GOVT. COLLEGE FOR WOMEN, PARADE GROUND, JAMMU-180001, J&K. (Erstwhile Maharani Mahila College Autonomous College affiliated to the University of Jammu College with Potential for Excellence, 2016

Syllabus and Course of Study in Zoology - M.SC. Semester-III

Core Course No.	PSZOTC-311
Course Title:	Biosystematics, Taxonomy & Evolution
Credits:	04
Maximum Marks:	100
Minor Test I:	20
Minor Test II:	20
Major Test:	60
Duration of External Exam:	2.30 Hrs.
Date of BOS	12-06-24

For examinations to be held in 2024-25, 2025-26 and 2026-2027.

Course Learning Objectives:

The course is designed to make students aware not only of the great diversity which is being displayed by animals around us but also to prepare them theoretically and practically to study and arrange the Bio-diversity in a scientific and natural manner. The theoretical background of systematic and taxonomy, thus, will go a long way in classifying the organisms based on their evolutionary history and establishing their phylogeny on the totality of parameters from all fields of study. Besides this, the course is also designed to convey the students, the knowledge and principles of evolution. As the syllabus deals with evolutionary thoughts in biology also, this will help the learners comprehend how in nature the variations are developed and subsequently lead to the formation of new taxa.

Course Learning Outcomes:

On completion of the course, the students will be able to:

- Understand the historical development of systematic biology from the 18th century to the present time.
- Comprehend the basic concepts of animal taxonomy and zoological nomenclature.
- Identify and classify different animal species following the ICZN.
- Comprehend the various theories of evolution.
- Understand different modes of speciation, role of isolating mechanisms in speciation.
- know about the chemical basis of the origin of life and experiments for supporting this idea.
- Understand the phenomenon of adaptive radiation in different groups of animals.

Syllabus

Unit-I Basic concept of Biosystematics and Animal Taxonomy				
1.1 History and importance of application of biosystematics in Biology				
1.2 Trends in taxonomy: Chemotaxonomy, cytotaxonomy and molecular taxonomy				
1.3 Macro-taxonomy and its three schools; Phenetics, cladistics and phylogenetics	S			
1.4 Types of classification: artificial and natural				
1.5 Species concepts: Typological, Nominalistic, Biological and Evolution concept, subspecies and other infra-specific categories.	ary species			
1.6 Taxonomic Hierarchy.				
Unit-II Essentials of Taxonomy and Biological Nomenclature	(13 Hrs)			
2.1Taxonomic collections-collecting ways and Data collection.				
2.2 Preservation of collected material and curetting.				
2.3 Methods of identification and problems encountered during the process				
2.4 Taxonomic keys, different types of keys, their merits and demerits				
2.5 Binomial system of classification, author citation, criteria for publication, types of names, principle of priority and its limitations.				
2.6 International code of Zoological Nomenclature (ICZN): Operative interpretation and application of important rules.	principles,			
Unit-III Concepts and Theories of Organic Evolution	(12 Hrs)			
3.1 Concepts of evolution (Convergent and Divergent evolution)				
3.2 Darwinism and Natural selection; Neo Darwinism				
3.3 Phylogenetic trees				
3.4 Theories of sexual selection				
3.5 The Shifting Balance theory of evolution				
Unit-IV Major Events in the Evolution of Life on the Earth	(12 Hrs)			
4.1 Theories of origin of life.				
4.2 Adaptive radiations.				
4.3 The Mutation theory of Evolution, Mimicry and Variation.				
4.4 Isolating mechanisms.				
4.5 Anagenesis and Cladogenesis.				

4.6 Speciation: Origin and mode of speciation (Allopatric, Parapatric, Peripatric and Sympatric).

Unit-V Evidences of Organic Evolution

5.1 Paleontological evidences: Formation of fossils and their types

- 5.2 Connecting links, missing link and living fossils.
- 5.3 Hardy-Weinberg Equilibrium and destabilizing forces.
- 5.4 Continental drift and distribution of animals.
- 5.4 Evolution of Man.
- 5.5 Evolution of Horse.

Note for Paper Setting:

Examination	Syllabus to be	Time allotted for	% weightage
Theory	covered in examination	Exam	(marks)
Minor Test I		1 Hr	(20 Marks)
Minor Tost II	210/10	1 III.	(20 Marks)
Minor Test II	21% 10 40%	1 пг.	(20 Marks)
Major Test	41% to 100%	2Hrs. & 30 Mins.	(60 Marks)

• Major test will have two sections (A & B).

• Section A is compulsory comprising of five (5) multiple choice questions of 1 mark each

covering the entire syllabus and 5 short answer type questions of 2 marks each spread

over the entire syllabus. (Sec A = 15 marks).

