St. Xavier's College – Autonomous Mumbai

Syllabus
For II Semester Courses in Zoology (November 2016 onwards)

Contents:

F.Y.B.Sc. Zoology S.ZOO.2.01

VERTEBRATE SYSTEMATICS AND ECOLOGY

Learning Objectives:

- To teach student basic classification and characteristics of vertebrates and special adaptations of these phyla
- To understand how environment affects distribution of animals

Number of lectures: 45

Unit 1

Lower Chordate classification: (15 lectures)

- Phylum Hemichordata
- Phylum Chordata
  - Subphylum Urochordata
  - Subphylum Cephalochordata.

Unit 2

Vertebrate classification: (15 lectures)

- Subphylum Vertebrata
  - Superclass: Agnatha
    Class Cyclostomata
  - Superclass: Gnathostomata
    Class Pisces – swimbladder, breeding and parental care
    Class Amphibia – neoteny and parental care
    Class Reptilia – adaptive radiation
    Class Aves - Migration
    Class Mammalia – Prototheria, Metatheria, Eutheria and Marine Mammals

Unit 3

Ecology (15 lectures)

- Concept of Ecosystem
- Concept of energy flow, food chain and food web
- Concept of biogeochemical cycles (Carbon, oxygen, nitrogen, phosphorus and water cycles)
- Human activities affecting biogeochemical cycles
- Ecological niches and adaptation
- Biodiversity Definition of Biodiversity hotspots, benefits of biodiversity, Conservation of biodiversity, biotic and abiotic theories of species richness
- Abiotic factors and distribution patterns

Recommended References:

1. Vertebrates by Kotpal
2. Chordate Zoology by Dhami and Dhami
3. Vertebrates by Jordan and Verma
4. Ecology:Principles and application by Chapman and Reiss
5. Essentials of Ecology by Tyler and Miller
6. Biodiversity by SVS Rana

Practical Course:

1. Determination of pH of soil
2. Estimation of Dissolved Oxygen in the water sample
3. Estimation of Hardness of water in the water sample
4. Study and identification of Foraminiferan shells
5. Estimation of frequency, density and dominance
6. Vertebrate classification:

Hemichordata:	Balanoglossus
Urochordata:	Ascidia, Salpa, Herdmania
Cephalochordata:	Amphioxus
Cyclostomata:	Petromyzon, Myxine, Ammocoete larva
Pisces:	Chondrichthyes – Shark, sting ray, electric ray Osteichthyes – Flying fish, Puffer fish and Sea horse
Amphibia:	Frog, toad, Caecilian, salamander, Siren
Reptilia:	Chameleon, Calotes/Gecko, turtle, tortoise, snake, crocodile, Phrynosoma
Aves:	Kite, duck, Owl
Mammalia:	Hedgehog, Bat, Guinea pig and Marine Mammals (Dugong, Blue Whale, Dolphin)

7. Parental Care : Bony fish (Siamese fighter, Tilapia and Guppy), Mid wife toad and Surinam toad
8. Neoteny : Axolotl larva
9. Adaptive radiations: sea snake, rattle snake, flying lizard
10. Study of swim bladders in fish

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F.Y.B.Sc. Zoology S.ZOO.2.02

BIOTECHNIQUES AND COMPARATIVE PHYSIOLOGY

Learning Objectives:

- To help students appreciate the complexity of systems and differences in the physiology of animals.
- To understand different techniques used in biology

Number of Lectures: 45

Unit 1

Biotechniques: (15 lectures)

- Concept of sterilization: Filtration, Dry heat sterilization, Wet sterilization, Radiation.
- Preparation of solutions: Molar, Normal, Percent solutions, PPM, PPB, Dilutions — serial dilutions
- Separation of Biomolecules:
  - Chromatography: Principle and applications i) Paper ii) Thin Layer iii) Ion exchange
  - Electrophoresis: Paper and gel (Agarose and Polyacrylamide)
- Cell counting techniques: Use of haemocytometer (by using suitable stain)
- Principles of different types of microscopes: a) Simple b) Compound c) Phase contrast d) Electron e) Fluorescence f) Confocal.

Unit 2

Comparative Physiology 1: (15 lectures)

- Movement and locomotion:
  - Amoeboid movement
  - Ultrastructure of cilia and ciliary movement
  - Ultrastructure of myofibril and sliding filament theory
  - Action of muscle (Role of muscle in movement)
- Nutrition:
  - Animals without alimentary canal e.g. Amoeba
  - Animals with incomplete alimentary canal e.g. Hydra
  - Animals with complete alimentary canal e.g. Bird
  - Brief account of physiology of digestion in vertebrates and symbiotic digestion in Ruminants.
- Respiration:
  - Types of respiratory surfaces: Trachea, spiracles, gills, lungs of Frog and Human, Air sacs of birds.
- Circulation:
  - Types of circulating fluids: Water, coelomic fluids, lymph and blood.
  - Types of circulation: Protoplasmic streaming
  - Open and closed circulation, single and double circulation.
  - Heart in Daphnia, cockroach and chordates

- Structure of cardiac muscle.

Unit 3

Comparative Physiology 2: (15 lectures)

- Excretion and Osmoregulation
  - Categorization of animals on the basis of principal nitrogenous excretory products
  - Ornithine cycle, formation of urea, deamination and detoxification
- Control and Coordination:
  - Nerve net in hydra and Giant nerve in Earthworm
  - Structure of a neuron
  - Physiology of neuronal function.
- Reproduction:
  - Asexual and Sexual reproduction
  - Gametogenesis, structures of egg and sperm of mammal
  - Fertilization and *in vitro* fertilization
  - Oviparity, viviparity and ovoviviparity

Recommended References:

1. Principles and Techniques of Molecular biology by Wilson and Walker
2. Biochemical Methods by S.Sadasivam and A. Manickam
3. Animal Physiology by Arora
4. Principles of Anatomy and Physiology: G. J. Tortora and S.R. Grabowski, Harper Row Publishers
5. Vertebrate Zoology by Dhami and Dhami
6. Invertebrate Zoology by Dhami and Dhami

Practical Course:

1. Circulatory system: Heartbeat of Daphnia, study of heart of Cockroach, Frog, Fish and Mammal
2. Respiratory system: Gills, Lungs of frog and mammal, spiracles in cockroach
3. Study of Nutritional apparatus
4. Muscle slides-smooth muscle, Striated muscle, Cardiac muscles, ultra structure of cilia
5. Observation of Giant nerve fibre and spinal cord, nervous net in hydra
6. Observation of binary fission and conjugation
7. Mounting of Septal Nephridium of Earthworm
8. Urine analysis and detection of Ammonia
9. Chromatography: TLC and Paper Chromatography
10. Demonstration of cell counter using a Haemocytometer and numerical problems using the haemocytometer
11. Study of agarose and polyacrylamide gels

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