St. Xavier's College – Autonomous Mumbai

Syllabus For V Semester Courses in Zoology (June 2016 onwards)

Contents:

Theory Syllabus for Courses:

T.Y. B.Sc. Zoology S.ZOO. 5.01

ONTOGENY OF VERTEBRATES, BEHAVIOURAL ECOLOGY AND CONSERVATION BIOLOGY

Learning Objectives:

- To comprehend the development and modifications of some vertebrate systems.
- To understand the behavioural and distribution patterns of animals and interpret formulation of conservation strategies.

Number of lectures: 60

Unit 1

Ontogeny of Vertebrate systems: **(15 Lectures)**

A) Integumentary system
B) Circulatory system
C) Urinogenital system

Unit 2

Behavioural Ecology: **(15 Lectures)**

A) Sexual selection
B) Mating systems
C) Parental care.

Unit 3

Population and Community Ecology: **(15 Lectures)**

A) Population growth curves, factors affecting population growth.
B) Life tables and survivorship curves, r and k strategies, Ecological succession.
C) Social interactions, Parasitism and Predation

Unit 4

Zoogeography and Conservation biology: **(15 Lectures)**

A) Zoogeographic realms, Biogeographic classification of the Indian subcontinent, Means of dispersal and Barriers to dispersal.
B) Island Biogeography, Wildlife Tourism and Wildlife Forensics.
C) History of Conservation Biology, Population Management and Restoration (case studies)

Recommended References:

1. Conservation Biology- Fred Van Dyke, Springer.
2. Wildlife Tourism- D.Newsome, R.Dowling, Susan Moore, Channel View Publication.
3. Conservation Biology- Scott P.Caroll and Charles Fox, Oxford University Press.
4. Comparative Anatomy of Vertebrates- George C.Kent, Mosby Year Book.
5. Elements of Chordate Anatomy- Charles K.Weichert, McGraw Hill Publication.
6. Behavioural Ecology- E.Danchin,L.A.Giraldeau,Frank Cezilly, Oxford University Press.
7. Atlas of World Wildlife- Sir J Huxley, Mitchell Beazely Publishers Limited
8. Behavioural Ecology- J.R. Krebs and N.B. Davies, Blackwell Scientific Publications
9. Animal Behaviour- John Alcock, SinauerAssociates,Inc.
10. Ecology- Eugene Odum.
11. Encyclopedia of Endangered Animals- A.J.Beer and P.Morris, Grange Books.
12. Ecology- Theories and Applications- Peter Stiling, Prentice-Hall of India.
13. Wildlife Forensics – Jane Huffman and John Wallace, Wiley-Backwell.
14. The wildlife detectives – Donna Jackson - Houghton Mifflin Harcourt Publishing Company

Practical Course:

1. Comparative study of the skull and girdles of frog, varanus, bird and rabbit.
2. Dissection of brain of chicken
3. Mountings of Columella of chicken, Hyoid of chicken
4. Identification of integumentary derivatives: feathers, scales (reptile), claw (bird/reptile/mammal), hooves (horse/cattle), horn, antler and teeth.
5. Mounting of epidermal derivatives (hair and fur)
6. Mounting of fish scales: placoid, cycloid, ctenoid.
7. Study of distinctive fauna of zoogeographic realms, and conservation status of the same
8. Study the response of housefly/cockroach to light.
9. Measure the Turbidity, and Conductivity of a given water sample.
10. Estimation of Population density (Sub-sampling of Daphnia and mark-recapture method).
11. Rapid field tests for sulphates, nitrates and base deficiency in different soil samples.
12. Calculation of life expectancy using life tables

- A long excursion to any National Park / Sanctuary for Unit 4

##########

T.Y.B.Sc. Zoology S.ZOO. 5.02

PHYSIOLOGICAL ADAPTATIONS

Learning Objectives:

- The aim of this module is to encourage an awareness of the physiological nature of life.
- To develop an understanding of form, function and adaptation in organ systems central to the maintenance of life and interaction with the environment.
- As an inter-disciplinary approach to the subject there is need to understand adaptations not only on the Earth but also in the space.

Unit 1:

Environment, adaptations and scaling (15 Lectures)

A) Environment and physiological changes

Respiration

- Gas exchange across respiratory surfaces
- Diffusion
- Partial pressures
- Models of gas exchange in vertebrates
- Effects of diving and altitude

Blood

- Fluid composition of blood
- Solids
- Formed Elements
- Erythrocytes and haemoglobin
- Leucocytes
- Thrombocytes and clotting mechanism
- Coping with hypoxia and anoxia

B) Animal Adaptations and Scaling

- Adaptation at a molecular and genomic level
  - Controlling protein synthesis
  - Controlling protein action
- Physiological regulation of gene expression by proteins
  - Signals
  - Receptors
  - Mediators
- Scaling
  - Isometric and allometric
  - Scaling of metabolic rate and locomotion

Unit 2:
Astrobiology and physiological adaptations in space conditions (15 lectures)

A) Basic Astrobiology
- Introduction
- Basic Astronomy
- Early Earth Conditions
- Origin and Evolution of Life on the Earth
- Habitable zones
- Detection of exoplanets and SETI

B) Space biology
- Revision of human physiology
- Effect of space conditions on human physiology
- Problems faced by Astronauts and solutions

Unit 3:
Osmoregulation and Thermoregulation (15 lectures)

A) Osmoregulation
- Regulation in aquatic environments (marine and freshwater),
- Regulation in terrestrial environments
  - Evaporative water loss
  - Salt water ingestion and salt excretion
  - Metabolic water
  - Behavioral adaptations
- Hormonal control of water, osmotic, pH and ionic balance
- Osmoregulation in extreme environments
  - Aquatic: transient water bodies and osmotically peculiar environments
  - Terrestrial: hot and cold deserts