• Section B comprises of 6 questions of 15 marks, each from remaining three units and the

Candidate has to attempt 1 question from each unit. (Sec $B = 3 \times 15 = 15$ marks)

Teaching and Learning Process:

Lectures using blackboard and power-point presentations will be delivered by the teachers and the queries of students will be addressed after they have revised the topic. Concepts can be clarified by giving assignments, e.g., collection, identification and classification of local animal fauna (insects etc), on the basis of their taxonomic characters, preparation of charts on the Evolutionary Time Scale, Adaptive radiation in different groups of animals, organising trips to some biodiversity rich area/ Museum etc. As a part of peer learning, regular group discussions will be held amongst the students to enhance their knowledge. In order to develop the scientific temperament of the students and to polish their communication skills, power point presentations, paper presentations and debate competitions shall be organized on various themes as prescribed in the syllabi, while focussing on the latest developments in them. Lectures of the researchers can be organised to update the students about the latest developments in this field so that they can make a career in this highly versatile field of Biological Sciences.

Assessment Methods:

The students can be assessed by the following methods for proper understanding of the subject.

- Assigning problem solving assignments.
- Evaluation of different topics through power point presentations.

- Holding debates and seminars for assessing the understanding of the subject.
- Conducting quiz competitions for assessing grasping of the topics.

Online tools and web resources:

- Google search
- http://epgp.inflibnet.ac.in/epgpdata/uploads/epgp_content/botany/15._plant_systema tics-iii/biosystematics/et/5905_et_21-biosystematics-et.pdf
- https://www.britannica.com/science/taxonomy
- https://en.wikipedia.org/wiki/Taxonomy_(biology)
- https://en.wikipedia.org/wiki/Evolutionary_biology

 $\label{eq:linear} {\label{eq:linear} \bullet https://www.yourarticlelibrary.com/evolution/concept-of-evolution-notes-on-themodern-concept-of-evolution/12443}$

Books Recommended:

1. Mayer, E. (1982). The Growth of Biological Thought. The Pulknap Press of Harvard University,

- 2. G. G. Simpson. Principal of Animal Taxonomy. Oxford IBH publishing company.
- 3. V.C. Kapoor. Theory and Practice of Animal Taxonomy. Oxford and IBH Publishing Co.
- 3. E. Mayer (1983). Principles of Animal Systematics. Tat McGraw Pub.
- 4. Jha, A.P. (1983). Genes and Evolution. John Publication, New Delhi
- 5. Merrel, D.J. (1993). Evolution and Genetics, Holt, Rinchart and Winston, Inc.
- 6. E.O. Wilson(1999). The Diversity of life W.W. Northern & Co.
- 7. Strickburger, N.W. (2000). Evolution, Jones and Bartett Publishers, Boston London.
- 8. Dobzhansky, (2005). The Genetics and Origin of Species. Columbia University press

9. Dobzhansky, Th. F.J.Ayala, I.L. Stebbines and J.M. valentine.(2005). Evolution. Surject Publication, Delhi.

10. King, M. (2009). Species Evolution-The role of chromosomal Change. The Cambridge University Press, Cambridge.

12. Pellens Roseli and Grand Colas (2016) Biodiversity Conservation and Phylogenetic Systematics. Spinger publication

Committee members (External)

1	Prof. (Dr.) Seema Langer Head, Department of Zoology & Dean, Life Sciences, University of Jammu	
2	Dr. N. K. Tripathi, Professor (Retd.) Department of Zoology, University of Jammu	
3	Dr. Surya Partap Singh, Assistant Prof. & Head, Department of Zoology, GDC Basholi	
4	Dr. Shvetambri Jasrotia, Assistant Prof., Department of Zoology, Central University of Jammu	
5	Mr. Munish Sharma Assistant Director Fisheries, Jammu.	
6	Col. (Retd.) Sunil Sambyal ,Biofloc Expert & Entrepreneur	

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LAB COURSE II

Course Code: PSZOPC-316

Practical exercises for Biosystematics, Taxonomy & Evolution -

Credits: 2

1. To study the tools and techniques involved in the museum preservation of specimens.

2. To study the common household insects and list their taxonomic characters.

3. To use the taxonomic keys for identification of the fish of the region, representing different families.

4. To prepare the identification keys for selected specimens of invertebrates (Insects) and vertebrates (Snakes and Birds).

5. To study the adaptive characters of various invertebrates and vertebrates in different habitats.

6. To study the fossil evidences Archaeopteryx, Peripatus from models/pictures.

7. To study the fossil evidences of Sphenodon and Latemeria from models/pictures.

8. To study the ancestry of man from the models/chart.

9. To study the phylogeny of horse from the model/chart.

10. To prepare a chart on the Geological Time Scale with special reference to the dominant species of each division.

11. To study the phenomenon of homology and analogy from the suitable specimens/pictures.

12. To demonstrate the phenomenon of adaptive radiation as exemplified by the Darwin's finches, their origin and ancestry.

13. To conduct the zoogeographical study through maps/charts/photographs.

14. To visit a local animal park/zoo/ geological museum to identify and study the captive/available fauna and prepare a report of the same.

Note: There will be one practical paper of 50 marks (comprising Lab Course II; based on Course No. 302 and 303). 50% (25 marks) shall be reserved for internal assessment including 20% marks (5 marks) for attendance, 20% (5 marks) for viva and 60% (15 marks i.e., 7 marks for internal assessment and 8 marks for day-to-day performance). In case of the regular students, internal assessment received from the college will be added to the marks obtained by them in the final examination (Major test) and in case of private candidates, the internal assessment marks shall be added proportionately to the marks obtained by them in the major examination in accordance with the statutes/regulations.

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