St. Xavier's College – Autonomous Mumbai

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

Contents:

S.Y.B.Sc. Zoology SZOO0301

ETHOLOGY AND PARASITOLOGY

Learning Objectives:

- To enable students understand animal strategies and interactions and emphasize the importance of behaviour for survival.
- To help students gain an in depth understanding of some disease causing protozoan and helminth parasites

UNIT 1

ANIMAL LEARNING: (15 lectures)

- Associative and instrumental learning
- Insight learning and Cognition
- Constraints of learning
- Animal interactions

UNIT 2

ETHOLOGY (15 lectures)

- Ontogeny of behaviour and sensitive periods during development
- Environmental influence on behaviour
- Communication in animals
- Adaptive strategies (ESS) and foraging strategies in animals

UNIT 3

PARASITOLOGY (15 lectures)

- Parasites (Ectoparasites, Endoparasites, Digenetic, temporary, Permanent, Facultative)
- Hosts (Definitive, Intermediate, paratenic, reservoir)
- Morphology , mode of infection, life cycle, pathogenicity, prophylaxis and treatment of
- Protozoan parasites – *Entamoeba histolytica, Leishmania donovani, Plasmodium vivax, Typanosoma gambiense, Giardia intestinalis*.
- Helminth Parasites – *Taenia solium, Ancylostoma duodenale, Wuchereria bancrofti, Ascaris lumbricoides, Dracunculus medinensis*

Recommended References:

1. Animal Behaviour – Mechanism, Ecology, Evolution by Drickamer, Vessey, Jakob
2. Animal Behaviour – Its development, Ecology and Evolution by Robert A Wallace. Goodyear Publishing Company
3. Animal Behaviour by David McFarland. Pitman Publishing ltd
4. Textbook of Animal behaviour byF.B.Mandal. PHI
5. Behaviour by M. Dockery and M Reiss. Cambridge University press.
6. Introduction to Animal Behaviour by Manning and Dawkins. Cambridge Univ. Press
7. Animal Parasitology by JD Smyth. Cambridge University Press
8. Parasitology - Protozoology & Helminthology by K.D. Chatterjee
9. Essentials of Human Parasitology by Judith S Heelan, Frances W Ingersoll. Delmar Thomson Learning
10. Medical Parasitology - A Practical approach by S.H.Gillespie and P.M. Hawkey. Oxford Univ Press
11. Manson's Tropical Diseases – P.H. Manson. Bahr Cassell and Co. Ltd.

CIA modalities:

CIA I – Short answers for 5 marks each with options
CIA II – Multiple choice questions /Presentations/Assignments

Practical Course:

1. Identification of Protozoan parasites – Entamoeba, Leishmania, Trypanosoma, Plasmodium, Giardia
2. Identification of Helminth parasites – Taenia, Ancylostoma, Wuchereria, Ascaris, Dracunculus
3. Parasitic adaptations – Taenia (scolex, proglottid), Trypanosoma, Entamoeba, Ascaris, Giardia
4. Mounting of mouthparts of mosquito/bed bug and house fly
5. Demonstrate wing cleaning in housefly and observation of feeding behaviour
6. Study of animal interactions
    a. Parasitism (Ecto and Endo)
    b. Mutualism
    c. Commensalism
7. To study antennal grooming in cockroach
8. Study of optimal foraging strategies and ideal free distribution using guppy

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S.Y.B.Sc. Zoology SZOO0302

BIOSTATISTICS AND EVOLUTION

Learning Objectives:

- ❖ To learn basic concepts in statistics and their application in biology
- ❖ To understand basic framework of evolutionary biology

UNIT 1

INTRODUCTION TO STATISTICS (15 lectures)

- Descriptive Statistics
  - Basic Statistical terminology, Sampling
  - Describing data - Measures of central tendency and dispersion & graphical representation
- Different types of distributions- Normal, Binomial, Poison distributions, Central limit theorem and confidence interval
- Experimental Design

UNIT 2

INFERENTIAL STATISTICS (15 lectures)

- Hypothesis testing
  - General framework,
  - Idea of probability,
  - Type I and II errors,
  - Idea of Significant difference
- Parametric tests - Z-test, t-test, G-test
- ANOVA
- Non-parametric tests – Wilcoxon test, Man-Whitney U test
- Regression and Correlation

UNIT 3

EVOLUTION (15 lectures)

