

U.G. 1st Semester

Paper: ZOO101C (Core)

Introductory Animal Biology, Systematics and Animal Diversity (I): Non-Chordates (Upto Pseudocoelomate)

Credits: 5 = 3+0+2 (48 Lectures)

Theory: 48 Lectures

Unit 1: Introductory Animal Biology (5 Lectures)

1. Introduction to concept of Animal Biology, concept of ecology; 2. Water and life, Properties of water and role of water in life; 3. Properties and significance of carbon in life; 4. Level of organisation of Biomolecules in life; 5. Prokaryotic and Eukaryotic cells.

Unit 2: Principles of Taxonomy and Systematics (15 Lectures)

1. Introduction of Taxonomy, Definition of Taxonomy and relationship with Systematics, Application of taxonomy; 2. Zoological Nomenclature: Binomial and Trinomial Nomenclature; 3. Three kinds of classification: Components of Classification, Taxonomic hierarchy (Linnaean hierarchy), Taxonomic types; 4. International Code of Zoological Nomenclature (ICZN): Origin, Components and Rules of Nomenclature; 5. Elementary idea of Taxidermy and Museology.

Unit 3: Animal Diversity- Criteria for classification of multicellular organisms (4 Lectures)

1. Symmetry; 2. Early development: Protostome and Deuterostome, Spiral and radial cleavage, 3. Body cavities: Acoelomate, Pseudocoelomate, Coelomate and Enterocoelomate, 4. Homology and Analogy.

Unit 4: Animal Diversity – I (Protista to Ctenophor) (24 Lectures)

4.1 Protozoa – 8L

1. General characters and classification upto orders with examples,
2. Type study : Amoeba and Paramecium, 3. Life cycle and pathogenicity of Plasmodium vivax,
4. Nutrition , Locomotion and Reproduction in Protozoa.

4.2 Metazoa- 3L

1. Evolution of metazoan; 2. metamerism of metazoan and its significance.

4.3 Porifera – 3L

1. General characters and classification upto orders with examples
2. Canal system in Porifera (Sponges)

4.4 Cnidaria – 7L

1. General characters and classification upto orders with examples,
2. Type study: Obelia; polymorphism in Siphonophora,
3. Diversity of coral and coral reefs formations, conservation.

4.5 Ctenophora- 3L

1. General characteristics
2. Difference between Cnidaria and Ctenophora, evolutionary significance.

Practicals: (2 Credits)

1. Study and preparation of prokaryotic cells
2. Study of eukaryotic cells.
3. Taxonomic arrangement of animal species from random sized supplied museum specimens.
4. Identification of permanent whole mount preparation: Amoeba, Euglena, Paramecium, Entamoeba, Opalina.
5. Study and classification of invertebrate specimen upto order (in museum): Grantia, Sycon, Spongilla, obelia, Physalia, Aurelia, Metridium, Pennatula, Gorgonia, Medripora.
6. Identification upto order from museum and significance of adult *Fasciola hepatica*, Taeniasolium and *Ascaris lumbricoides* (male/ female)
7. Study of: sponge spicules and gemmules from slide.
8. Permanent staining and mounting of any protozoa (Euglena/ Paramecium) and Obelia colony.

**** Lab notebook with labelled diagrams, methods (wherever applicable) and results must be incorporated.**

Books Recommended-

1. Dalela & Sharma: Animal Taxonomy and Museology (1976, Jai Prakash Nath).
2. Kapoor: Theory and Practicals of Animal Taxonomy (1988, Oxford & IBH).
3. Simpson: Principles of Animal Taxonomy (1962, Oxford).
4. Roymahoney: Laboratory Techniques in Zoology (1966, Butterworths).
5. Mayer & Ashlock: Principles of Systematic Zoology (1991, McGraw Hill).
6. Campbell & Reece: Biology (7th ed 2005, Pearson).
7. Jordan. K. and P. S. Verma, Invertebrate Zoology, S Chand and Co. Ltd.
8. Modern text book of Zoology, Invertebrates, R. L. Kotpal, Rastogi Publications.
9. Nigam: Biology of Non-Chordates (1997, S Chand)
10. Villee, Walker & Barnes: General Zoology (5th ed 1979, Saunders)
11. F. C. Majumuria-Invertebrate Zoology, Vol I.
12. Parker and Haswell: Text Book of Zoology, Vol I.

