



**SOPHIA COLLEGE FOR WOMEN  
(EMPOWERED AUTONOMOUS)**

Affiliated to the University of Mumbai

Programme: Science  
Zoology (Minor)

**Syllabus for the Academic Year 2025-2026  
based on the National Education Policy 2020**



**SOPHIA COLLEGE (AUTONOMOUS)**

**DEPARTMENT OF ZOOLOGY**

**COURSE DETAILS FOR MINOR:**

	<b>SEMESTER 1</b>	<b>SEMESTER 2</b>
<b>TITLE</b>	<b>Diversity of Animal Kingdom -I</b>	<b>Diversity of Animal Kingdom -II</b>
<b>TYPE OF COURSE - DSC</b>	<b>Minor</b>	<b>Minor</b>
<b>CREDITS</b>	<b>4</b>	<b>4</b>

**Preamble:**

This syllabus of Zoology Program offered by Sophia College for Women, Mumbai has been designed under the under the National Education Policy 2020 to be implemented from the academic year 2023-24.

The syllabus tries to encompass fundamental areas such as taxonomy, developmental biology, genetics, physiology, cell biology as well as applied zoology disciplines like ecology and economic zoology that would promote skill enhancement and entrepreneurship. The syllabus is planned such that the learners who are beginning their academic journey opting for the subject of Zoology will be equipped with not only the basic knowledge of the animal world but also the recent trends in the subject.

Learning of the subject would involve various innovative pedagogies such as experiential learning, problem-based learning, collaborative learning in addition to the traditional mode of learning. Besides sensitizing the learners towards environment and sustainability, the subject also offers career opportunities in a variety of fields such as conservation, research, education, and animal management. Due care would be taken to adhere to the directions as given in the UGC Circular F14-4/2006 (CPP-II) while conducting practicals involving animal types.



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### PROGRAMME OBJECTIVES

<b>PO 1</b>	To provide a holistic knowledge about animal biology such as taxonomy, comparative anatomy and physiology, behaviour, ecology and evolution.
<b>PO 2</b>	To develop experimental and research-oriented skills for future career in academia
<b>PO 3</b>	To gain field-based knowledge through experiential learning
<b>PO 4</b>	To get acquainted with the applied areas of zoology to promote employability and entrepreneurship
<b>PO 5</b>	To encourage understanding about the importance of biodiversity conservation, the threats facing ecosystems and the conservation measures used to preserve wildlife

### PROGRAMME SPECIFIC OUTCOMES

<b>PSO 1</b>	Apply the field-based and the in-class knowledge of animal biology to identify and classify the animals in their natural habitat upto class level
<b>PSO 2</b>	Identify the various types of animal behaviour, and animal interactions with the ecosystem
<b>PSO 3</b>	Conduct basic research that involves application of critical thinking and experimental skills
<b>PSO 4</b>	Get career opportunities in a variety of fields such as conservation, research, education, and animal management



**SOPHIA COLLEGE (AUTONOMOUS)**

<b>Programme: Sciences Zoology Minor</b>		<b>Semester – 1</b>	
<b>Course Title: Diversity of Animal Kingdom-I</b>		<b>Course Code: SZOO111</b>	
<p><b><u>COURSE OBJECTIVES:</u></b></p> <ol style="list-style-type: none"> <li>1. Understand the general organization starting from Kingdom Protista and the invertebrate phyla</li> <li>2. To understand the fundamental processes of life in kingdom animalia</li> <li>3. To comprehend how the various physiological processes help animals to adapt to different ecosystems</li> <li>4. To gain knowledge about the human physiology</li> </ol>			
<p><b><u>COURSE OUTCOMES:</u></b> The learner will be able to:</p> <ol style="list-style-type: none"> <li>1. Relate the characteristic features among different taxonomic groups</li> <li>2. Interpret phylogenetic relationships</li> <li>3. Relate how the various physiological processes help the organisms to adapt to their environment</li> <li>4. Understand the interrelationship between the various human physiological processes</li> </ol>			
<b>Lectures per week (1 Lecture is 60 minutes)</b>		<b>2</b>	
<b>Total number of Hours in a Semester</b>		<b>30</b>	
<b>Credits</b>		<b>2</b>	
<b>Evaluation System</b>	<b>Semester End Examination</b>	<b>1 Hour</b>	<b>30 Marks</b>
	<b>Internal Assessment</b>	<b>--</b>	<b>20 Marks</b>

UNIT 1 General organization of Kingdom Protista	Salient features up to phylum level of:		15 hours
	1.1	Unicellular organization Kingdom Protista - Phylum Protozoa	



