



# Syllabus

## Fourth Semester Courses in Zoology

### 2024 – 2025

#### Contents:

- Syllabus for Core Courses Course (CR)  
**USZOO5003CR1 – EVOLUTION**  
**USZOO5004CR1 – ANIMAL BEHAVIOUR**
- Syllabus for Minor Courses Course (MN)  
**USZOO5002MN1 – PARASITOLOGY**



S.Y.B.Sc. ZOOLOGY

Course Code: USZOO5003CR1

**EVOLUTION**Credits 4: **Theory 3 = 45 hrs and Practical 1 = 30 hrs**Prerequisite: **The student should have done two core courses in Zoology in Semesters I and II****Course Objectives:**

1. To present before the students an overview of modern evolutionary understanding of the concepts they come across in everyday life.
2. To equip them with skill sets to better understand fundamental evolutionary processors in depth to be able to understand modern biology better.

**Course Outcomes:**

On completion of the course the learner should be able to:

<b>CO</b>	<b>Course Outcomes</b>	<b>Bloom's Taxonomy Level</b>
<b>1</b>	Recapitulate fundamental evolutionary concepts.	<b>Remembering</b>
<b>2</b>	Learners can understand complex evolutionary mechanisms and forces that shape species diversity.	<b>Understanding</b>
<b>3</b>	Generate scientific explanations for complex/puzzling phenomenon when presented.	<b>Applying</b>
<b>4</b>	Analyse and interpret data, figures and tables from literature and draw sound conclusions.	<b>Analysing</b>

## **UNIT 1**

(15 lectures)

- Evolution: Defined and Explained
- Why Study Evolution? Understanding Evolutionary Thought process
- Critical concepts in Evolution: (Use majorly Evolutionary Analysis by Herron and Freeman)
  - Natural Selection – What does it mean? Natural selection and chance, Selfish genes and Unselfish behaviour, what not to expect of Natural selection.
  - Fitness: The currency of selection. How fitness drives selection? - Looking at Evolution of Beak shape on the island of Daphne major.
  - Mutation – The ultimate source of variations, Point and structural mutations, Is mutation random? - Richard Lensky's experiment to giving an overview of selective mutations driving evolution
  - Genetic Drift – Concept, relation to population size, aging in humans and diet. How does it affects DNA repair and longevity? How strong is Genetic Drift? Random mating – Concept, contribution to evolution.

## **UNIT 2**

(15 lectures)

- Modern Synthesis of Evolution
- Sexual Selection: why Sex and how does evolution drive it
- Types of Selection and Mechanisms of Speciation
- Precambrian Evolution and Cambrian Explosion
- Evolution and the Fossil record:
  - Nature of the fossil record and the story of evolution in it
  - Mass extinction events on Earth
  - Comparing Fossil and molecular divergence data

## **UNIT 3**

(15 lectures)

- Evolutionary story of Homo Sapiens
  - Concept of a common ancestor
  - Where did we come from – the story leading to the hominid line
- Uses and implications of Evolutionary Biology
  - Practical applications of evolutionary science
  - Health and medicine

**List of Recommended Reference Books:**

1. Shubin, N. (2020). Some assembly required. Oneworld Publications
2. Zimmer, C., & Emlen, D. (2019). Evolution: Making sense of Life (3<sup>rd</sup> ed). W. H. Freeman Macmillan Learning.
3. Futuyama, D., & Kirkpatrick, M. (2017). (Evolution 4th ed). Sinauer Publications
4. Herron, J. C., & Scott, F. (2013). Evolutionary Analysis (5<sup>th</sup> ed). Pearson Education Limited
5. Ridley, M. (2003). Evolution (3rd ed.). Blackwell Publishing.

**Practical Course:**

1. Identification of feet and beak in birds
2. Identification of fossils - Trilobite, Ammonite, Fish fossil, Molluscan fossil, wood fossil
3. Construction of a Phylogenetic tree
  - ✓ Downloading sequencing from primary databases
  - ✓ Multiple Sequence Alignment
  - ✓ Construction of phylogenetic trees using open-source tree generation software
4. Dating a common ancestor using the concept of divergence from common ancestor
5. Radiometric dating: Understanding Carbon 14 dating, Rubidium - strontium dating, Uranium - lead dating, Potassium Argon dating.
6. Calculating the likelihood of an evolutionary tree : the concept of an outgroup, Rooted vs unrooted tree and tree building algorithms
7. Studying the combined effects of selection and migration in organism - Lake Erie Island water snakes
8. Random genetic drift, bottleneck effect and founder effect - a study using virtual labs
9. Use of allele frequencies and linkage disequilibrium to date modern human expansion from Africa - use of Alu repeats

**Evaluation (Theory): Total marks per course - 100**

**I. Formative Assessment ‘for’ Learning (continuous internal assessment - CIA to improve learning).**

CIA Exam – 40 marks

- CIA 1: Written Test – 20 marks
- CIA 2: Multiple choice questions / Field report /Assignment / Presentation - 20 marks

**II. Summative Assessment ‘of’ Learning**

End Semester Examination – 60 marks

- One question from each unit for 20 marks, with internal choice. Total marks per question with choice -30 to 32.