Paper: ZOO102C (Core)

Animal Diversity (II): Non-Chordata (Coelomates) & Perspective in Ecology

Credits: 5=3+0+2 (48 Lectures)

Theory: 48 Lectures

Unit 1: Introduction to Coelomates & Evolution of coelom and metamerism

(14 Lectures)

1.1: Annelida (6L)

1. General characters and classification upto orders with examples in Annelida; 2. Type Study of Leech;
3. Coelomoduct and Nephridia and their relationship (according to Goodrich).

1.2: Arthropoda (6L)

1. General characters and classification upto orders with examples in Arthropoda; 2. Type Study of Prawn; 3. Life history of mosquito, and its role as vector; 4. Respiration in Arthropoda; 5. Social life of Honey bees.

1.3: Onychophora (2L)

1. General Characters and evolutionary significance of Onychophora; 2. Structure (Anatomical peculiarities) and affinities of Onychophora (Peripatus).

Unit: 2 Mollusca & Echinodermata

(10 Lectures)

2.1: Mollusca (6L)

1. General characters and classification of Mollusca upto orders with examples, 2. Nervous system and Respiration in Mollusca, 3. Torsion and Detorsion in Gastropoda, 4. Larval forms of Mollusca and evolutionary significance (trochophore larva), 5. Foot modifications in Mollusca.

2.2: Echinodermata (4L)

1. General characters and classification of Echinodermata upto orders with examples, 2. Water Vascular System in Asteroidea, 3. Larval forms of Echinodermata, 4. Affinities of Echinodermata.

Unit: 3 Perspectives in Ecology

(24 Lectures)

3.1 : Introduction to Ecology (4L)

1. History of ecology, autecology, synecology, levels of organisation, abiotic factors and impact on animals, 2. Laws of Limiting factors (Leibigs law of minimum, Shelford's law of tolerance); 3. soil types and soil erosion.

3.2: Population (8L)

1. Unique and important attributes of population. (population characteristics density, natality, mortality, life tables, Fecundity tables, survivorship curve, age and sex ratio, Dispersion, 2. Population Growth- Geometric and Exponential logistic growth equation, R & K strategies, Population regulation: density dependent and independent factors, 3. Population interaction- Gause's principle with laboratory and field examples, Malthusian equation, Lotka-Volterra equation for competition, predator-prey cycle.

3.3: Community (6L)

1. Community characteristics, spurs diversity, Abundance, Dominance, richness, vertical stratification, Ecotone and edge effect, 2. Ecological succession; 3. Theories pertaining to climax community.

3.4: Ecosystem (6L)

1. Types of ecosystem with example, Food Chain- Detritus & Grazing food chain (Linear & Y shaped), Food Web; 2. Energy flow through ecosystem, Ecological pyramids & Ecological efficiency; 3. Biogeochemical cycles (Nitrogen cycle).

Practicals: (2 Credits)

Unit : I

1. Study of museum specimens:
 - a. Annelids- Aphrodite, Nereis, Heteronereis, Chaetopterus, Pheretima, Hirudinaria;
 - b. Arthropods- Limulus, Balanus, Cancer, Scolopendra, Julus, Queen termite, Stick insect, Lepisma, Praying mantis, Peripatus.
 - c. Molluscs- Chiton, Unio, Octopus, Loligo, Mytilus, Dentalium, Pinctada.
 - d. Echinoderms- Asterias, Echinus, Cucumaria, Ophiura, Clypeaster.
2. Study of digestive system, septal nephridia, pharyngeal nephridia of earthworm and digestive system of leech (demonstration).
3. Study of T.S. through pharynx, gizzard and typhlosolar intestine of earthworm through permanent slides.
4. Temporary mount of mouth parts, dissection of nervous system of cockroach; urinogenital system in leech (demonstration through chart/ diagram/ dissection/model).
5. Study of larval forms of Mollusca (Nauplius, Trochophore), Echinoderms (Bipinnaria, Ophiopluteus, Pluteus, Echinopluteus)

Unit: II

1. Study of population density in a natural/ hypothetical community by quadrat method.
2. Study of an aquatic ecosystem: Phytoplankton and zooplankton.
3. Determination of temperature, turbidity, alkalinity, pH, dissolved oxygen content (Winkler's method) and free carbon dioxide with reference to aquatic ecosystem.
4. Determination of temperature, moisture content of soil.