- Natural selection: The driving force in evolution??
  - Darwins idea of natural selection
  - Do we really need fossils??
  - The missing Link. Is anything missing???
- Neo Darwinism: Natural selection revisited and remodified
- Evolution of genome/gene
- Phylogenetic Analysis
  - Phylogenetics – Use of sequence to decipher distance
  - Phlyogenetic trees - Cladogram, Dendogram

Recommended References:

1. Biostatistics: A foundation for analysis: Daniel. Wiley Publishing House
2. Statistical Methods in Biology: Norman Bailey. Cambridge Low Price Edition
3. Choosing and Using Statistics: A Biologist's Guide: Calvin Dytham. Blackwell Publishing
4. Origin of Species – Charles Darwin.
5. Evolution: Mark Ridley. 3rd edition
6. Evolution: Douglas Futuyama. 3nd edition
7. What Evolution Is: Ernst Mayr

CIA modalities:

CIA I – Short answers for 5 marks each with options
CIA II – Multiple choice questions /Presentations/Assignments

Practical Course:

1. Descriptive Statistics – Central Tendency Problems
2. Descriptive Statistics – Dispersion Problems
3. Graphical Representation
4. Computers in biostatistics – Use of Excel and other softwares
5. Evolution in Jaw and cranium: Fish, Amphibian, Reptile, Bird, Mammal
6. From water to land: the evolution of limb in animals
7. Constructing phylogenetic trees.

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S.Y.B.Sc. Zoology SZOO0303

ADVANCED GENETICS AND BIOINFORMATICS

Learning Objectives:

- This course aims at a comprehensive understanding of genetics and its varied applications whilst shedding light on more fundamental concepts of sex determination and mutations affecting genes.
- In Bioinformatics students are exposed at a basic level to the exciting world of fusion between IT and Biology and the enormous advances and uses of this field.

UNIT 1

GENETICS 1 (15 lectures)

- **Population Genetics**
  - Hardy-Weinberg equilibrium
  - Proof of HW equilibrium
  - Problems on HW equilibrium

- **Linkage Mapping**
  - Proof of crossing over
  - Two point cross
  - Three point cross
  - Use of linkage analysis in gene Mapping

UNIT 2

GENETICS 2 (15 lectures)

- **Sex Determination in Man**
  - Red herrings along the way
  - The Sry story
- **Sex determination in Drosophila Melanogaster**
- **Chromosomal aberrations**
  - Deletion, Duplication, Translocation, Inversion, non-disjunction, fragile X
- **DNA mutations**
  - Transition, Transversion, Insertion, Deletion, Frame shift
- **DNA Replication**
  - Models of DNA replication, Hershey Chase experiment
  - Molecules and Mechanism in Prokaryotes
  - Molecules and Mechanism in Eukaryotes

UNIT 3

BIOINFORMATICS (15 lectures)

- http, html, ftp, ip, www, lan, wan: terms and their understanding
- Introduction to international Databanks
  - NCBI, EBI, DDBJ
  - Literature retrieval, sequence retrieval
- Sequence Analogy and Homology
- Di-deoxy DNA sequencing, Pyro sequencing

Recommended References:

1. Bioinformatics and Molecular Evolution – Higgs and Attwood. Blackwell Publishing
2. Gentics – Strickberger. CB publications
3. iGenetics – Russel.
4. Genetics – Gardener
5. Genetics – Winchester. Oxford IBH publication
6. Principles of Genetic - Sinnot, Dunn and Dobzansky. McGraw Hill Publication
7. Basic human genetics - E.J.Mange and A.P.Mange. Rastogi Publication
8. Bioinformatics and Molecular Evolution – Higgs and Attwood. Blackwell Publishing
9. Lehninger Biochemistry – Nelson and Cox

CIA modalities:

CIA I – Short answers for 5 marks each with options
CIA II – Multiple choice questions /Presentations/Assignments

Practical Course:

1. Goodness of Fit: Chi square test
2. Validation of Mendels Monohybrid cross using Drosophila
3. Validation of Mendels Dihybrid cross using Drosophila
4. Problems on HW law
5. Problems on Linkage analysis
6. Labs for Bioinformatics: Literature retrieval, sequence retrieval, Global Vs Local Alignment, BLAST
7. Methods in Protein structure prediction
8. Sexual dimorphism: Drosophila, Cockroach, Bonelia worm, Honey bee

Field Trip: Visit to Jai Vakeel Foundation and Research centre Parel / CREMERE Malad.

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