**Evaluation of (Practical:) Total marks Practical course – 50**

- End Semester Practical Examination (Identification and performance of experiments) and Journal – 50 marks.

**Template for End Semester examination in Semester IV for the Core course in Evolution.**

<b>UNITS</b>	<b>REMEMBERING</b>	<b>UNDERSTANDING</b>	<b>APPLICATION and ANALYSES</b>	<b>TOTAL MARKS Per unit</b>
1	7	5	8	20
2	6	4	10	20
3	6	4	10	20
<b>TOTAL</b>	19	13	28	60
<b>% WEIGHTAGE</b>	31.6	21.6	46.6	100

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**ANIMAL BEHAVIOUR**Credits 4: **Theory 3 = 45 hrs and Practical 1 = 30 hrs**Prerequisite: **The student should have done two core courses in Zoology in Semesters I and II****Course Objectives:**

1. The students will be introduced the field of animal behaviour.
2. The students will learn how animal behaviour is shaped by development, genetics, physiology, ecology and evolution.
3. The students will also be introduced to some examples of classical experiments and observations in animal behaviour.
4. The students will learn the basic techniques used to record and analyze animal behaviour.

**Course Outcomes:**

On completion of the course the learner should be able to:

<b>CO</b>	<b>Course Outcomes</b>	<b>Bloom's Taxonomy Level</b>
<b>1</b>	Understand how behaviour of animals is shaped by development, genetics, physiology, ecology and evolution	Understanding
<b>2</b>	Understand how researchers have set up experiments to elucidate and interpret behaviour of animals.	Analysing
<b>3</b>	Perform basic techniques used to record and analyze animal behaviour	Applying

## **UNIT 1**

(15 lectures)

### **Basics of Animal Behaviour**

- Historical review of ethology
- Scope of the field of ethology
- Approaches to study animal behaviour – ethological and behaviourist approaches
- Tinbergen's four questions
- Animal personalities

## **UNIT 2**

(15 lectures)

### **Expression of behaviour**

- Bases of behaviour: Genetic, Developmental, Neurological, Physiological
- Communication
- Instinct, learning and cultural transmission
- Play behaviour
- Aggression

## **UNIT 3**

(15 lectures)

### **Behavioural Ecology**

- Habitat selection, territoriality and migration
- Prey-predator interactions, foraging
- Sexual selection and mating systems
- Parental care
- Sociobiology

### **Recommended References:**

1. Dugatkin, L. A. (2020). Principles of Animal Behavior (4<sup>th</sup> ed). University of Chicago Press
2. Alcock, J. (2009). Animal Behaviour: An Evolutionary Approach (9<sup>th</sup> ed). Sinauer Associates Inc., U.S.
3. Martin, P. and Bateson, P. (2007). Measuring Behaviour: An Introductory Guide (3<sup>rd</sup> ed). Cambridge University Press
4. Gadagkar, R. (1997). Survival Strategies. Universities Press

5. Selected research papers about classical animal behaviour studies and developing methods to study animal behaviour.
6. Selected films, videos about animal behaviour

**Practical Course:**

1. Constructing Ethogram for lab organisms, pets or animals seen in the surrounding, learning basic techniques such as ad libitum sampling, instantaneous scans, all occurrence sessions, focal animal and behaviour sampling.
2. Simulation models to study – such as flock formation, ant foraging and trail formation, Hawk – Dove game
3. Analyzing sound spectra

**Evaluation:** Practicals will be assessed continuously. There will be no end semester exam. But there will be a viva. The marks will be distributed as follows: Ethogram and sampling techniques: 20 marks, simulation studies: 20 marks, Viva: 10 marks

**Evaluation (Theory): Total marks per course - 100**

**I. Formative Assessment ‘for’ Learning (continuous internal assessment - CIA to improve learning).**

CIA- 40 marks

- CIA 1: Written Test – 20 marks
- CIA 2: Multiple choice questions/Descriptive/assignments/presentations - 20 marks

**II. Summative Assessment ‘of’ Learning**

End Semester Examination – 60 marks

- One question from each unit for 20 marks, with internal choice. Total marks per question with choice -30 or more.



**Template for End Semester examination in Semester IV for the Core course in Animal Behaviour**

<b>UNITS</b>	<b>REMEMBERING</b>	<b>UNDERSTANDING</b>	<b>APPLICATION and ANALYSES</b>	<b>TOTAL MARKS Per unit</b>
1	8	6	6	20
2	10	6	4	20
3	10	6	4	20
<b>TOTAL</b>	<b>28</b>	<b>18</b>	<b>14</b>	<b>60</b>
<b>% WEIGHTAGE</b>	<b>46.7</b>	<b>30</b>	<b>23.3</b>	<b>100</b>

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**PARASITOLOGY**Credits 4: **Theory 3 = 45 hrs and Practical 1 = 30 hrs**Prerequisite: **The student should have done two core courses in Zoology in Semesters I and II****Course Objectives:**

1. To help students gain an in depth understanding of some disease-causing protozoan, helminth parasites.
2. Students should be able to understand the molecular aspect of certain parasites.

