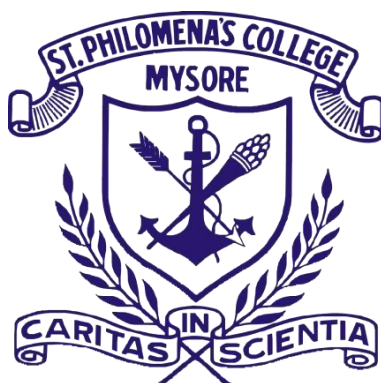


ST. PHILOMENA'S COLLEGE(AUTONOMOUS)

Affiliated to University of Mysore
Accredited by NAAC with 'B++' Grade
Bannimantap, Mysore, Karnataka,
India-570015



DEPARTMENT OF ZOOLOGY

**The Board of Studies in Zoology which met on 20/08/2024 has
approved the syllabus and pattern of examination for
Semesters V and VI for the
Academic Year 2024-25**

BOS COMMITTEE MEMBERS

Sl. No.	Name	Designation
1	Mrs. Mary Sofia I	Chairman
2	Dr. M.S Krishna	University of Mysore - Member
3	Dr. Hemachandra Amin	Other University-Member
4	Dr. Mahadevaswamy	External Member
5	Dr. Sathish S V	External Member
6	Mrs. Sangeetha MD	Internal Member
7	Mrs. Neena PK	Internal Member

Semester V BSc ZOOLOGY**Core Course Content**

Program Name	B.Sc.	V Semester	
Course Title	Non-Chordates and Economic Zoology(Theory)		
Course Code:	ZOOC	No .of Credits	4
Contact hours	60Hours	Duration of SEA/Exam	2$\frac{1}{2}$ hours
Formative Assessment Marks	40	Summative Assessment Marks	60

Pedagogy: Written Assignment/Presentation/Project / Term Papers/Seminar/Field studies

Formative Assessment		
Assessment Occasion	Assessment type	Weight agein Marks
C1 First component	Test-40 marks test for 90 minutes	10
C1 Second Component	Assignment	10
C2 First component		10
C2 Second Component		10
Total		40

Note: Any two different activities for C2 First component and C2 Second component can be selected from the below

Quiz/Project/Class room exercise/Practice exercise/Educational (industry/ institutes/ NGOs) visit/ field trip/ Field work/Viva voce/Role Play/Charts/ Models/Case study/Group discussion/Crosswords/ Presentation/seminar/Review – movie / Book/Research articles/e – content preparation

Course Objectives:

1. Recall and describe the basics of classification up to classes, along with morphology and reproduction in Protozoa, Coelenterate, Ctenophora, and Nematelminths, with suitable examples.
2. Demonstrate an understanding of the general characteristics, classification up to classes, and morphology and reproduction in Annelida and Arthropoda, including the nervous system.
3. Outlining the general characteristics, classification up to classes, and discussing morphology, respiration, and the nervous system in Mollusca. Additionally, understand the basics of classification up to classes, including morphology and the water vascular system in Echinodermata.

4. Understand the diversity of pests, their life cycles, and control measures. Also, understand the concepts of Lac-culture, Vermi-culture, and Poultry.

Course Outcome	On successful completion of the course the students will be able to	Cognitive domain	POs	PSOs
CO1	Discuss the fundamental characteristics of chordates, their outline classification, the structural features and evolutionary significance of Hemichordata, Cephalochordata, Urochordata and Agnatha.	Understand	1,3,6	
CO2	Explain the characteristics and classify Pisces and Amphibia up to the order level, emphasizing the relationships and unique traits within these groups.	Understand	1,3, 6	
CO3	Critically assess the general characteristics and classification of Reptilia, Aves and Mammalia.	Evaluate	1, 8,9	
CO4	Compare the components and working of Integumentary, Respiratory, Circulatory, Skeletal, Excretory and Nervous systems of Fishes, Amphibians, Reptiles, Aves and Mammals.	Analyse	1,3,5	

COURSE CONTENT

Contents	60Hrs
Unit-I	15
General characters, classification upto classes with suitable examples to all phyla	
1. Protozoa to Coelenterate	
<ul style="list-style-type: none"> • Protozoa-<i>Paramecium</i>: Morphology and Reproduction-Fission and conjugation. • Porifera- <i>Sycon</i>: External and Canal System • Coelenterata– <i>Obelia</i>: Morphology, polymorphism and Reproduction 	
1. Ctenophora to Nematheiminthes	
<ul style="list-style-type: none"> • Ctenophora– Salient feature • Platyhelminthes- <i>Taenia</i>(Tapeworm): Morphology and Reproduction • Nematelminthes- <i>Ascaris lumbricoides</i>: Morphology and Reproduction. 	

