

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 "Chordate Diversity Part II" provides an in-depth exploration of reptiles, birds, mammals, and primates. It covers general characteristics, examples of modern reptiles and their distribution, IUCN status, threats and their conservation. The course supplies some topics to learn about the origin of reptiles and birds, including flightless and flying species. The course also examines egg-laying, pouched, and placental mammals, a section on primates and animals from extreme environments and ends with the merging of the basic facts on classical taxonomy and molecular taxonomy. Through lectures, activities, and field visits, students gain a comprehensive understanding of chordates' diversity and adaptations, highlighting their significance and role in the animal world.				

Detailed Syllabus

Module	Unit	Content	45 Hrs
I		Reptiles	13
	1.1	Reptiles: Key characteristics of reptiles, Briefly Mention the significant evolutionary changes acquired by the ancestral amphibians into terrestrial reptiles mention only Amniotic eggs, dry skin, and thoracic breathing. (Brief account only).	2
	1.2	Modern Reptiles: Brief account of the essential characteristics of modern reptiles	

		Turtles and Tortoises: General characters. Mention differences between turtles and tortoises. Examples- Green sea turtle (<i>Chelonia mydas</i>) and Indian star tortoise (<i>Geochelone elegans</i>) Mention IUCN status, distribution, salient features, threats and conservation.	2
	1.3	Tuataras: General characters.Example Tuataras (<i>Sphenodon punctatus</i>) Mention IUCN status, distribution, salient features, threats and conservation.	1
	1.4	Lizards: General characters.Examples: Dussumier's forest skink (<i>Sphenomorphus dussumieri</i>) and Oriental garden lizard (<i>Calotes versicolor</i>). Mention IUCN status, ecology, and salient features Snakes-Venomous Snakes: General characters.Examples: Indian cobra (<i>Naja Naja</i>), Banded krait (<i>Bungarus fasciatus</i>), and Malabar pit viper (<i>Craspedocephalus malabaricus</i>) Mention IUCN status, distribution, salient features, threats, conservation and nature of venom . Nonvenomous Snakes: General characters. Examples: Keeled rat snake (<i>Ptyas carinata</i>), the Indian python (<i>Python molurus</i>), and the Wolf snake (<i>Lycodon aulicus</i>) Mention IUCN status, distribution, salient features, threats, and conservation.	6
	1.5	Crocodiles and Alligators: General characters, Examples: Fish-eating crocodile (<i>Gavialis gangeticus</i>) and American alligator (<i>Alligator mississippiensis</i>) Mention IUCN status, distribution, salient features, threats and conservation. Difference between Crocodiles and Alligators.	2
	Birds		7
II	2.1	Birds: Key characteristics (Different types of feathers and flight skeleton), Briefly mention the changes acquired by ancestral reptiles for avian mode of life. Brief account of characteristics of modern birds mention only Efficient respiration, Efficient circulation, and Endothermy.	2
	2.2	Flightless Birds: General characters. Examples: Common ostrich (<i>Struthio camelus</i>) - Mention breathing adaptation and predators, Common kiwi (<i>Apteryx australis</i>) and King penguin (<i>Aptenodytes patagonicus</i>) Mention IUCN status, distribution, salient features and threats.	2
	2.3	Flying birds: General characters.,Examples Rock pigeon (<i>Columba livia</i>), Indian Cuckoo (<i>Cuculus micropterus</i>) - Mention brood parasite behaviour, Great Pied Hornbill (<i>Buceros bicornis</i>), Mention IUCN status, distribution, salient features, threats, and conservation . Adaptations for flight in modern birds.	3
III	Mammals		9
	3.1	Mammals: Fundamental characteristics (Hair and Mammary glands) and notable features (Endothermy and Placenta).	2
	3.2	Modern mammals - Egg-laying mammals (Monotremes):	2

