

**DEPARTMENT OF ZOOLOGY**  
**B.Sc. Zoology Semester I**  
**Systematics And Animal Diversity -I (Protozoa to Hemichordata)**

<b>Program Name</b>	<b>B.Sc.</b>	Semester	<b>I</b>
Course Title	<b>Systematics And Animal Diversity - I (Protozoa to Hemichordata) (Theory)</b>		
Course Code	<b>ZOO-S-101T</b>	No. of Credits	<b>3</b>
Contact hours	<b>60 Hours</b>	Duration of SEA/Exam	<b>3 hrs.</b>
Formative Assessment Marks	<b>20</b>	Summative Assessment Marks	<b>80</b>

<b>SYLLABUS</b>	<b>Hrs.</b>
<b>UNIT-I</b>	<b>15</b>
<b>Chapter 1: Systematics:</b> <ul style="list-style-type: none"> <li>• Concept and significance of taxonomy</li> <li>• Zoological classification- Uses, kinds of classification and Linnean hierarchy.</li> <li>• Rules and Codes of binomial nomenclature.</li> <li>• ICZN – features, code, ICZN rules, electronic publication.</li> <li>• Phylogenic tree- Features and types- Dendrogram, phenogram, cladogram, curvogram and phylogram. Significance of phylogram.</li> <li>• Recent trends in taxonomy- bar coding life.</li> <li>• Collection and preservation of natural history specimens</li> </ul>	<b>08</b>
<b>Chapter 2: Animal Architecture:</b> <ul style="list-style-type: none"> <li>• Outline classification of Kingdom Animalia up to the level of phyla.</li> <li>• Body organization: Levels of body organization- Protoplasmic, cellular, tissue, organ and organ system grade.</li> <li>• Body Symmetry - Definition and its types-asymmetry, spherical, radial, biradial and bi-lateral.</li> <li>• Germ layers – Definition and its types- Diploblastic (Apparent and absolute) and Triploblastic</li> <li>• Body Coelom – Definition, and its types- acoelom, pseudo coelom, eucoelom (Enterocoelome and schizocoelom).</li> <li>• Metamerism - Definition and its types with suitable examples- pseudometamerim, true metamerism- homonomous and heteronomous.</li> <li>• Concept of development: direct, indirect, protostomes and Deuterostome</li> </ul>	<b>07</b>
<b>Unit II</b>	<b>15</b>
<b>Chapter 3:Protozoans, Poriferans and Coelenterates</b> <ul style="list-style-type: none"> <li>• <b>Phylum Protozoa:</b> General characters of the phylum; classification up to classes (At least two unique characters for each class) with suitable examples.</li> </ul>	<b>07</b>

<ul style="list-style-type: none"> <li>• Types of Nutrition: Autotrophic, Holozoic, Saprozoic, Holophytic, Parasitic and Mixotrophic with an example for each.</li> <li>• Locomotion: Amoeba (Walking movement and Sol-Gel theory), Euglena – Flagellar and euglenoid, Paramecium- ciliary movement (Paddle and stroke theory).</li> <li>• Reproduction: Binary fission, conjugation and its significance in <i>Paramecium</i> and <i>caudatum</i>.</li> <li>• <b>Phylum Porifera:</b> General characters of the phylum; classification up to classes (At least two unique characters for each class) with suitable examples.</li> <li>• Sycon - Morphology, T.S of body wall</li> <li>• Canal system and its evolution: Asconoid, Syconoid, Leuconoid and Rhagonoid types.</li> <li>• <b>Phylum Coelenterata:</b> General characters of the phylum; classification up to classes (At least two unique characters for each class) with suitable examples.</li> <li>• Polymorphism with reference to <i>Halistemma</i>.</li> <li>• Coral reefs: Definition and its types.</li> <li>• <b>Ctenophora</b> –Salient features and its affinities.</li> </ul>	05
<b>UNIT III</b>	15
<p><b>Chapter 4: Helminthes</b></p> <ul style="list-style-type: none"> <li>• <b>Phylum Platyhelminthes:</b> General characters of the phylum; classification up to classes (At least two unique characters for each class) with suitable examples.</li> <li>• <b>Phylum Nematoda:</b> General characters of the phylum; classification (At least two unique characters) with suitable examples.</li> </ul> <p><b>Chapter 5: Annelida</b></p> <ul style="list-style-type: none"> <li>• <b>Phylum Annelida:</b> General characters of the phylum; classification up to classes (At least two unique characters for each class) with suitable examples.</li> <li>• Type study of Earthworm (<i>Pheretima posthuma</i>)- Morphology, Digestive system, and Excretory system.</li> <li>• Trochophore larva and its significance.</li> </ul>	08
<p><b>Chapter6: Arthropoda</b></p> <ul style="list-style-type: none"> <li>• <b>Phylum Arthropoda:</b> General characters of the phylum; classification up to classes (At least two unique characters for each class) with suitable examples.</li> <li>• <i>Peripatus:</i> Systematic positions, Salient features and affinities with Annelida and Arthropoda.</li> <li>• Respiratory organs: Gills, book gills, trachea and book lungs.</li> <li>• Sense organs: Simple eye and compound eye</li> <li>• Metamorphosis: Definition and types with suitable examples.</li> <li>• Neuro-endocrine regulation of metamorphosis in <i>Bombyx mori</i>.</li> </ul>	07



