

SEMESTER IV



University of Kerala

Discipline	ZOOLOGY				
Course Code	UK4DSCZOO201				
Course Title	Chordate Diversity - Part II				
Type of Course	DSC				
Semester	IV				
Academic Level	200 -299				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total Hours/Week
	4	3 hours	-	2 hours	5
Pre-requisites	Pass in Class XII				
Course Summary	The course provides an in-depth exploration of reptiles, birds, mammals, and primates. It covers general characteristics, classification, and examples of reptiles, as well as the phylogeny of Clade Sauropsida. Students learn about the origin and evolutionary path of birds, including flightless and flying species. The course also examines egg-laying, pouched, and placental mammals, along with a dedicated section on primates and animals from extreme environments. Through lectures, activities, and field visits, students gain a comprehensive understanding of chordates diversity and adaptations, highlighting their significance in ecosystems and human society.				

Detailed Syllabus

Module	Unit	Content	45 Hrs
I	Reptiles		13
	1.1	Reptiles: Key characteristics of reptiles (Amniotic eggs, dry skin, and thoracic breathing), as well as the origin and evolution of reptiles (Brief account only). Modern Reptiles: Brief account of the essential characteristics of modern reptiles. Mention Turtles and tortoises, Tuataras, Lizards and snakes, Crocodiles, and alligators. The concept of phylogeny of Clade Sauropsida (Brief account only).	3

	1.2	<p>Turtles and Tortoises: General characters. A brief account of evolutionary significance. Mention differences between turtles and tortoises.</p> <p>Scientific classification, IUCN status, distribution, salient features, threats and conservation of Green sea turtle (<i>Chelonia mydas</i>) and Indian star tortoise (<i>Geochelone elegans</i>).</p>	2
	1.3	<p>Tuataras: General characters. A brief account of evolutionary significance.</p> <p>Scientific classification, IUCN status, distribution, salient features, threats and conservation of Tuatara (<i>Sphenodon punctatus</i>).</p>	1
	1.4	<p>Lizards and Snakes: General characters. A brief account of evolutionary significance.</p> <p>Lizards: Scientific classification, IUCN status, ecology, and salient features of Dussumier's forest skink (<i>Sphenomorphus dussumieri</i>) and Oriental garden lizard (<i>Calotes versicolor</i>).</p> <p>Snakes:</p> <p>Venomous Snakes: Scientific classification, IUCN status, distribution, salient features, threats, conservation and nature of venom of Indian cobra (<i>Naja Naja</i>), Banded krait (<i>Bungarus fasciatus</i>), and Malabar pit viper (<i>Craspedocephalus malabaricus</i>).</p> <p>Nonvenomous Snakes: Scientific classification, IUCN status, distribution, salient features, threats, and conservation of Keeled rat snake (<i>Ptyas carinata</i>), the Indian python (<i>Python molurus</i>), and the Wolf snake (<i>Lycodon aulicus</i>).</p>	5
	1.5	<p>Crocodiles and Alligators: General characters. A brief account of evolutionary significance.</p> <p>Scientific classification, IUCN status, distribution, salient features, threats and conservation of Fish-eating crocodile (<i>Gavialis gangeticus</i>) and American alligator (<i>Alligator mississippiensis</i>).</p>	2
II		Birds	10
	2.1	<p>Birds: Key characteristics (Different types of feathers and flight skeleton), Evolutionary path to birds, Brief account of characteristics of modern birds (Efficient respiration, Efficient circulation, and Endothermy). Mention the position of birds in a cladistic sense.</p>	3
	2.2	<p>Flightless Birds: General characters. Scientific classification, IUCN status, distribution, salient features and threats of Common ostrich (<i>Struthio camelus</i>) - Mention breathing adaptation and predators, Common kiwi (<i>Apteryx australis</i>) and King penguin</p>	3

