Tribhuvan University
Institute of Science and Technology
Four Years B. Sc. Zoology Course of Study

Course Title: Non-chordata and Protochordata **Full Marks: 100**
Course No. : B. Sc. Zool.101 **Pass Marks: 35**
Nature of Course: Theory **Year: I**
Instruction hrs: 150

Course Objectives:
At the end of course students will be able to:

- Classify the non-chordates with their examples.
- Know the functional anatomy of typical representative/s of each Phylum.
- Understand polymorphism, parasitism, social life etc. of some non-chordates.
- Know the economic importance of non-chordate animals.
- Know the structures, affinities and development of Protochordates.

Group A: Lower Non-chordata

Taxonomy: Concept, trends, species, keys, characters, procedures and significance of taxonomy. ICZN. Phylogeny of invertebrates. Classification of Protozoa, Porifera, Coelenterata, Platyhelminthes, Aschelminthes and Annelida with characters and examples. (**10 hrs.)**

Protozoa: Status of protozoa and concept of portista. Locomotion, nutrition, reproduction and osmoregulation in protozoa. Structure and reproduction of *Vorticella.* Structure, life cycle, pathogenicity and control measures of *Leishmania donovani*, *Entamoeba histolytica and Trichomonas vaginalis*. Radiolaria and suctoria. (**14 hrs.)**

Porifera: Metazoa and their origin. Organization of bilateria. Structure, reproduction of sponges and embryogeny of *Scypha.* Canal and skeletal systems. Origin and affinities. Economic importance of Porifera. (**7 hrs.)**

Coelenterata: Structure, reproduction and development of *Obelia*. Polymorphism. Distribution, types and formation of corals and coral reefs. Coral and dinoflagellate symbiosis and coral bleaching. Human intrusion in coral reefs. Economic importance of Coelenterates. **(12 hrs.)**

Platyhelminthes: Body wall, digestive, excretory, reproductive and nervous systems, & sense organs. Structure, life cycle, pathogenicity and control measures of *Fasciola hepatica, Taenia solium* and *Echinococcus granulosus*. Morphological and physiological adaptations of helminth parasites. Larval forms. **(12 hrs.)**

Aschelminthes: Body wall, digestive, excretory and reproductive and nervous systems, & sense organs. Structure, life cycle, pathogenicity and control measures of *Ancylostoma duodenale, Enterobius vermicularis, Wuchereria bancrofti* and phyto-nematode (*Meloidogyne incognita*). Economic importance of Aschelminthes. (**10 hrs.)**

Annelida: Coelom and Nephridia in Annelida. Structure, organ systems, life cycle and parasitic adaptations of *Hirudinaria granulosa*. Introduction to vermicomposting. Classification, structure and affinities of Archiannelida. Adaptive radiation in Polychaeta. Economic importance of annelids. **(10 hrs.)**

Group B: Higher Non-chordata and Protochordata

Classification of Arthropoda, Mollusca, Echinodermata and Protochordata with characters and examples. (**6 hrs.)**

Arthropoda: Body wall, digestive, excretory, reproductive and nervous systems, and sense organs. Organ systems of freshwater prawn (*Palaeomon*). Structure, life history and economic importance of *Periplaneta americana*, *Phlebotomus argentipus*, *Culex quinquefasciatus*, *Aedes aegypti* and *Sitophilus oryzae*. Mouthparts of insects. Metamorphism in insects. Social behavior of insects. Characteristics and affinities of Onychophora. Insect Hormones and Pheromones. Economic importance of Arthropods**. (25 hrs.)**

Mollusca: Foot and Shells in Mollusca. Structure and organ systems of Apple Snail (*Pila globosa),* fresh water mussel: *Lamellidens* (=*Unio*). Pearl and its formation. Dispersal, damage and control measures of African Giant Land Snail (*Lissachatina fulica*). Torsion and detorsion in Gastropoda. Economic importance of molluscs. Diversity of molluscs in Nepal. **(22 hrs.)**

Echinodermata: Origin and Evolution Structure, organ systems and development of *Asterias*. Larval forms in Echinodermata. Water vascular system. **(8 hrs.)**

Minor Phyla: Salient features of Acanthocephala, Nemartina, Rotifera, Gastroitricha, Mesozoa and Ctenophora. **(5 hrs.)**

Protochordata: Origin and Evolution. Structure, organ systems and affinities of *Balanoglossus, Herdmania* and *Branchiostoma*. Development of *Herdmania*. (9 **hrs.)**

Text Books (latest eds.):

Jordan, E.L. & Verma, P.S. Invertebrate Zoology. S. Chand & Co. Pub., 857 pp.
Jordan, E.L. & Verma, P.S., Chordate Zoology & Animal Physiology. S. Chand,New Delhi.
Kotpal, R.L. Modern textbook of Zoology: Invertebrates. Rastogi Pub., Meerut,India.
Kotpal, R.L. Modern textbook of Zoology: Vertebrates. Rastogi Pub., Meerut,India.
Parker, T.J. & Haswell, W.A. A text book of Zoology, Vol.1. The McMillan Press Ltd.London, UK.

Suggested Readings:

Barnes, R.D. Invertebrate Zoology. Saunders College Pub.,1089 pages
Dhami, P.S. and Dhami, J.K. Invertebrate Zoology. R. Chand & Co. Pub., NewDelhi, India.
http//:www.archive.org
http://www.biodiversitylibrary.org
Prasad, S.N. Life of Invertebrates. Vikas Publishing House Pvt. Ltd., New Delhi, India.

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Four Years B. Sc. Zoology Course of Study

Course Title: Non-chordata and Protochordata **Full Marks : 50**
Course No. : B. Sc. Zool.102 **Pass Marks : 20**
Nature of course: Practical **Year : I**

Course Objectives:

At the end of this course students will be able to:

- Identify representatives of different Phyla of Non-chordates and Protochordates.
- Know the pathogenic animals; histology of different organs of non-chordate animals.
- Know the structure of mouth-parts of insects and structure of larval forms of different arthropods.
- Know the basic differences in general anatomy of different animals.

Techniques: Collection and preservation of Non-chordates.

Taxonomy: Identification of Non-chordates (collection, museum specimens and permanent slides).

Culture: Protozoan culture.

Permanent histological slides: Sections of *Fasciola, Ascaris*, *Hirudinaria*, *Balanoglosus* and *Amphioxus.*

Slide preparations:

1. Temporary slide preparation:
   Any cultured organism, Statocyst of prawn, Jaw of snail/slug, Jaw of *Hirudinaria,* Mosquito larva and Nematodes of animals.
2. Permanent slide preparation:
   Radula of snail; mosquito larva; mouthparts of mosquitoes, cockroach, honeybee, house fly and butterfly; *Daphnia/Cyclops/Cypris*.

Morphology and anatomy (Dissection):

1. Leech – General Anatomy, Excretory and Reproductive.
2. Prawn - Appendages, Nervous system and Digestive organs.
3. Cockroach – General anatomy, digestive organs, nervous system and reproductive organs
4. Apple snail (*Pila*) – General anatomy and Nervous system.

Case study and report writing (any one)

i) Medical diseases
ii) Veterinary diseases
iii) Agriculture pests
iv) Faunal survey/ Field trip (one day).

Practical note book preparation as regular study.