**Practical Paper: Systematics and Animal Diversity - I  
(Protozoa to Hemichordata)**

Course Title	<b>Systematics and Animal Diversity - I (Protozoa to Hemichordata) (Practical)</b>	Practical Credits	<b>2</b>
Course Code	<b>ZOO-S-101P</b>	Contact Hours	<b>45 hrs.</b>
Formative Assessment	<b>10 Marks</b>	Summative Assessment	<b>40 Marks</b>

**Syllabus**

1. Scientific drawing using camera lucida.
2. **Protozoa:** Systematics of *Amoeba*, *Euglena*, *Noctiluca*, *Paramecium* and *Vorticella* (Permanent slides, any 4).
3. **Porifera:** Systematics of *Sycon*, *Euplectella*, *Hyalonema*, *Spongilla* and *Euspongia* (Specimens, any 4). Study of permanent slides of T.S of *Sycon*, spicules and gemmules.
4. **Cnidaria:** Systematics of *Aurelia* and *Metridium* (Specimens). Slides of *Hydra*, *Obelia*-polyp and medusa, and *Ephyra* larva, T.S. of *Metridium* passing through mesenteries.
5. **Study of Corals** - *Astraea*, *Fungia*, *Meandrina*, *Corallium*, *Gorgonia*, *Millepora* and *Pennatula*.
6. **Helminthes:** Systematics of *Planaria*, *Fasciola hepatica* and *Taenia solium*, *Ascaris*-Male and female (Specimens). Slides of T.S. of *Planaria*, T.S of male and female *Ascaris*.
7. **Annelida:** Systematics of *Nereis*, *Sabella*, *Aphrodite* and Leech (Specimens) Slide of T.S. of Earthworm through typhlosole.
8. **Arthropoda:** Systematics of *Penaeus*, *Palaemon*, *Astracus*, *Scorpion*, Spider, *Limulus*, *Peripatus*, Millipede, Centipede, Praying mantis, Termite Queen, Moth, Butterfly, Dung beetle / Rhinoceros beetle (Any six specimens). Slide of Larvae-Nauplius, Zoea and Mysis.
9. **Mollusca:** Systematics of *Chiton*, *Mytilus*, *Aplysia*, *Pila*, Octopus, *Sepia* (Specimens) and Glochidium larva (Slide).
10. Shell Pattern-*Unio*, *Ostrea*, *Cypraea*, *Murex*, *Nautilus*, *Patella*, *Dentalium*, Cuttlebone. (Any four)
11. **Echinodermata:** Systematics of *Asterias* (Sea star), *Ophiuroidea* (Brittle star), *Echinus* (Sea Urchin), *Cucumaria* (Sea cucumber), *Antedon* (Sea lily) (Specimens). Slides of Bipinnaria larva, Echinopluteus larva and Pedicellaria.
12. **Hemichordata:** *Balanoglossus*, T.S. through proboscis of *Balanoglossus*, Tornaria larva of *Balanoglossus*.
13. **Virtual Dissection (Major):** Earthworm and Cockroach: Nervous system, and Digestive System.
14. **Virtual Dissection (Minor):** Mouth Part of cockroach, house fly, Pollen basket of honey bee, setae of earthworm.