Unit-II	15
3. Annelida <ul style="list-style-type: none"> Annelida– <i>Pheretima</i>-Morphology, digestive and nervous system. Larva-Trochophore larva. Onychophora -Peripatus -External and its systematic position. 	
4. Arthropoda <ul style="list-style-type: none"> Arthropoda –<i>Palaemon</i> (Prawn): Morphology, Appendages, nervous system and Reproduction 	
Unit-III	15
6. Mollusca to Hemichordata <ul style="list-style-type: none"> Mollusca– <i>Pila</i>: Morphology, Shell, Nervous System and Reproduction. Echinodermata– <i>Pentoceros</i>: Morphology and Water Vascular System. 	
Unit-IV	15
7. Economic Zoology: Vectors and Pests <ul style="list-style-type: none"> Lifecycle and their control of following pests:, Sugarcane leafhopper, Ticks, Mites, Termites and Mosquitoes and their control. 	
8. Economic Zoology: Lac-culture, Vermiculture and Poultry	

Blueprint of End semester examination

UNIT	PART A-2 MARK	PART B-6 MARK	PART C-10 MARK	TOTAL MARKS
I	2	1	1	20
II	2	1	1	20
III	2	1	1	20
IV	2	1	1	20

QUESTION PAPER PATTERN

Semester:		Subject: ZOOLOGY	
Course Title: Non-Chordates and Economic Zoology		QP Code:	
Time: 2 ½ Hours		Max Marks: 60	
Instructions to the Candidates: Draw diagram wherever necessary.			
PART A			
I	Answer any SIX of the following.		2X6=12
1			
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PART-B		
II	Answer any THREE of the following.	3X6=18
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10		
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12		
PART- C		
	Write explanatory notes on any THREE of the following.	10X3=30
13		
14		
15		
16		

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Semester V- Zoology Practical V

Course Objectives

1. Understand and differentiate various types of protozoans. Develop an understanding of the different species within the classifications of Protozoa, Porifera, and Cnidaria.
2. Apply the knowledge of corals and comprehend the concepts related to Helminthes, Annelida, and Arthropoda, demonstrating the ability to relate these concepts to real-world situations.
3. Analyze the systematics of Mollusca, including its larval forms and various shell patterns. Additionally, analyze the systematics of Echinodermata and its larval forms, focusing on the connections and distinctions between these groups.
4. Evaluate the significance of harmful and beneficial non-chordates. Enhance the learning experience by critically assessing these organisms through virtual dissections, employing a higher level of cognitive thinking.

Course Outcome	On successful completion of the course the students will be able to	Cognitive domain	POs	PSOs

CO1	Identify and comment on the distinctive characteristics of Balanoglossus, Branchiostoma, Herdmania, Petromyzon and their larvae.	Understand	1, 6, 9	
CO2	Compare the distinctive characteristics of different Pisces and Amphibian specimens.	Analyse	1, 3, 8	
CO3	Discuss the classification and characteristics of Reptilia including snakes, feet and beak modification of Birds and Mammalia.	Understand	1, 3, 6, 8	
CO4	Explain the components of afferent and efferent branchial systems, glosso-pharyngeal and vagus nerves of shark, circulatory system (arterial and venous) and urinogenital system of rats and skeletal systems in Shark, Frog, Pigeon, and Rabbit.	Understand	1, 3, 5, 8, 9	

Lab Content

Course Title	Non-Chordates and Economic Zoology(Practical)	Practical Credits	2
Course Code	ZOOC10-P	Contact Hours	
Formative Assessment	25Marks	Summative Assessment	25Marks

Formative Assessment for Practical

Assessment Occasion/type	Marks
House Examination/Test	10
Written Assessment/Presentation/Project/Term	10