**** Lab notebook with labelled diagrams, methods (wherever applicable) and results must be incorporated.**

Books Recommended -

1. E. L. Jordan and Dr. P. S. Verma, Invertebrate Zoology, S Chand and Co. Ltd.
2. Modern text book of Zoology, Invertebrates, R. L. Kotpal, Rastogi Publications.
3. Ruppert and Barnes. D.(2006), Invertebrate Zoology, 8th edition, Hault and Saunders Publications.
4. Invertebrates, A New Synthesis, 3rd edition, Blackwell Science.
5. P. S. Verma and V.K. Agarwal, Text book of Ecology
6. Ecology-Theories and Applications 2001, 4th edition, Peter Styling.
7. Odum, E.P., 2008, Fundamentals of Ecology, Indian edition, Brooks/Cole.
8. Krebs, C.J., 2001, Ecology, VI edition, Benjamin Cummings.
9. Robert Leo Smith Ecology and field biology, Harper and Row publishers.

Paper Code – ZOO103M (Modular General Elective)
Animal Diversity

Credits: 4=2+1+1 (32 Lectures)

Theory: 32 Lectures

Protista : General characters of Protozoa; Life cycle of Plasmodium (2L)

Porifera: General characters and canal system in Porifera (2L)

Radiata: General characters of Cnidarians and polymorphism (2L)

Aceolomates: General characters of Helminthes; Life cycle of *Taenia solium* (2L)

Pseudocoelomates: General characters of *Nemethelminthes*; Parasitic adaptations (2L)

Coelomate Protostomes: General characters of Annelida ; Metamerism. (2L)

Arthropoda: General characters. Social life in insects. (2L)

Mollusca: General characters of Mollusca; Pearl Formation 2L

Coelomate Deuterostomes: General characters of Echinodermata, Water Vascular system in Starfish. (3L)

Protochordata: Salient features (1L)

Pisces: Osmoregulation, Migration of Fishes (2L)

Amphibia: General characters, Adaptations for terrestrial life, parental care in Amphibia. (3L)

Reptilia: Amniotes; Origin of reptiles, Terrestrial adaptations in reptiles. (2L)

Aves: The origin of birds; Flight adaptations (2L)

Mammalia: Early evolution of mammals, Primates, Dentition in mammals. (3L)

Practicals: (1 Credit)

1. Study of following specimens: Non Chordates: Euglena, Noctiluca, Paramecium, Sycon, Physalia, Metridium, Taenia, Ascaris, Nereis, Aphrodite, Leech, Peripatus, Limulus, , Hermitcrab, Millipede, Centipede, Beetle, Chiton, Dentalium, Octopus, Asterias, and Antedon. Chordates: Balanoglossus, Amphioxus, Petromyzon, Pristis, Hippocampus, Labeo, Ichthyophis, Salamander, Draco, Uromastix, Naja, Viper, model of Archaeopteryx, Owl, Squirrel and Bat.
2. Study of following Permanent Slides: Cross section of Sycon, Sea anemone and Ascaris (male and female). T. S. of Earthworm passing through pharynx, gizzard, and typhlosolar intestine. Bipinnaria and Pluteus larva.
3. Temporary mounts of mounts of Placoid ,cycloid and ctenoid scales.
4. Demonstration of Digestive and nervous system of Cockroach.

****Lab notebook with labelled diagrams, methods and results**

Recommended Books-

1. Modern Text Book of Zoology, Invertebrates, Vol I & Vertebrates Vol II, R L Kotpal,Rastogi Publications.
2. E. L. Jordan and Dr. P. S. Verma, Invertebrate Zoology & Vertebrate Zoology, S Chand and Co. Ltd.
3. Barnes, R.D. (1992). Invertebrate Zoology. Saunders College Pub. USA.
4. Ruppert, Fox and Barnes (2006) Invertebrate Zoology. A functional Evolutionary Approach 7th Edition, Thomson Books/Cole
5. Campbell & Reece (2005). Biology, Pearson Education, (Singapore) Pvt. Ltd.
6. Kardong, K. V. (2002). Vertebrates Comparative Anatomy. Function and Evolution. Tata McGraw Hill Publishing Company. New Delhi.
7. Raven, P. H. and Johnson, G. B. (2004). Biology, 6th edition, Tata McGraw Hill Publications. New Delhi.