**Course Outcomes:**

On completion of the course the learner should be able to:

<b>CO</b>	<b>Course Outcomes</b>	<b>Bloom's Taxonomy Level</b>
1	Students can understand the molecular aspect of certain parasites.	Understanding
2	Students will be able to diagnose the causative agents, vectors, describe pathogenesis, treatment and prophylaxis for the parasites studied.	Applying
3	Know the Molecular mechanisms that are at play in host parasite infections	Remembering
4	Students will be able to analyse at a molecular level how vectors and hosts are compatible for an infection	Analysing

## **UNIT 1**

(15 lectures)

### **INTRODUCTION TO PARASITOLOGY AND PROTOZOAN PARASITES**

- 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
- Protozoan parasites – *Entamoeba histolytica*, *Leishmania donovani*, *Plasmodium vivax*, *Giardia intestinalis*.

## **UNIT 2**

(15 lectures)

### **HELMINTH PARASITES**

- Morphology , mode of infection, life cycle, pathogenicity, prophylaxis and treatment of Helminth parasites
- Helminth Parasites – *Taenia solium*, *Fasciola hepatica*, *Wuchereria bancrofti*, *Ascaris lumbricoides*

## **UNIT 3**

(15 lectures)

### **MOLECLAR PARASITOLOGY**

- Host-parasite interactions.
  - Molecular Mechanisms that are at play in host parasite interactions in Plasmodium, Trypanosoma, Entamoeba, Leishmania
  - Immune invasion strategies in Plasmodium and Leishmania.
  - Molecular interactions between parasites and their vectors: Plasmodium and Anopheles, Trypanosoma and Tse Tse fly, Leishmania and sandfly (phlebotomus)

### **List of Recommended Reference Books:**

1. Symth, J. D. (1994). Introduction to Animal Parasitology. Cambridge University Press.
2. Chatterjee, K. D. (2019). Parasitology - Protozoology and Helminthology (13<sup>th</sup> ed). S.Chand Publications.
3. Heelan, J. S., Ingersoll, F. W. (2002). Essentials of Human Parasitology. Delmar Thomson Learning
4. Gillespie, S. H., & Hawkey, P. M (1995). Medical Parasitology - A Practical approach. Oxford Univ Press.
5. Farrar, J. (2023). Manson's Tropical Diseases. Elsevier Health Sciences

6. Elridge, B. F., & Edman, J. D. (2003). Medical Entomology: A Textbook on Public Health and Veterinary Problems Caused by Arthropods (revised edition). Kluwer academic publisher
7. Dhama, P.S., & Dhama, J.K. (2021). Invertebrate Zoology (5<sup>th</sup> ed.). R. Chand & Co
8. Burleigh, B. A., & Soldati-Favre, D (eds). (2008). Molecular Mechanisms of Parasite Invasion. Springer link
9. Soldati, D., Froth, B., & Cowman, A. (2004). Molecular and functional aspects of parasite invasion. Springer link

### **Practical Course:**

1. Identification of Protozoan parasites – Entamoeba, Leishmania,, Plasmodium, Giardia
2. Identification of Helminth parasites – Taenia, Liverfluke, Ancylostoma, Wuchereria, Ascaris, Dracunculus
3. Parasitic adaptations – Taenia (scolex, proglottid), Trypanosoma, Entamoeba, Ascaris, Giardia
4. Mounting of mouthparts of mosquito/bed bug

### **Evaluation (Theory): Total marks per course - 100**

#### **I. Formative Assessment ‘for’ Learning (continuous internal assessment - CIA to improve learning).**

CIA Exam – 40 marks

- CIA 1: Written Test – 20 marks
- CIA 2: Multiple choice questions - 20 marks

#### **II. Summative Assessment ‘of’ Learning**

End Semester Examination – 60 marks

- One question from each unit for 20 marks, with internal choice. Total marks per question with choice – 30 to 32.

### **Evaluation of (Practical:) Total marks Practical course – 50 marks**

- End Semester Practical Examination (Identification and performance of experiments) and Journal – 50 marks

**Template for End Semester examination in Semester IV for the Minor course in Parasitology.**

<b>UNITS</b>	<b>REMEMBERING</b>	<b>UNDERSTANDING</b>	<b>APPLICATION and ANALYSES</b>	<b>TOTAL MARKS Per unit</b>
1	7	8	5	20
2	7	8	5	20
3	7	8	5	20
TOTAL	21	24	15	60
% WEIGHTAGE	35	40	25	100

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