



## University of Kerala

Discipline	<b>ZOOLOGY</b>				
Course Code	<b>UK4DSCZOO202</b>				
Course Title	<b>Evolution and Zoogeography</b>				
Type of Course	<b>DSC</b>				
Semester	<b>IV</b>				
Academic Level	<b>200-299</b>				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5
Pre-requisites	Pass of Class XII				
Course Summary	This course provides a comprehensive understanding of evolutionary biology, including classical and modern concepts, human evolution, and zoogeography, enabling students to grasp the complex mechanisms and patterns of life's diversity on Earth. Overall, students will gain a deep understanding of evolutionary processes, and the distribution of life forms on Earth, preparing them for advanced studies and careers in evolutionary biology, ecology, and related fields.				

### Detailed Syllabus

Module	Unit	Content	45 hrs
<b>Evolution</b>			
<b>I</b>	<b>Introduction to Evolution</b>		<b>8</b>
	1.1	Theories of organic evolution: Lamarck's theory; Weisman's germplasm theory; Darwin's theory of natural selection and the contributions of Wallace. Evolution- types- Micro, Macro, Mega and Co-evolution.	2
	1.2	Natural selection- Variability, Fitness and different environmental conditions. Types of selection -brief account of <i>Industrial Melanism</i> .	2
	1.3	Speciation- Sympatric and Allopatric; Isolation and isolating mechanisms.	3
	1.4	Adaptive radiation with special reference to Darwin's finches.	1
<b>II</b>	<b>Modern Concepts of Evolution</b>		<b>8</b>
	2.1	Geological Time scale -Brief description on Paleontological evidences and Fossil dating.	2
	2.2	Modern concept of organic evolution: (Neo Darwinism), <del>Sources of Variation: mutation</del> , Role of mutation in evolution, neutral mutation (Kimura).	3
	2.3	Genetic basis of evolution- gene pool, gene frequency, genetic drift, genetic equilibrium; factors affecting genetic equilibrium and Hardy – Weinberg law.	3
<b>III</b>	<b>Human Evolution</b>		<b>9</b>
	3.1	Evolution of Man- Brief account – Hominid fossils.	5

	3.2	Molecular Basis of Evolution; Contributions of Svante Paabo (Paleogenomics, Paleoanthropology).	4
		<b>Zoogeography</b>	<b>13</b>
<b>IV</b>	4.1	Introduction to Zoogeography and patterns of animal distribution- cosmopolitan, dis-continuous, bipolar and isolated distribution, factors affecting animal distribution.	3
	4.2	Brief account of each realm, mention the areas, physical features and peculiarities of fauna. Palaearctic realm, Australian realm, Ethiopian realm, Nearctic realm, Oriental realm and Neotropical realm.	5
	4.3	Bio-geographical classification of Indian Sub-continent- Biodiversity hotspots in India -Western Ghats, Eastern Ghats and Himalayas. Insular Fauna: Brief account of oceanic islands (Galapagos) and continental islands (British Isles). Plate tectonics and Continental Drift theory (Brief account).	5
<b>V</b>		<b>Phylogeny, Evolutionary and Extinction Events</b>	<b>7</b>
	5.1	Phylogenetic Tree -Distance and Parsimony methods. Origin of new genes and proteins, Migration and Random Genetic Drift, Convergent Evolution- Sexual selection and gene pool mixing.	3
	5.2	Barriers and means of dispersal (Land and Aquatic ecosystems).	2
	5.3	Evolution of Gene families- Molecular Drive.	1
	5.4	Extinction - Background and mass Extinctions (causes and effects) and K-T Extinction.	1

## References

1. A brief introduction to Zoogeography, Muhammad Bilal.
2. A text book of Zoogeography (2018), Frank E Beddard, Forgotten Books publishers, ISBN-10: 1331879310
3. An introduction to evolution and Zoogeography (2009), T K Saha, Emkay Publications, ISBN-10: 8185712115
4. Brace, C. L. (1967). The stages of Human Evolution, Prentice Hall International. Cambridge University Press.33.
5. Campbell, N.A. and Reece J.B (2011). Biology. IX Edition. Pearson, Benjamin, Cummings.
6. Colbert E.H. (1980). Evolution of the Vertebrates, John Wiley & Sons. Corporation, NewYork
7. Dadson E.O. (1960). Evolution: Process and Product. Reinhold Pub.
8. Darlington P.J.Jr. (1980). Zoogeography: The geographical Distribution of Dehradun, Delhi.
9. Douglas, J. Futuyma (1997). Evolutionary Biology. Sinauer Associates.
10. Ehrlich P.R. & holm R.W. (1973). The Proces of Evolution, Mc. Graw- Hill Inc.
11. Hall, B.K. and Hallgrimson, B (2008). Evolution IV Edition. Jones and Barlett Publishers.
12. Lull R.S. (1947). Organic Evolution Macmillan Pub. Co. New York.
13. Monroe. W. Strickberger 2000. Sudbury (Massachusetts): Jones and Bartlett Publishers. 722p.
14. Moody P.A. (1978) Introduction to Evolution, Ind. Ed. Kalyani Pub., New Delhi



15. Oparin A.I. (1957). The Origin of Life on Earth. Oliver & Boyd, London. Private limited, New Delhi Publishers Ltd.
16. Ridley, M (2004) Evolution III Edition Blackwell publishing.
17. Savage J.M. (1969). Evolution, Hold, Rinchart and Winston Inc. New Delhi.
18. Stebbins G.L. (1977). Process of Organic Evolution, Prentic Hall Inc. Tomorrow printers, New Delhi.
19. Volpe E.P. (1985). Understanding Evolution. *Ind. Repr.* Universal Book Stall.