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& Kingdom Animalia (Non- Chordata) (1 Credit)	1.2	Multicellular organization: 1.2.1 : Colonization level - Phylum Porifera 1.2.2 : Division of labour – Phylum Cnidaria	
	1.3	Triploblastic acoelomate and pseudocoelomate organization 1.3.1 : Acoelomate organization – Phylum Platyhelminthes 1.3.2 : Pseudocoelomate organization – Phylum Nematoda	
	1.4	Triploblastic Coelomate organization 1.4.1 : Animals with metameric segmentation: Phylum Annelida 1.4.2 : Animals with jointed appendages: Phylum Arthropoda 1.4.3 : Animals with mantle: Phylum Mollusca 1.4.4 : Animals with enterocoel: Phylum Echinodermata	
UNIT 2 Comparative Physiology - I (1 Credit)	2.1	Nutrition: 1.1.1 : Comparative study of nutritional apparatus (structure and function): Amoeba, Hydra, Earthworm, Cockroach, Amphioxus, Pigeon and Ruminants. 1.1.2 : Physiology of digestion in humans	15 hours
	2.2	Respiration: 1.2.1: Comparative study of respiratory organs (structure and function): Earthworm, Spider, Bony fish, Frog and Pigeon.	



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		1.2.2: Structure of lungs and physiology of respiration in humans	
	2.3	Circulation: 1.3.1 : Comparative study of circulation: (a) Open and Closed type, (b) Single and Double type. 1.3.2 : Comparative study of hearts (structure and function): Earthworm, Cockroach, Shark, Frog, Calotes and Pigeon 1.3.3 : Structure and mechanism of working of heart in human	

<b>PRACTICAL COURSE</b>		<b>Course Code: SZOO111P</b>	
<b>Course Title: Diversity of Animal Kingdom -I</b>			
<b><u>COURSE OUTCOMES:</u></b> The learners will be able to: <ol style="list-style-type: none"> <li>1. Identify the animals based on the observations of the external characteristics</li> <li>2. Perform experiments based on temporary mountings</li> <li>3. Prepare field report based on observations done during field excursions</li> </ol>			
<b>Lectures per week (1 Lecture is 120 minutes)</b>		<b>2</b>	
<b>Total number of Hours in a Semester</b>		<b>60</b>	
<b>Credits</b>		<b>2</b>	
<b>Evaluation System</b>	<b>Semester End Examination</b>	<b>3 Hours</b>	<b>50 marks</b>
	<b>Internal Assessment</b>	--	

1	Classification of Phylum Protozoa: ( <i>Amoeba, Euglena, Paramecium, Plasmodium</i> ) & Porifera: ( <i>Leucosolenia, Euplectella, Euspongia</i> )	60 hours
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2	Mounting of foraminiferan shells	
3	Classification of Phylum Coelenterata: ( <i>Hydra</i> , <i>Obelia</i> colony, <i>Aurelia</i> , <i>Fungia</i> , <i>Madrepora</i> ) & Phylum Platyhelminthes: ( <i>Planaria</i> , Liver fluke, Tapeworm)	
4	Classification of Phylum Nematoda: ( <i>Ascaris</i> - male and female) & Phylum Annelida: ( <i>Nereis</i> , Earthworm, Leech)	
5	Dissection of digestive system of earthworm.	
6	Dissection of nervous system of earthworm	
7	Mounting of setae, nephridia, ovary and spermatheca of earthworm	
8	Classification of Phylum Arthropoda: (Crab, lobster, <i>Lepisma</i> , beetle, dragonfly, butterfly, spider, tick, scorpion, centipede, millipede)	
9	Study of appendages in prawn	
10	Study of mouthparts in insects – Biting and chewing, siphoning, sponging, piercing and sucking, chewing and lapping	
11	Classification of Phylum Mollusca: ( <i>Chiton</i> , <i>Dentalium</i> , <i>Pila</i> , <i>Unio</i> , <i>Sepia</i> , <i>Nautilus</i> ) & Phylum Echinodermata: (Starfish, Brittle star, Feather star, Sea urchin, Sand Dollar, Sea cucumber)	
12	Maintenance & observation of terrestrial snail	
13	Effect of varying pH on enzyme amylase activity	



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14	Observation of food vacuole, contractile vacuole and ciliary movement in <i>Paramecium</i>
15	Study of nutritional apparatus - gastrovascular cavity of hydra, digestive system of liver fluke, earthworm and cockroach and bird, ruminant stomach
16	Study of respiratory apparatus – spiracle and trachea of cockroach, gills of shark and bony fish, lungs of frog and mammals
17	Estimation of vital capacity of human lungs
18	Study of circulatory apparatus – heart of cockroach, fish, frog and mammal
19	Measurement of heartbeat of <i>Daphnia</i>
20	Measurement of blood pressure using sphygmomanometer.
21	Project based survey on campus biodiversity
22	Study trip to observe the fauna and biodiversity

#### ASSESSMENT DETAILS:

- I. Internal Assessment (IA): Any one activity / assignment / test of 20 marks
- II. Semester End Examination (SEE): Theory exam of 30 marks – One hour duration
- III. Semester End Examination (SEE): Practical exam of 50 marks – Three hours duration

#### REFERENCES:

1. Dhama, P. S. and Dhama, J. K. (2021). Invertebrate Zoology. (5th ed.). R Chand & Co. New Delhi.
2. Haswell W. A. (1992). A Textbook of Zoology, Invertebrates. Vol. I. (1st Indian ed.). CBS Publishers and Distributors Pvt. Ltd.



