

St. Xavier's College – Autonomous Mumbai

Syllabus For V Semester Courses in Zoology (June 2019 onwards)

Contents:

Theory Syllabus for Courses:

SZOO0501– Ontogeny of Vertebrates, Behavioural Ecology and Conservation Biology

SZOO0502- Physiological Adaptations

SZOO5AC- Insect Taxonomy and Applied Entomology

Practical Course Syllabus for: SZOO5PR and SZOO5ACPR

T.Y. B.Sc. Zoology

SZOO0501

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.

UNIT 1

ONTOGENY OF VERTEBRATE SYSTEMS

(15 Lectures)

- ➤ Integumentary system
- Circulatory system
- Urinogenital system

UNIT 2

BEHAVIOURAL ECOLOGY

(15 Lectures)

- > Sexual selection
- Mating systems
- Parental care

UNIT 3

POPULATION AND COMMUNITY ECOLOGY

(15 Lectures)

- ➤ Population growth curves, factors affecting population growth.
- Life tables and survivorship curves, r and k strategies, Ecological succession.
- > Social interactions, Parasitism and Predation

UNIT 4

ZOOGEOGRAPHY AND CONSERVATION BIOLOGY

(15 Lectures)

- ➤ Zoogeographic realms, Biogeographic classification of the Indian subcontinent, Means of dispersal and Barriers to dispersal.
- ➤ Island Biogeography, Wildlife Tourism and Wildlife Forensics.
- ➤ 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, Sinauer Associates, 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

CIA modalities:

CIA I – Short answers for 5 marks each with options

CIA II – Multiple choice questions

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

Field Trip: A long excursion to any National Park / Sanctuary for Unit 4

T.Y.B.Sc. Zoology

SZOO0502

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)

> Environment and physiological changes

Respiration

- Partial pressures
- Effects of diving and altitude
- Coping with hypoxia and anoxia

Blood

- Composition of blood
- Formed Elements
- Clotting mechanism

> Animal Adaptations and Scaling

- Adaptation at a molecular and genomic level
- Signal transduction
 - o Signals (ligands)
 - o Receptors
 - o Mediators
- Scaling
 - o Isometric and allometric
 - Scaling of metabolic rate and locomotion

UNIT 2

ASTROBIOLOGY AND PHYSIOLOGICAL ADAPTATIONS IN SPACE CONDITIONS (15 lectures)

> Basic Astrobiology

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

> 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)

Osmoregulation

- Regulation in aquatic environments (marine and freshwater),
- Regulation in terrestrial environments
 - Evaporative water loss
 - o Salt water ingestion and salt excretion
 - o Metabolic water
 - o Behavioral adaptations
- Osmoregulation in extreme environments
 - o Aquatic: transient water bodies and osmotically peculiar environments
 - o Terrestrial: hot and cold deserts

> Thermoregulation

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

UNIT 4

PHYSIOLOGY OF REPRODUCTION

(15 lectures)

> Human Reproductive Systems

- Male System
 - o Anatomy and histology of the testes
 - o Endocrine regulation of the male system
- Female System
 - o Anatomy and histology of the ovary
 - o Endocrine regulation of the female system

> 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.

CIA modalities:

CIA I – Short answers for 5 marks each with options

CIA II – Multiple choice questions

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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

Field Trip: An overnight sky-observation session at Vangini

T.Y. B.Sc. Applied Component

SZOO5AC

INSECT TAXONOMY AND APPLIED ENTOMOLOGY

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.

UNIT 1

CLASSIFICATION OF COMMON INSECTS

(15 Lectures)

- > 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)

- Morphology and modifications of Mouth-Parts, Antennae, Wings and Legs
- ➤ An Outline of the Anatomy of Insects
 - Digestive and Excretory system
 - Circulatory and Respiratory system
 - Nervous and Endocrine system
 - Reproductive system
 - Effect of environment on insect development and behaviour
- ➤ Metamorphosis in insects

UNIT 3

INSECTS OF COMMERCIAL IMPORTANCE

(15 lectures)

- ➤ Honey Bee (Apiculture)
- ➤ Silk Moth (Sericulture)
- ➤ Lac Insect (Lac culture)
- ➤ Lytta sps [blister beetles] (Cantharidine)
- ➤ Dactylopius coccus (Cochneal bug)

UNIT 4

SOCIAL LIFE OF INSECTS

(15 lectures)

- ➤ Honey Bee
- > Termites
- > Wasps

Recommended References:

- 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

CIA modalities:

CIA I – Short answers for 5 marks each with options

CIA II – Multiple choice questions

Practical Course:

- 1. 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.
- 2. Metamorphosis of insects (Silkmoth, Mosquito, Flea, Beetle and housefly).
- 3. Mouth-parts of butterfly and bed-bug.
- 4. Types of antennae and legs.
- 5. Identification of the parts of bee box and apiculture equipment.
- 6. Identification of insect products
- 7. Identification of Castes of Social insects
- 8. Dissection of Cockroach Nervous system and Mounting of Spiracles
- 9. Mounting of Halteres, Legs, Antennae and Mouth-parts of House-fly.
- 10. Study of Haemocytes in cockroach haemolymph
- 11. Preservation of insect specimens
- 12. Model making or Project
- 13. Social Life of Insects

Field Trip: Visit to BAIF/KKV