

**Institute of Zoology
Faculty of Life Sciences
University of the Punjab, Lahore
Course Outline**



Programme	BS Zoology	Course Code	ZOOL-106	Credit Hours	1
Course Title	Lab. Animal Diversity-II				
Course Introduction					
This course provides an in-depth exploration of the anatomy, physiology, and evolutionary significance of echinoderms, protochordates, and hemichordates. Students will learn about the taxonomy, morphology, ecological roles, and developmental biology of these groups, emphasizing their importance in the evolutionary context.					
Learning Outcomes					
On the completion of the course, the students will:					
<ol style="list-style-type: none"> 1. Understand the distinguishing features of echinoderms, protochordates, and hemichordates. 2. Explore the evolutionary relationships among these groups and other animals. 3. Examine the anatomical and physiological adaptations of each group. 4. Investigate the ecological roles and life histories of these organisms. 5. Develop skills in comparative analysis and scientific observation. 					
Course Content					Assignments/Readings
Week 1	Examination of echinoderm specimens				
Week 2	Dissection of a starfish				
Week 3	Identification of key anatomical features, Observing water vascular system in action				
Week 4	Comparative study of different echinoderm classes (Asteroidea, Echinoidea, Holothuroidea, Ophiuroidea, Crinoidea)				
Week 5	Analyzing echinoderm feeding behaviors				
Week 6	Studying fossil specimens of echinoderm				
Week 7	Examination of tunicate and lancelet specimens				
Week 8	Dissection of a lancelet				
Week 9	Identification of key anatomical features of protochordate				
Week 10	Observing protochordate feeding mechanisms				
Week 11	Comparative study of tunicates and lancelets				
Week 12	Dissection of an acorn worm				
Week 13	Examination of hemichordate specimens				
Week 14	Identification of key anatomical features, Observing hemichordate feeding mechanisms				
Week 15	Comparative study of enteropneusts and pterobranchs				
Week 16	Construction of phylogenetic tree of echinoderm, protochordate and hemichordate				
Textbooks and Reading Material					

1. Edward E. Ruppert, Richard S. Fox, Robert D. Barnes 2003 Invertebrate Zoology: A Functional Evolutionary Approach 7th Edition Cengage Learning
2. Jan Pechenik 2015 Biology of the Invertebrates, 7th Edition McGraw Hill.
3. Barrington E.J.W. 1965 The Biology of Hemichordata and Protochordata Oliver & Boyd
4. **Suggested Readings**
 - 4.1. Verma P. S. Chordate Zoology 2010 S. Chand Publishing, 2010
 - 4.2. Saxena O.P 1985 Modern text-book of Protochordata S. Chand & company Limited,

Teaching Learning Strategies

Course Overview:

This course covers the biology, diversity, and evolutionary relationships of Echinoderms, Protochordates, and Hemichordates. It includes lectures, laboratory work, field trips, and group discussions to provide a comprehensive understanding of these groups' structure, function, and ecological roles.

Learning Objectives:

1. Identify and describe the key characteristics and classifications of Echinoderms, Protochordates, and Hemichordates.
2. Understand the evolutionary relationships among these groups and other deuterostomes.
3. Analyze the anatomical and physiological adaptations of these organisms.
4. Explore the ecological roles and life histories of Echinoderms, Protochordates, and Hemichordates.
5. Develop skills in comparative analysis, critical thinking, and scientific research.

Teaching Strategies:

1. Interactive Lectures:

Objective: Provide foundational knowledge on the taxonomy, morphology, physiology, and evolution of Echinoderms, Protochordates, and Hemichordates.

Strategy:

- Use multimedia presentations (slides, videos, animations) to illustrate concepts.
- Incorporate real-life examples and case studies to enhance understanding.
- Encourage active participation through question-and-answer sessions and small group discussions.

2. Laboratory Sessions:

Objective: Develop hands-on skills in identifying and analyzing anatomical structures and physiological processes.

Assignments: Types and Number with Calendar

Group Presentations:

Objective: Foster collaboration and deeper understanding through research and peer teaching.

Strategy:

- Assign group projects on specific topics such as evolutionary relationships, ecological roles, or conservation issues.
- Require groups to prepare and deliver presentations, promoting peer learning.
- Incorporate peer assessment and feedback to improve learning outcomes and presentation skills.

Assessment

Sr. No.	Elements	Weightage	Details
1.	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.
2.	Formative Assessment	25%	Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.
3.	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.