		(<i>Aptenodytes patagonicus</i>).	
	2.3	Flying birds: General characters., Scientific classification, IUCN status, distribution, salient features, threats, and conservation of Rock pigeon (<i>Columba livia</i>), Indian Cuckoo (<i>Cuculus micropterus</i>) - Mention brood parasite behaviour, Great Pied Hornbill (<i>Buceros bicornis</i>), Little cormorant (<i>Microcarbo niger</i>), Common Kingfisher (<i>Alcedo atthis</i>) and Barn Owl (<i>Tyto alba</i>).	4
III	Mammals		10
	3.1	Mammals: Fundamental characteristics (Hair and Mammary glands) and notable features (Endothermy and Placenta). Origin of mammals, Mention Modern mammals (Egg laying mammals, Pouched mammals, and Placental Mammals).	2
	3.2	Egg-laying mammals (Monotremes): General characters, retention of reptilian characters. Scientific classification, IUCN status, distribution, salient features, threats, and conservation of Short-beaked echidna (<i>Tachyglossus aculeatus</i>) and Duck-billed platypus (<i>Ornithorhynchus anatinus</i>).	2
	3.3	Pouched mammals (Marsupials): General characters. Mention the origin and pattern of embryonic development. Scientific classification, IUCN status, distribution, salient features, threats, and conservation of Red Kangaroo (<i>Macropus rufus</i>) and Koala (<i>Phascolarctos cinereus</i>).	3
	3.4	Placental Mammals: General characters. Mention the speciality of the placenta. Scientific classification, IUCN status, distribution, salient features of Asian elephant (<i>Elephas maximus</i>) and Ganges river dolphin (<i>Platanista gangetica</i>).	3
IV	Reptiles, Birds and Mammals in the Extreme Environments		3
	5.1	Extreme Environments: Brief account of the habitats and adaptations of the organisms. Cold climate (Ice): Brief account of Emperor penguin (<i>Aptenodytes forsteri</i>), Snow Leopard (<i>Panthera uncia</i>), and Polar Bear (<i>Ursus maritimus</i>). Mention the following examples: Arctic Fox (<i>Vulpes lagopus</i>), Reindeer (<i>Rangifer tarandus</i>), Arctic hare (<i>Lepus arcticus</i>), Walrus (<i>Odobenus rosmarus</i>), and Snowy owl (<i>Bubo scandiacus</i>). Hot climate (Desert): Brief account of Dromedary Camel (<i>Camelus dromedarius</i>), Gila monster (<i>Heloderma suspectum</i>) and Giant kangaroo rat (<i>Dipodomys ingens</i>). Mention the following examples: Mongolian wild ass (<i>Equus hemionus</i>), Desert tortoise (<i>Gopherus agassizii</i>), Jerboa (<i>Allactaga jaculus</i>), Addax (<i>Addax nasomaculatus</i>) and Desert horned lizard (<i>Phrynosoma</i>	3

		<i>platyrhinos</i>).	
V		The World of Living Primates (A mammalian group that includes Lemurs, Lorises, Tarsiers, Monkeys, Apes, and Humans)	9
	4.1	Living primates: Brief account on primatology. Distinct features of primates (Grasping fingers and toes, Binocular vision).	1
	4.2	Lemurs: General features. A brief account of the Ring-tailed lemur (<i>Lemur catta</i>). Lorises: General features. A short account of the Pygmy slow loris (<i>Xanthyonycticebus pygmaeus</i>). Tarsiers: General features. A brief account of Philippine tarsier (<i>Carlito syrichta</i>).	4
	4.3	Monkeys: General features. A brief account of Lion-tailed macaque (<i>Macaca silenus</i>). Ape: General features. A short account of Chimpanzee (<i>Pan troglodytes</i>), Gorilla (<i>Gorilla gorilla</i>). Hominids (Humans and their direct ancestors): General features. Brief account of Humans (<i>Homo sapiens</i>).	4

References

1. Lal S.S. (2018). Practical Zoology. Rastogi Publications.
2. Michael J. Benton (2024). Vertebrate Palaeontology, 5th edition, Wiley.
3. Parker & Haswell A. (2005). Text Book of Zoology Vol.II, Macmillan.
4. Peter H. Raven, George B. Johnson, Kenneth A. Mason, Jonathan Losos, and Susan Singer, Carleton College (2017). Biology, 10th edition, McGraw Hill Education.
5. Young, J.Z. (2004). The Life of Vertebrates, 3rd Edition, Oxford University Press.

Suggested Reading:

1. Daniel J.C. (2002). The Book of Indian Reptiles and Amphibians. Bombay Natural History Society.
2. Dileepkumar R. (2016). A Handbook on Snakes of Kerala, Kerala Bhasha Institute.
3. Harvey Pough F. and Christine M. Janis (2019). Vertebrate Life, 10th Edition, Oxford University Press.
4. Kailash Chandra Amitava Majumder, Gopinathan Maheswaran, and Imran Alam (2022). Birds of India. Zoological Survey of India.
5. Scott Weidensaul (2022). A World on the Wing. Picador-The Smithsonian, London.
6. Vivek Menon (2023). Indian Mammals. Hachette India.