**DEPARTMENT OF ZOOLOGY**  
**B.Sc. Zoology Semester II**  
**Animal Diversity -II (PROTOCHORDATA TO MAMMALIA)**

<b>Program Name</b>	<b>B.Sc.</b>	<b>Semester</b>	<b>II</b>
<b>Course Title</b>	<b>Animal Diversity - II (PROTOCHORDATA TO MAMMALIA) (Theory)</b>		
<b>Course Code</b>	<b>ZOO-S-201T</b>	<b>No. of Credits</b>	<b>3</b>
<b>Contact hours</b>	<b>60 Hours</b>	<b>Duration of SEA/Exam</b>	<b>3 hrs.</b>
<b>Formative Assessment Marks</b>	<b>20</b>	<b>Summative Assessment Marks</b>	<b>80</b>

<b>Syllabus</b>	<b>Hrs.</b>
<b>Unit -I</b>	<b>15</b>
<b>Chapter: 1</b> <ul style="list-style-type: none"> <li>• General characters of chordata. Origin of chordata. Theories (Echinoderm origin, Urochordate origin, Hemichordate origin, Cephalochordate origin).</li> <li>• Basic Chordate characters and outline classification up to classes.</li> </ul> <b>Protochordata:</b> <ul style="list-style-type: none"> <li><b>a. Cephalochordata:</b> <ul style="list-style-type: none"> <li>• <i>Amphioxus</i> – Morphology, Digestive system, Feeding mechanism and Circulatory system.</li> </ul> </li> <li><b>b. Urochordata:</b> <ul style="list-style-type: none"> <li>• Type study of <i>Herdmania</i>-Morphology, tadpole of <i>Herdmania</i> and retrogressive metamorphosis.</li> </ul> </li> </ul>	<b>11</b>
<b>Chapter 2: Agnatha</b> <ul style="list-style-type: none"> <li>• General characters and classification up to classes.</li> <li>• General characters of Cyclostomata with examples.</li> <li>• Differences between Lampreys and Hag fishes.</li> <li>• Ammocoete larva and its significance.</li> </ul>	<b>04</b>

<b>Unit –II</b>	<b>15</b>
<ul style="list-style-type: none"> <li>• <b>Chapter 3: Super class: Pisces</b></li> <li>• General characters and classification up to subclasses.</li> <li>• Differences between Chondrichthyes and Osteichthyes.</li> <li>• <i>Scoliodon</i>: Morphology, Digestive system, Circulatory system – Afferent arterial system, Neuromast organs (Lateral line sensory system and Ampullae of Lorenzini) and Urinogenital system.</li> <li>• Parental care in fishes – (Hippocampus, Tilapia, Betta and Arius jella)</li> <li>• Salient features of Placodermi and Ostracodermi with examples.</li> <li>• Dipnoi: Interesting features and their evolutionary significance.</li> </ul>	<b>10</b>

<p><b>Chapter 4: Class Amphibia</b></p> <ul style="list-style-type: none"> <li>• Origin of Amphibia.</li> <li>• General characters and classification of class Amphibia up to living orders, with suitable examples.</li> <li>• Neoteny and Paedogenesis</li> <li>• Parental care in Amphibia – (Pipa, Ichthyophis, Alytes, Gastrothecus)</li> </ul>	<b>05</b>
<b>Unit –III</b>	<b>15</b>
<p><b>Chapter 5: Class Reptilia</b></p> <ul style="list-style-type: none"> <li>• General characters and outline classification of modern reptiles with suitable examples.</li> <li>• Adaptive radiation in extinct reptiles with suitable examples.</li> <li>• Temporal fossae in reptiles.</li> <li>• Venomous and non- venomous snakes, Venom apparatus in snakes, Venom and its types and its clinical applications, Anti-venom. Common poisonous snakes of India (Common krait, Russel Viper, Saw scaled viper, Indian cobra).</li> <li>• Interesting features of Sphenodon.</li> </ul>	<b>08</b>
<p><b>Chapter 6: Class Aves</b></p> <ul style="list-style-type: none"> <li>• General characters and classification up to orders with examples.</li> <li>• Differences between Ratitae and Carinatae.</li> <li>• Interesting features of <i>Archaeopteryx</i>.</li> <li>• Flight adaptations in birds (Morphological, anatomical and physiological)</li> <li>• Migration in Birds – Types, causes and theories.</li> </ul>	<b>07</b>
<b>Unit –IV</b>	<b>15</b>
<p><b>Chapter 7: Class Mammalia</b></p> <ul style="list-style-type: none"> <li>• General characters and classification up to subclasses (Prototheria, Metatheria and Eutheria) with suitable examples.</li> </ul>	<b>10</b>

