



Semester I

MAJOR 1: Biology of Non-Chordates (Paper Code: UZOOMAJ1101)

Paper Type: Theory + Practical Lab Based [TH+PLB]

Credit: 4 (Theory 3+ Practical 1)

Class Hours: 75 (Theory 45 hrs. + Practical 30 hrs.)

Full Marks: 75 (Theory 40 + Practical 20 + Continuous evaluation 10 + Attendance 05)

Duration of end semester examination: (Theory 2 hrs. + Practical 2 hrs.)

Syllabus:

Theory	Class Hour(s)
Unit I: Introduction to Non-chordates	01
<ul style="list-style-type: none"> • Introduction to Five Kingdoms System. • General characters of Kingdom Animalia. • Basis of classification of Kingdom Animalia into different phyla. 	
Unit II: Protista	06
<ul style="list-style-type: none"> • General characteristics and classification up to phyla. • Locomotion in <i>Amoeba</i>, <i>Euglena</i> and <i>Paramecium</i> • Conjugation in <i>Paramecium</i>. • Life cycle of <i>Plasmodium vivax</i>. 	
Unit III: Porifera	03
<ul style="list-style-type: none"> • General characteristics and classification up to classes. • Canal system in sponges. 	
Unit IV: Cnidaria and Ctenophora	05
<ul style="list-style-type: none"> • General characteristics and classification up to classes. • Polymorphism in Cnidaria. • Corals and coral reefs. 	
Unit V: Platyhelminthes and Nematoda	06
<ul style="list-style-type: none"> • General characteristics and classification up to classes. • Reproductive system and life cycle of <i>Fasciola hepatica</i> and <i>Ascaris lumbricoides</i>. • Parasitic adaptations of helminths. 	
Unit VI: Annelida	05
<ul style="list-style-type: none"> • General characteristics and classification up to classes. • Locomotion in <i>Nereis</i>. • Excretion in Annelida. 	
Unit VII: Arthropoda and Onychophora	07
<ul style="list-style-type: none"> • General characteristics and classification up to classes. • Structure and affinities of Xiphosura. • Tracheal respiration in cockroach. • Vision in Insecta. • General characteristics and evolutionary significance of Onychophora. 	



Unit VIII: Mollusca	05
<ul style="list-style-type: none"> • General characteristics and classification up to classes. • Respiration in <i>Pila</i>. • Nervous system in Gastropoda. • Torsion and detorsion in Gastropoda. 	
Unit IX: Echinodermata	05
<ul style="list-style-type: none"> • General characteristics and classification up to classes. • Water-vascular System in Asteroidea. • Affinities with chordates. 	
Unit X: Hemichordata	02
<ul style="list-style-type: none"> • General characteristics. • Affinities with non-chordates and chordates. 	

Note: Outline classification of the kingdom Protista up to phyla to be followed from Levine et al. (1980) and that of other phyla up to classes to be followed from "Ruppert, Fox and Barnes (2003): Invertebrate Zoology: A Functional Evolutionary Approach". VII Edition or from Brusca, R.C and Brusca, G. J (2003): Invertebrate (2nd ed.) Sinauer Associates Inc., Publishers Sunderland.

Practical	30 Hours
<ul style="list-style-type: none"> • Museum study <ul style="list-style-type: none"> (i) Protozoa: <i>Euglena</i>, <i>Paramecium</i> (including binary fission and conjugation), <i>Amoeba</i>, <i>Plasmodium vivax</i> (trophozoite/signet ring stage). (ii) Porifera: <i>Sycon</i>, <i>Hyalonema</i>, <i>Spongilla</i>. (iii) Cnidaria: <i>Hydra</i>, <i>Obelia</i>, <i>Aurelia</i>, <i>Gorgonia</i>, <i>Pennatula</i>, <i>Fungia</i>, <i>Metridium</i>. (iv) Platyhelminthes: <i>Planeria</i>, <i>Fasciola hepatica</i>, <i>Taenia solium</i>. (v) Nematoda: <i>Ascaris lumbricoides</i> (male and female). (vi) Annelida: <i>Neries</i>, <i>Chaetopterus</i>, <i>Pheretima</i>, <i>Hirudinaria</i>. (vii) Arthropoda: <i>Limulus</i>, <i>Palamnaeus</i>, <i>Palaemon</i>, <i>Daphnia</i>, <i>Balanus</i>, <i>Cancer</i>, <i>Eupagurus</i>, <i>Scolopendra</i>, <i>Julus</i>, <i>Bombyx</i>, <i>Periplanta</i>, <i>Apis</i>. (viii) Mollusca: <i>Chiton</i>, <i>Dentalium</i>, <i>Pila</i>, <i>Unio</i>, <i>Sepia</i>, <i>Octopus</i>. (ix) Echinodermata: <i>Asterias</i>, <i>Ophiura</i>, <i>Echinus</i>, <i>Cucumaria</i>, <i>Antedon</i>. • Study of the sections: T.S. and L.S. of sponge; T.S. through pharynx, gizzard, and typhlosolar intestine of earthworm. • Mounting: Nerve ring and spermatheca of earthworm, salivary glands and mouthparts of cockroach. • Dissection: Alimentary system and nervous system of earthworm, digestive system and nervous system of cockroach. 	

Note: In case of unavailability of preserved specimens/slides, departments can use photographs for the study of museum specimens and permanent slides.

Evaluation Structure for end semester practical examination:

1. Identification with reason: 3 specimens/each 2 marks (Identification = $\frac{1}{2}$, Systematic position = $\frac{1}{2}$, Characters = 1), 1 section /each 2 marks (Identification = $\frac{1}{2}$, Characters = $1\frac{1}{2}$)
Total = 8 marks
2. Dissection & display, drawing and labelling (one system) ($4\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = 6$ marks)
3. Mounting: Any one (2 marks)
4. Laboratory Note Book: 2 marks (Based on the neatness, inclusiveness, overall presentation and regularity)
5. Viva-Voce: 2 marks (Testing of Knowledge in the said Course)

Suggested Readings

1. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2009). The Invertebrates: A Synthesis. III Edition, Jhon Willey & Sons.
2. Barrington, E.J.W. (2012). Invertebrate Structure and Functions. II Edition, EWP Publishers.
3. Brusca, R.C. and Brusca, G.J. (2003). Invertebrate. II Edition, Sinauer Associates Inc., Sunderland.
4. Levine, N. D., J. O. Corliss, F. E.G. Cox, G. Deroux, J. Grain, B. M. Honigberg, G. F. Leedale, et al. 1980. "A Newly Revised Classification of the Protozoa." *The Journal of Protozoology*. 27 (1): 37-58.
5. Parker, T.J. and Haswell, W.A. (1972). A text book of Zoology, Vol-I. VII Edition, Marshall and Williams (eds.), Mc Millan Press ltd.
6. Pechenik, J.A. (2015). Biology of the Invertebrates. VII Edition, McGraw-Hill Education.
7. Ruppert, E.E., Fox, R.S. and Barnes, R.D. (2003). Invertebrate Zoology: A Functional Evolutionary Approach. VII Edition, Cengage Learning, India.