Web Resources:

1. <https://www.britannica.com/animal/sifaka>
2. <https://www.britannica.com/topic/Our-Nonconscious-Future-2119857>
3. <https://www.britannica.com/list/7-of-the-worlds-most-dangerous-lizards-and-turtles>
4. <https://epgp.inflibnet.ac.in>

Practicum (30 hours)

(Wherever wet lab experiments are not possible, the principles and concepts can be demonstrated through any other material or medium, including videos/virtual labs, etc.)

(All items to be done from Sl.No.1 to Sl.No.9 and any 4 items to be done from Sl. No.10 to Sl.No.18)

Sl. No.	Contents
1	Turtles & Tortoises - Olive ridley sea turtle (<i>Lepidochelys olivacea</i>), Indian flapshell turtle (<i>Lissemys punctata</i>) and Travancore tortoise (<i>Indotestudo travancorica</i>): Spotter, Salient features (Use photos/drawings).
2	Reptiles - Common chameleon (<i>Chamaeleo chamaeleon</i>), Komodo dragon (<i>Varanus komodoensis</i>), Marine iguana (<i>Amblyrhynchus cristatus</i>): Spotters, Salient features (Use photos/drawings).
3	Snakes - King cobra (<i>Ophiophagus hannah</i>), Beaked sea snake (<i>Hydrophis schistosus</i>), and Indian green pit viper (<i>Craspedocephalus gramineus</i>) and Checkered keelback (<i>Fowlea piscator</i>): Spotters, Salient features (Use photos/drawings).
4	Crocodiles & Alligators - Mugger crocodile (<i>Crocodylus palustris</i>), Chinese alligator (<i>Alligator sinensis</i>): Spotters, Salient features (Use photos/drawings).
5	Flightless Birds - Common kiwi (<i>Apteryx australis</i>) and Emu (<i>Dromaius novaehollandiae</i>): Spotters, Salient features (Use photos/drawings).
6	Flying Birds - Common swift (<i>Apus apus</i>), Eurasian teal (<i>Anas crecca</i>), Common tea peregrine falcon (<i>Falco peregrinus</i>) and Bar-headed goose (<i>Anser indicus</i>): Spotters, Salient features (Use photos/drawings).
7	Egg-laying mammals (Monotremes): Western long-beaked echidna (<i>Zaglossus bruijnii</i>) and Duck-billed platypus (<i>Ornithorhynchus anatinus</i>): Spotters, Salient features (Use photos/drawings).
8	Pouched mammals (Marsupials): Tasmanian devil (<i>Sarcophilus harrisii</i>) and Musky rat-kangaroo (<i>Hypsiprymnodon moschatus</i>): Spotters, Salient features (Use photos/drawings).
9	Placental Mammals: African bush elephant (<i>Loxodonta africana</i>) and Dugong (<i>Dugong dugon</i>): Spotters, Salient features (Use photos/drawings).

10	Construct a flowchart on the relationship of the tuatara to other living reptiles and birds (Group activity).
11	Make a poster on major reptilian orders, including typical examples and key characteristics (Group activity).
12	Make a poster on any five turtles and tortoises in India (Group activity).
13	Make a PowerPoint presentation of any two dinosaurs of your choice and include details on their habitat, distribution, salient features, adaptations, and causes of extinction (Group activity, Maximum time - 10 Minutes).
14	Make a poster on the evolutionary path from reptiles to birds using drawings/photographs (Group activity).
15	Visit the nearest Zoo and prepare an annotated list of 5 reptiles, 5 birds and 5 mammals/Visit a Biodiversity Museum and prepare a report on reptilian, bird and mammalian diversity.
16	Identify any five birds from your college campus and make a report (Individual reports).
17	Celebration of International Primate Day - September 1/National Bird Day (January 5)/World Migratory Bird Day (Second week of May)/World Sparrow Day/World Animal Day - October 4 (March 20)-(Quiz/Invited talk/Photography exhibition/Documentary show).
18	Talk on the topic 'Common Snakes of your Locality' by experts from the Department of Forest Govt of Kerala or other competent experts in the field.