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3. Jordan E. L. and Verma P. S. (2015). Invertebrate Zoology. (Reprint ed.). S. Chand and Co. Ltd.
  
4. Kotpal R. L. (2020). Modern Textbook of Zoology, Invertebrates, (12th ed.). Rastogi Publications.
  
5. Miller S. A. and Harley J. B. (2016) Zoology. (10th ed.). Tata McGraw Hill.
  
6. Parker T. J. and Haswell, W. A. (1991). A Textbook of Zoology, Vol. II. (Low Price Indian Edition). CBS Publishers and Distributors Pvt. Ltd.
  
7. Taylor D.J., Stout G.W., Green N.P.O, Soper R. (1997) *Biological Science*. (3<sup>rd</sup> ed.). Cambridge University Press.
  
8. Tortora, G. J. and Derrickson, B. (2009) *Principles of Anatomy and Physiology* (12<sup>th</sup> ed.). John Wiley & Sons, Inc.



**SOPHIA COLLEGE (AUTONOMOUS)**

<b>Programme: Sciences Zoology Minor</b>		<b>Semester – 2</b>	
<b>Course Title: Diversity of Animal Kingdom-II</b>		<b>Course Code: SZOO122</b>	
<b><u>COURSE OBJECTIVES:</u></b>			
<ol style="list-style-type: none"> <li>1. Understand the general classification of Hemichordates and Chordates</li> <li>2. To understand the fundamental processes of life in kingdom Animalia</li> <li>3. To comprehend how the various physiological processes help animals to adapt to different ecosystems</li> <li>4. To gain knowledge about the human physiology</li> </ol>			
<b><u>COURSE OUTCOMES:</u></b>			
The learner will be able to:			
<ol style="list-style-type: none"> <li>1. Relate the characteristic features among different taxonomic groups</li> <li>2. Interpret phylogenetic relationships</li> <li>3. Relate how the various physiological processes help the organisms to adapt to their environment</li> <li>4. Understand the interrelationship between the various human physiological processes</li> </ol>			
<b>Lectures per week (1 Lecture is 60 minutes)</b>		<b>2</b>	
<b>Total number of Hours in a Semester</b>		<b>30</b>	
<b>Credits</b>		<b>2</b>	
<b>Evaluation System</b>	<b>Semester End Examination</b>	<b>1 Hour</b>	<b>30 Marks</b>
	<b>Internal Assessment</b>	<b>--</b>	<b>20 Marks</b>

UNIT 1 General organization of Hemichordates and Chordates	Salient features up to phylum level of:		15 hours
	1.1	Phylum Hemichordata: Balanoglossus	



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(1 Credit)	1.2	Phylum Chordata: 1.2.1 Subphylum Urochordata 1.2.2 Subphylum Cephalochordata 1.2.3 Subphylum Vertebrata	
	1.3	Superclass Agnatha: Class Cyclostomata	
	1.4	Superclass Gnathostomata: 1.4.1 Class Pisces 1.4.2 Class Amphibia 1.4.3 Class Reptilia 1.4.4 Class Aves 1.4.5 Class Mammalia	
<b>UNIT 2</b> <b>Comparative</b> <b>Physiology -</b> <b>II</b>  (1 Credit)	2.1	Excretion and Osmoregulation: 2.1.1: Comparative study of excretory and osmoregulatory structures and functions. a) Amoeba - Contractile vacuoles b) Planaria - Flame cells c) Cockroach - Malpighian tubules 2.1.2: Structure of kidney, uriniferous tubule and physiology of urine formation in man	15 hours
	2.2	Movement and Locomotion: 2.2.1: Locomotory organs - structure and functions of: a) Pseudopodia in Amoeba (Sol- Gel theory), Cilia in Paramecium b) Legs in cockroach c) Tube feet in starfish d) Wings in birds	



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		2.2.2: Structure of striated muscle fibre in human and sliding filament theory	
	2.3	Control and Coordination: 2.3.1: Irritability in Paramecium, nerve net in Hydra, nerve ring and nerve cord in earthworm. 2.3.2: Types of neurons based on the structure and function. 2.3.3: Conduction of nerve impulse: Resting potential, Action potential and Refractory period 2.3.4: Synaptic transmission	