		General characters. Examples: Short-beaked echidna (<i>Tachyglossus aculeatus</i>) and Duck-billed platypus (<i>Ornithorhynchus anatinus</i>). Retention of reptilian characters. Mention IUCN status, distribution, salient features, threats, and conservation.	
	3.3	Modern mammals- Pouched mammals (Marsupials): General characters. Mention briefly about the origin and pattern of embryonic development. Examples: Red Kangaroo (<i>Macropus rufus</i>) and Koala (<i>Phascolarctos cinereus</i>). Mention IUCN status, distribution, salient features, threats, and conservation.	2
	3.4	Modern mammals- Placental Mammals: General characters. Mention the speciality of the placenta. Examples; Asian elephant (<i>Elephas maximus</i>) and Ganges river dolphin (<i>Platanista gangetica</i>) Mention IUCN status, distribution, salient features.	3
IV		Living Primates	7
	4.1	Living primates: Brief account on primatology. Distinct features of primates (Grasping fingers and toes, Binocular vision).	1
	4.2	Lemurs: General features. Examples: Ring-tailed lemur (<i>Lemur catta</i>). Lorises: General features. A short account of the Pygmy slow loris (<i>Xanthonycticebus pygmaeus</i>). Tarsiers: General features. A brief account of the Philippine tarsier (<i>Carlito syrichta</i>).	3
	4.3	Monkeys: General features. Examples: 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>).	3
V		Reptiles, Birds and Mammals in the Extreme Environments	9
	5.1	Extreme Environments: Brief account of the Extreme habitats (Cold climate and Hot climate) Mention adaptations of the organisms mentioned below. 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>). 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>).	4
	5.2	Bridging the concepts of Classical taxonomy and Molecular taxonomy	

	Classical taxonomy (Traditional taxonomy) Mention definition and approaches (morphological, anatomical, embryological and ecological) Raven et al. (2017)	5
	Molecular Taxonomy (Phylogenetics) Mention definition and approaches .Concepts in cladistics.	
	The concept of phylogeny of Clade Sauropsida (Brief account only).	
	Mention the position of birds in a cladistic sense.	
	Mention the position of Mammals in a cladistic sense.	

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.
3. Michael J. Benton (2024). Vertebrate Palaeontology, 5th edition, Wiley.
4. Parker & Haswell A. (2005). Text Book of Zoology Vol.II, Macmillan.
5. Lal S.S. (2018). Practical Zoology. Rastogi Publications.

Suggested Reading:

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

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.)

(From Sl.No.1 to 11, **4 & 5** compulsory and out of nine **any five** can be selected for record preparation and **any two** items to be done from Sl. No.12 to Sl.No.18)

Sl. No.	Content
1	Turtles & Tortoises - Olive ridley sea turtle (<i>Lepidochelys olivacea</i>), and Travancore tortoise (<i>Indotestudo travancorica</i>): Spotter, Salient features (Use photos/drawings).
2	Reptiles - Common chameleon (<i>Chamaeleo chamaeleon</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	Study structure of carapace and plastron: Using original or models, Draw and label.
5	Study the different types of feathers and identification - Quill feather, Contour feather, Filoplume, Down feathers. (Identify, Draw and label) (Practical- Major)
6	Flightless Birds - Common kiwi (<i>Apteryx australis</i>) and Emu (<i>Dromaius novaehollandiae</i>): Spotters, Salient features (Use photos/drawings).
7	Flying Birds - Common swift (<i>Apus apus</i>), Common tea peregrine falcon (<i>Falco peregrinus</i>) and Bar-headed goose (<i>Anser indicus</i>): Spotters, Salient features (Use photos/drawings).
8	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).
9	Pouched mammals (Marsupials): Tasmanian devil (<i>Sarcophilus harrisii</i>) and Musky rat-kangaroo (<i>Hypsiprymnodon moschatus</i>): Spotters, Salient features (Use photos/drawings).
10	Placental Mammals: African bush elephant (<i>Loxodonta africana</i>) and Dugong (<i>Dugong dugon</i>): Spotters, Salient features (Use photos/drawings).
11	Compare and differentiate primates from non-primates based on external morphological characteristics using photographs or images. (Human, monkey, gorilla, chimpanzee, lemur & Dog, cat, horse, squirrel, elephant, bat)
12	Construct a flowchart on the relationship of the tuatara to other living reptiles and birds (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	Acquire competency in identifying, describing, comparing and analysing the general characteristics of modern reptiles (Turtles, snakes, crocodiles etc) and their uniqueness, threats and conservation.	U, R, Ap, An, E, C	1, 2, 3
CO-2	Obtain proficiency in familiarising, distinguishing, and analysing the key characteristics of different birds (flightless birds and flying birds with some common birds as examples) and the evolutionary changes.	R, U, Ap, An, E, C	1, 2, 3, 4