**Web resources:**

1. <https://www.sciencedaily.com/newsletters.htm>
2. <https://evolutionnews.org/>
3. <https://www.biodiversitylibrary.org/>
4. <https://www.blackwellpublishing.com/ridley/resources.asp>

**Practicum (30 hrs)**

Sl. No	Topic
1	Macro evolution using Darwin Finches (Pictures)
2	Photo of Darwin, Lamark, Wallace, Svante Paabo and , Lynn Margulis - Identify the scientist and mention the contribution.
3	Identification of Living fossils (Specimens/Pictures)- Any three
4	Identification of geographical realms (Map).
5	Identification of respective fauna of Zoological regions (pictures).
6	Field visit to any important hotspot area (any regions in Western Ghats). <b>OR</b> Visit to Natural History Museum/Biodiversity Museum Submit a report
7	Phylogenetic tree preparation using suitable software's (Demonstration only) Eg: MEGA <b>OR</b> Demonstration of OMIM public database using LMS

**References**

1. Patole S S, Hasim M S and Yuvraj M B (2019) Evolutionary biology: Theory and Practicals, Academic Book publications. Jalgaon.
2. Sai Jyoti U (2022) Ecology, Zoogeography and Evolution-Lab Practical with solutions, SIA Publishers & Distributors Pvt Ltd.
3. Tripurari M (2023) Evolutionary biology with practical, Mahaveer Publications.

### Course Outcomes

No.	Upon completion of the course the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Understand major theories of organic evolution, analyze mechanisms like natural selection, speciation, and isolation, and evaluate evolutionary patterns such as adaptive radiation and co-evolution.	R, U, Ap, An, E, C	PSO-1,2
CO-2	Remember the geological time scale and fossil evidence, analyze the genetic basis of evolution including mutation and genetic drift, and evaluate concepts like Hardy-Weinberg law and neo-Darwinism.	R, U, Ap, E, An, C	PSO-1,2
CO3	Understand the evolution of man through hominid fossils and analyse the molecular basis of evolution with insights from Svante Paabo's contributions to paleogenomics and paleoanthropology concepts of evolution	R, U, Ap, E, An, C	PSO-1,2
CO 4	Remember major zoogeographical branches, understand patterns and factors of animal distribution, analyze biogeographical realms and Indian biodiversity zones, and evaluate the impact of continental drift on faunal distribution.	R, U, Ap, E, An, C	PSO-1,2
CO5	Understand evolutionary processes and extinction events, analyze gene evolution and dispersal mechanisms, and evaluate patterns like genetic drift, sexual selection, and mass extinctions.	R, U, Ap, E, An, C	PSO-1,3

**R-Remember, U-Understand, Ap-Apply, An-Analyze, E-Evaluate, C-Create**

**Name of the Course: Evolution and Zoogeography**  
**Credits: 3:0:1 (Lecture: Tutorial: Practical)**

CO No.	CO	PO/PS O	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
1.	Understand the evolutionary mechanisms which can explain the genetic composition and distribution of organisms.	PO 1, PO2/ PSO-1, 2	U	F, C	L	P



2.	Remember the Zoogeography and its applications for conservations of Biodiversity.	PO 1/ PSO-1, 2	U, R	P	L	P
3.	Create an insight into the basic knowledge of the origin of life and molecular concepts of evolution.	PO 3/ PSO-1, 2	A	F, C	L	P
4.	Analyse patterns of animal distribution based on geographic factors, barriers, and means of dispersal in land and aquatic ecosystems.	PO 3/ PSO-1, 2	A	F	L	P

**F-Factual, C- Conceptual, P-Procedural, M-Metacognitive**

**Mapping of COs with PSOs and POs:**

	PSO 1	PSO 2	PSO 3	PSO4	PS O5	PS O6	PO1	PO2	PO3	PO4	PO5	PO6
<b>CO 1</b>	1	2	-	-	-	-	2	2	-	-	-	-
<b>CO 2</b>	2	3	-	-	-	-	3	-	-	-	-	-
<b>CO 3</b>	1	2	-	-	-	-	-	-	2	-	-	-
<b>CO 4</b>	2	1	-	-	-	-	-	-	3	-	-	-

**Correlation Levels:**

Level	Correlation
-	Nil
1	Slightly / Low

2	Moderate Medium
3	Substantial/ High

#### Assessment Rubrics:

##### Assignment/Seminar topics

1. Prof. Madhav Gadgil
2. Endemic species
3. Origin of life
4. Mass extinction phenomenon
5. Living fossils
6. Adaptive radiation
7. Animal connecting links
8. Plate tectonics and Continental drift theory
9. Biodiversity hotspots

#### Continuous Comprehensive Assessment

1. Assignments
2. Seminar
3. Submission of report
4. Submission of Field report
5. Test
6. Quiz/Debate

#### End Semester Evaluation

1. Multiple Choice Questions
2. Very Short Answer Questions
3. Short Answer Questions
4. Essay Type Questions
5. Practical Examination

#### Mapping of COs to Assessment Rubrics:

	Internal Exam	Assignment I	Project Evaluation	End Semester Examination
CO 1	✓			✓
CO 2	✓			✓
CO 3	✓			✓
CO 4		✓		✓