<ul style="list-style-type: none"> <li>• Interesting features of mammalian orders- Insectivora, Carnivora (Pinnipedia and Fissipedia), Chiroptera (Mega and Micro), Cetacea (Mystoceti and Odontoceti), Proboscidea (Indian Elephant and African Elephant), Ungulata (Perissodactyla and Artiodactyla) and Primates (Platyrrhini and Catarrhini) with examples.</li> </ul>	
<p><b>Chapter 8: Dentition in mammals</b></p> <ul style="list-style-type: none"> <li>• Definition, Structure of molar tooth.</li> <li>• Types – Morphological, based on attachment, succession and kinds of teeth. Significance of teeth.</li> <li>• Pattern of cheek teeth-Bunodont, Secodont, Selenodont and Lophodont (definition and examples).</li> <li>• Dental formula (Horse, Dog, Man, Cat, Rabbit and Elephant)</li> <li>• Evolution of molar tooth.</li> </ul>	<b>05</b>

## Practical Paper: Animal Diversity - II (PROTOCHORDATA TO MAMMALIA)

Course Title	<b>Animal Diversity - II (PROTOCHORDATA TO MAMMALIA) (Practical)</b>	Practical Credits	<b>2</b>
Course Code	<b>ZOO-201P</b>	Contact Hours	<b>45 hrs.</b>
Formative Assessment	<b>10 Marks</b>	Summative Assessment	<b>40 Marks</b>

<b>Syllabus</b>
<p><b>a. Protochordata:</b> <i>Herdmania</i> and <i>Amphioxus</i>, T.S. of <i>Amphioxus</i> through pharynx and intestine.</p> <p><b>b. Cyclostoma:</b> <i>Petromyzon</i>, Ammocoete larva and <i>Myxine</i></p>
<p><b>Pisces:</b></p> <p><b>a.</b> Cartilaginous Fishes: <i>Narcine</i>, <i>Trygon</i>, <i>Pristis</i>, <i>Mylobatis</i></p> <p><b>b.</b> Bony Fishes: Zebra fish, <i>Hippocampus</i>, <i>Muraena</i>, <i>Ostracion</i>, <i>Tetradon</i>, <i>Pleuronectus</i>, <i>Diodon</i> and <i>Echeneis</i> (Any four).</p> <p><b>c.</b> Ornamental fishes: Siamese, Koi, Oscar, Betta Sp. Neon tetra, Guppies, Goldfish, Angel fish, Rainbow fish, Molliesese.</p> <p><b>d.</b> Accessory respiratory organs: <i>Saccobranchus</i>, <i>Clarias</i> and <i>Anabas</i></p>
<p><b>Amphibia:</b></p> <p><b>a.</b> <i>Rana</i>, <i>Bufo</i>, <i>Ambystoma</i>, Axolotl larva, <i>Necturus</i> and <i>Ichthyophis</i>.</p>
<p><b>Reptilia:</b></p> <p><b>a.</b> Turtle, Tortoise, <i>Mabuya</i>, <i>Calotes</i>, Chameleon, <i>Varanus</i>. snakes – <i>Dryophis</i>, Rat snake, Brahmini, Cobra, Krait, Russell's viper and <i>Hydrophis</i> (Any four).</p>
<p><b>Aves:</b></p> <p><b>a.</b> Beak and feet modification in Duck, Crow, Sparrow, Parrot, Kingfisher, Eagle or Hawk. (Any four).</p>
<p><b>Mammalia:</b></p> <p><b>a.</b> <i>Mongoose</i>, <i>Squirrel</i>, <i>Pangolin</i>, Hedge Hog, Rat, <i>Loris</i> (Any four).</p>
<p><b>Virtual dissection/Cultured specimens: (Use of Dissected Animal or Photograph or Model)</b></p> <p><b>a. Mounting:</b> Preparation of whole mount of fish scale.</p> <p><b>b.</b> Shark/Bony fish: Afferent and Efferent branchial systems, glosso- pharyngeal and vagus nerves.</p> <p><b>c.</b> Rat: Dissection (only demonstration) - Circulatory system (arterial and venous), Urinogenital system of both male and female rat.</p>