CO-3	Gain expertise in differentiating, analysing and comparing the fundamental characteristics and basic facts about mammals (modern mammals egg laying, pouched and placental mammals) .	R, U, Ap,An, E,C	1, 2, 4
CO4	Obtain skill in Explain, differentiate and analyse the basic facts about Living primates(Lemurs, Tarsiers and Monkeys etc).	R, U, Ap,An, E,C	1, 2, 3, 4, 7
CO5	Develop excellence in the basic concepts of extreme environments and animals in the habitat and how they adapted (Ice and desert environment) as well as attain competency in classical and modern concepts in taxonomy (position of reptiles, birds and mammals in cladistic taxonomy)	R, U, Ap, An, E,C	1,2,3,7

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

Note: 1 or 2 COs/module

Name of the Course: Chordates 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	Acquire competency in identifying, describing, comparing and analysing the general characteristics of modern reptiles (Turtles, snakes, crocodiles etc) and their uniqueness, threats and conservation .	PO-1,2 PSO-1, 2, 3	U, R,Ap,An,E,C	F, C,P,M	L/T	p
CO-2	Obtain proficiency in familiarising, distinguishing, and analysing the key characteristics of different birds(flightless birds and flying birds with some common birds as examples) and the evolutionary changes.	PO-1, 2, 3/ PSO-1, 2, 3,	U, R,Ap,An,E,C	F, C,P,M	L/T	P
CO-3	Gain expertise in differentiating, analysing and comparing the fundamental characteristics and basic facts about mammals (	PO- 1, 2, 5/ PSO-1, 2, 3	U, R,Ap,An,E,C	F, C,P,M	L/T	P

	modern mammals egg laying, pouched and placental mammals) .					
CO-4	Obtain skill in Explain, differentiate and analyse the basic facts about Living primates(Lemurs, Tarsiers and Monkeys etc).	PO-1, 2, 3, 5/ PSO-1, 2, 3, 4,	U, R,Ap,A n,E,C	F, C,P,M	L/T	P
CO-5	Develop excellence in the basic concepts of extreme environments and animals in the habitat and how they adapted (Ice and desert environment) as well as attain competency in classical and modern concepts in taxonomy (position of reptiles, birds and mammals in cladistic taxonomy)	PO-3, 5, 6/ PSO-1, 2, 3	U, R,Ap,A n,E,C	F, C,P,M	L/T	P

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

Mapping of COs with PSOs and POs :

CO	PS O1	PS O2	PS O3	PS O4	PSO 5	PS O6	PS O7	PO 1	PO2	PO 3	PO 4	PO5	PO6	PO7	PO8
1	2	2	1	-	-	-	-	3	2	2	-	-	-	-	-
2	1	2	2	3	-	-	-	3	2	1	-	-	-	-	-
3	1	3	2	2	-	-	-	2	1	2	-	1	-	-	-
4	2	3	3	2	-	-	-	2	1	2	-	1	-	-	-
5	1	1	3	-	-	-	-	2	2	1	-	2	-	-	-

Correlation Levels:

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

Assessment Rubrics:

Assignment/in class discussion, seminar

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	✓	✓	-	✓