- Classify Porifera and Coelenterata with taxonomic keys
- Classify Phylum Platy & Nemathelminthes using examples, parasitic adaptation
- Describe Phylum Annelida & Arthropoda using examples and economic importance of vermicomposting & economic importance of insects.
- Describe Mollusca, Echinodermata & Hemichordata with suitable examples in relation to the phylogeny

**SYLLABUS:**

**UNIT-I**

1.1 Whittakers five kingdom concept and classification of Animal Kingdom.
1.2 Protozoa General Characters and classification up to classes with suitable examples
1.3 Protozoa Locomotion & nutrition
1.4 Protozoa reproduction

***Activity: Assignment /Seminar on the above***
***Evaluation: Marks to be awarded for written and oral presentations***

**UNIT –II**

2.1 Porifera General characters and classification up to classes with suitable examples
2.2 Canal system in sponges
2.3 Coelenterata General characters and classification up to classes with suitable examples
2.4 Polymorphism in coelenterates & Corals and coral reefs

***Activity: Assignment /Seminar /Quiz/Project on the above***
***Evaluation: Evaluation of Written part Evaluation of oral Presentation, Assessment of students in Quiz participation and Ranking - Evaluation of Project Report and oral presentation***