References:

Recommended Reading

1. Peter H. Raven, George B. Johnson, Kenneth A. Mason, Jonathan Losos, and Susan Singer, Carleton College (2017). Biology, 10th edition, McGraw Hill Education.
2. Young, J.Z. (2004). The Life of Vertebrates, 3rd Edition, Oxford University Press.
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3. Dileepkumar R. (2016). A Handbook on Snakes of Kerala, Kerala Bhasha Institute.

Web Resources:

1. <https://www.britannica.com>
2. <https://animaldiversity.org>
3. <https://cmfri.com/library-museum.html>
4. <https://www.museumsofindia.org/museum/12251/kerala-biodiversity-museum>
5. <https://tnhm.in>
6. <https://naturalhistory.si.edu>

Course Outcomes

No.	Upon completion of the course, the graduate will be able to	Cognitive Level	PSO addressed
CO-1	Gain an understanding of the fundamental characteristics of chordates and explore the concept of cladograms.	U	1, 2, 3
CO-2	Gain insight into the scientific classification, unique characteristics and evolutionary significance of selected reptiles, birds, and mammals.	R, U	1, 2, 3, 4
CO-3	Examine the diversity and unique adaptations of chordates thriving in extreme climatic conditions.	U, Ap	1, 2, 4
CO4	Foster a commitment to chordate conservation by engaging in experiential learning activities, collaborative teamwork, and honing presentation abilities to effectively communicate the importance of preserving these organisms and their habitats	U, Ap, An	1, 2, 3, 4, 7
CO5	Develop proficiency in identifying indigenous bird species and generating scientific reports based on observations and findings.	U, Ap, An, E	1,2,3,7

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

Name of the Course: Chordate Diversity-Part II

Credits: 3:0:1 (Lecture: Tutorial: Practical)

CO No.	CO	PO/ PSO	Cognitive Level	Knowledge Category	Lecture (L)/Tutorial (T)	Practical (P)
CO-1	Gain an understanding of the fundamental characteristics of chordates and explore the concept of cladograms.	PO-1/PSO-1, 2, 3	U	F, C	L	-
CO-2	Gain insight into the scientific classification, unique characteristics and evolutionary significance of selected reptiles, birds, and mammals.	PO-1, 2, 3/ PSO-1, 2, 3, 4	R, U	C, P	L	P
CO-3	Examine the diversity and unique adaptations of chordates thriving in extreme climatic conditions.	PO-1, 2, 5/ PSO-1, 2, 4	U, Ap	C, P	L	P
CO-4	Foster a commitment to chordate conservation by engaging in experiential learning activities, collaborative teamwork, and honing presentation abilities to effectively communicate the importance of preserving these organisms and their habitats	PO-1, 2, 3, 5/ PSO-1, 2, 3, 4, 7	U, Ap, An	C, P	L	P
CO-5	Develop proficiency in identifying indigenous bird species and generating scientific reports based on observations and findings.	PO-3, 5, 6/ PSO-1, 2, 3, 7	U, Ap, An, E	C, P, M	L	P

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

Mapping of COs with PSOs and POs

CO	PSO 1	PS O2	PS O3	PS O4	PS O 5	PS O 6	PS O 7	PO 1	PO2	PO3	PO4	PO5	PO 6	PO7	PO8
1	2	2	1	-	-	-	-	1	-	-	-	-	-	-	-
2	1	2	2	3	-	-	-	1	2	1	-	-	-	-	-
3	1	3	-	2	-	-	-	1	1	-	-	1	-	-	-
4	2	3	3	2	-	-	1	2	1	2	-	1	-	-	-
5	1	1	3	-	-	-	1	-	-	1	-	2	2	-	-

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly/Low
2	Moderate/Medium
3	Substantial/High

Assessment Rubrics:

Assignments (Any two)

1. Investigate the conservation status of a specific reptile species and propose management strategies for its protection.
2. Prepare an identification key for differentiating venomous and nonvenomous snakes.
3. Analyse the conservation status of a threatened or endangered bird species and propose conservation measures to protect it.
4. Analyse the adaptations of mammals to various environments, such as deserts, forests, or aquatic ecosystems.

Continuous Comprehensive Assessment

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

End Semester Evaluation

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

Mapping of COs to Assessment Rubrics

	Internal Exam	Assignment	Project Evaluation	End Semester Examinations
CO-1	✓	✓	-	✓
CO-2	✓	✓	-	✓
CO-3	✓	✓	-	✓
CO-4	✓	✓	-	✓
CO-5	✓	✓	-	✓