B) Thermoregulation
- Patterns of body temperature and temperature tolerance,
- Heat exchange
  - Conduction
  - Convection
  - Radiation
- Temperature regulation in ectotherms
- Temperature regulation in endotherms
  - Concept of critical temperatures
  - Heat gain
  - Heat Loss
- Life in temperature extremes

Unit 4:
Physiology of reproduction (15 lectures)
A) Human Reproductive Systems
- Male System

- Anatomy and histology of the testes
- Endocrine regulation of the male system

- Female System
  - Anatomy and histology of the ovary
  - Endocrine regulation of the female system

B) Breeding cycles

- Menstrual cycle
- Ovarian cycle
- Oestrous cycle in rats and dogs

Recommended References:

1. Molecular Biology of the Cell: Harvey Lodish, David Baltimore et al., Scientific American Books
2. Comparative Animal Physiology: P.C. Withers, Thomson Publishing Co.
3. Comparative Animal Physiology: Knut, Schmidt-Neilson, Cambridge
4. Principles of Anatomy and Physiology: G. J. Tortora and S.R. Grabowski, Harper Row Publishers
5. Human Physiology, Vol I: Chatterjee, Central Book Agency
6. Environmental Physiology of Animals: Pat Wilmer and Stone Graham, Blackwell publishers.
7. An Introduction to Astrobiology Edited by Iain Gilmour and Mark Sephton (2004). Cambridge University Press.

❖ **Field Trip for Unit 2:** It will be an overnight sky-observation session.

Practical Course:

1. Identification:
    i. T.S. of Testes
    ii. T.S. of Ovary
    iii. Blood of fish
    iv. Blood of lower vertebrate (Frog)
    v. Blood of calotes
    vi. Blood of bird
    vii. Blood of Camel
    viii. Blood of Mammal
    ix. Vaginal smear of rat
2. Differential Leucocyte Count in Humans
3. Total Leucocyte count
4. Estimation of Haemoglobin
5. Estimation of plasma proteins (Folin-Ciocalteau method)
6. Estimation of total triglycerides in blood by Phosphovanillin method
7. Fragility test
8. To study effect of osmotic fluids on paramoecium.
9. To study the effect of temperature on respiration in fish
10. Identification:
    i. Parts of Astronaut suit
    ii. Parts of Space shuttle and Space station that help maintain normal physiological conditions.
    iii. Meteorite specimens
11. Introduction to Telescope
12. Group projects: Projects will be given to groups of students and will be evaluated (Practical CIA).

&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

T.Y. B.Sc. Economic Entomology S.ZOO. 5.AC

INSECT FORM AND FUNCTION, COMMERCIAL ENTOMOLOGY AND INSECT ADAPTATIONS

Learning Objectives:

- To understand insect classification and nomenclature of insects
- To study the working of insect systems
- To understand their adaptations to the environment
- To look into some commercial applications of entomology.

.

Number of lectures: 60

Unit 1

Classification of common Insects: (15 Lectures)

A) General characteristics, with examples and economic importance of the following orders:
- Thysanura
- Lepidoptera
- Hemiptera
- Coleoptera
- Diptera
- Orthoptera
- Dictyoptera

Unit 2

Morphology and Anatomy: (15 Lectures)

A) Morphology and modifications of Mouth-Parts, Antennae, Wings and Legs

B) An Outline of the Anatomy of Insects
- Digestive and Excretory system
- Circulatory and Respiratory system
- Nervous and Endocrine system
- Reproductive system and development of insects

C) Metamorphosis in insects

Unit 3

Insects of Commercial importance: (15 lectures)

A) Honey Bee (Apiculture)
B) Silk Moth (Sericulture)
C) Lac Insect (Lac culture)
D) Government Agencies involved in research
E) Introduction to feasibility report and funding agencies

Unit 4

Environmental factors and Special adaptations in Insects: (15 Lectures)

A) Environmental factors affecting insects – temperature, light and humidity
B) Sound Production and Chemical signaling
C) Mimicry

Recommended References:

1) A Textbook of Insect Morphology, Physiology and Endocrinology – Tembhare D.B. – S.Chand publication
2) Principles of Insect Morphology – Snodgrass R. E. –Tata McGraw Hill
3) Textbook of Entomology – Ross – John Wiley publication
4) General and Applied Entomology – David and Ananthakrishnan – Tata McGraw Hill publication
5) Economic Zoology – Shukla and Upadhyay, Rastogi Publication
6) Applied Entomology – Alka Prakash and Fennemore, New Age Publishers
7) A General Textbook of Entomology – A.D. Imms
8) Textbook of Entomology – Awasthi
9) Insects – Chapman, ELBS Publications
10) Entomology – Romoser, Macmillan Publishing Co.
11) Applied Agricultural Entomology – Lalit Kumar Jha New Central Book Agency
12) Natural History of the Insects of India – Westwood J.O. , Narendra Publishing House
13) Entomology – Novel approaches – P.C. Jain and M. C. Bhargava, New India Publishing House

Practical Course:

1) Identification of specimens

- Lepisma, Butterfly, Moth (Hawk Moth), Bed-bug, Giant water bug, Potter wasp, Carpenter ant, Lady bird beetle, Blister beetle, House-fly, Flesh-fly, Blue/Green bottle fly, Cricket, Grasshopper Praying Mantis.
- Metamorphosis of insects (Silkmoth, Mosquito, Flea, Beetle and housefly).
- Mimicry and Camouflage.
- Mouth-parts of butterfly and bed-bug.
- Types of antennae and legs.
- Identification of the parts of a bee box and apiculture equipment.

2) Mountings

- Halteres, Legs, Antennae and Mouth-parts of House-fly.
- Preservation of insect specimen.

$$