<b>PRACTICAL COURSE</b> <b>Course Title: Diversity of Animal Kingdom -II</b>	<b>Course Code: SZOO122P</b>
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<b><u>COURSE OUTCOMES:</u></b> The learners will be able to:	
<ol style="list-style-type: none"> <li>1. Identify the hemichordates and chordates based on the observations of the external characteristics</li> <li>2. Perform experiments based on temporary mountings</li> <li>3. Prepare field report based on observations done during field excursions</li> </ol>	

<b>Lectures per week (1 Lecture is 120 minutes)</b>		<b>2</b>	
<b>Total number of Hours in a Semester</b>		<b>60</b>	
<b>Credits</b>		<b>2</b>	
<b>Evaluation System</b>	<b>Semester End Examination</b>	<b>3 Hours</b>	<b>50 marks</b>
	<b>Internal Assessment</b>	<b>--</b>	

1	Classification of phylum Hemichordata: ( <i>Balanoglossus</i> ), subphylum Urochordata: ( <i>Herdmania</i> ), subphylum Cephalochordata: ( <i>Amphioxus</i> ), subphylum: ( <i>Petromyzon</i> )	60 hours
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2	Classification of class Pisces: Chondrichthyes: Shark, skate, sting ray/ electric ray, Osteichthyes: Sciaena, flying fish, Puffer fish (poisonous)	
3	Classification of class Amphibia: Frog, toad, caecilian, salamander	
4	Classification of class Reptilia: Chameleon, Calotes, turtle, tortoise, venomous (Krait, Russell's Viper, Saw- scaled Viper, Cobra and King Cobra) and non-venomous (Python, Rat snake) snakes, alligator/crocodile	
5	Classification of class Aves: Kite, kingfisher, duck	
6	Classification of class Mammalia: Shrew, hedgehog, guinea pig, bat	
7	Urine analysis: Normal and Abnormal constituents	
8	Detection of ammonia excreted by fish from aquarium water	
9	Detection of uric acid from excreta of birds	
10	Temporary mounting of striated muscle fibre using chicken tissue	
11	Study of locomotory organs (Amoeba, Starfish, Fish, and Bird)	
12	Mounting of nephridia of earthworm	
13	Study of irritability in <i>Paramoecium</i> - Effect of weak acids and salts	
14	Study of leg of cockroach and wing of butterfly	
15	Study of permanent slides of kidney - L.S, T.S.	
16	Project on neurotransmitters and their related disorders	
17	Adaptive radiation in reptiles	
18	Study of T.S. of spinal cord, outer view and V.S. of mammalian brain, nerve net in hydra	
19	Study trip to observe the fauna and biodiversity	



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20	Project on biodiversity study	
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### **ASSESSMENT DETAILS:**

1. Internal Assessment (IA): Any one activity / assignment / test of 20 marks
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3. Semester End Examination (SEE): Practical exam of 50 marks – Three hours duration

### **REFERENCES:**

1. Dhama, P. S. (2006). *Chordate Zoology*. (1st ed.). R. Chand and Co.
2. Jordan, E. L., and Verma, P. S. (2013). *Chordate Zoology* (14<sup>th</sup> revised Ed.). S. Chand and Co. Ltd.
3. Kotpal, R. L. (2010). *Modern Textbook of Zoology: Vertebrates*. Rastogi Publications.
4. Marieb, E. L. (2012). *Human Anatomy and Physiology* (9<sup>th</sup> ed.). Pearson Education Low Price Edition.
5. Miller, S. A. & Harley, J. B. (2016). *Zoology*. (10th ed.). Tata McGraw Hill.
6. Moore J. (2006). *Introduction to Vertebrates*. (2nd ed.). Cambridge University- Low Priced Edition.
7. Parker, T. J., and Haswell, W. A. (1991). *A Textbook of Zoology, Vol. II* (Low Price Indian Edition). CBS Publications and Distributors Pvt. Ltd.
8. Taylor D.J., Stout G.W., Green N.P.O, Soper R. (1997) *Biological Science*. (3<sup>rd</sup> ed.). Cambridge University Press.
9. Taylor, D.J., Stout, G.W., Green, N.P.O., Soper, R. (2005). *Biological Science*. (3rd ed.). Cambridge University Press.
10. Tortora, G. J. and Derrickson, B. (2009) *Principles of Anatomy and Physiology* (12<sup>th</sup> ed.). John Wiley & Sons, Inc.
11. Verma, P. S. and Jordan, E. L. (2013). *Vertebrate Zoology Volume I*. (14th ed.). S. Chand and Co.