Practical Content

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<ol style="list-style-type: none"> 1. Preparation and observation of protozoan culture. 2. Protozoa: Systematics of <i>Amoeba</i>, <i>Euglena</i>, <i>Noctiluca</i>, <i>Paramecium</i> and <i>Vorticella</i> (Permanent slides). 3. Porifera: Systematics of <i>Sycon</i>, <i>Euplectella</i>, <i>Hyalonema</i>, <i>Spongilla</i> and <i>Euspongia</i> (Specimens). Study of permanent slides of T.S of <i>Sycon</i>, spicules and gemmules. 4. Cnidaria: Systematics of <i>Aurelia</i> and <i>Metridium</i> (Specimens). Slides of <i>Hydra</i>, <i>Obelia</i>-polyand medusa, and <i>Ephyra</i> larva, T.S. of <i>Metridium</i> passing through mesenteries. 5. Study of Corals-<i>Astraea</i>, <i>Fungia</i>, <i>Meandrina</i>, <i>Corallium</i>, <i>Gorgonia</i>, <i>Millepora</i> and <i>Pennatula</i>. 6. Helminthes: Systematics of <i>Planaria</i>, <i>Fasciola hepatica</i> and <i>Taenia solium</i>, <i>Ascaris</i>-Male and female (Specimens). Slides of T.S. of <i>Planaria</i>, T.S of male and female <i>Ascaris</i>. 7. Annelida: Systematics of <i>Nereis</i>, <i>Sabella</i>, <i>Aphrodite</i> and Leech (Specimens) Slide of T.S. of Earthworm through typhlosole. 8. Arthropoda: Systematics of <i>Panaeus</i>, <i>Palaemon</i>, <i>Astracus</i>, Scorpion, Spider, <i>Limulus</i>, <i>Peripatus</i>, <i>Millipede</i>, <i>Centipede</i>, Prayingmantis, Termite Queen, Moth, Butterfly, Dungbeetle/Rhinoceros beetle (Any six specimens). Slide of Larvae-Nauplius, Zoa and Mysis. 9. Mollusca: Systematics of <i>Chiton</i>, <i>Mytilus</i>, <i>Aplysia</i>, <i>Pila</i>, <i>Octopus</i>, <i>Sepia</i> (Specimens) and Glochidium larva (Slide). 10. Shell Pattern-<i>Unio</i>, <i>Ostrea</i>, <i>Cypria</i>, <i>Murex</i>, <i>Nautilus</i>, <i>Patella</i>, <i>Dentalium</i>, Cuttlebone. (Any four) 11. Echinodermata: Systematics of Seastar, Brittlestar, Sea Urchin, Sea cucumber, Sea lily (Specimens). 12. Slides of Bipinnaria larva, Echinopluteus larva and Pedicellaria. 13. Harmful Non chordates: Soil Nematodes. Agricultural, veterinary and human pests of Arachnida and Arthropoda. 14. Beneficial Non-chordates: <ul style="list-style-type: none"> • Sericulture: Lifecycle of <i>Bombyx mori</i>, Uzi fly, Cocoon, Raw silk. • Apiculture: Any 2 Species of honeybee and bee-wax. • Pearl Culture: Pearl Oyster and Natural Pearls. 15. Virtual Dissection/Cultured specimens: Earthworm–Nervous system, Leech–Digestive System 16. Virtual Dissection/Cultured specimens: Prawn–Nervous system. Cockroach–Salivary Apparatus and Digestive system. 	
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References	
1	Barnes, R.S.K.; Calow, P.; Olive, P.J.W.; Golding, D.W.; Spicer, J.I. (2002) <i>The Invertebrates: Synthesis</i> , Blackwell Publishing.
2	Hickman, C.; Roberts, L.S.; Keen, S.L.; Larson, A. and Eisenhour, D. (2018) <i>Animal Diversity</i> , McGraw-Hill.
3	Holland, P. (2011) <i>The Animal Kingdom: A Very Short Introduction</i> , Oxford University Press.
4	Kardong, K.V. (2006) <i>Vertebrates: Comparative Anatomy, Function, Evolution</i> (4th edition), McGraw-Hill.

5	Barrington, E.J.W. (1979) Invertebrate Structure and Functions. II Edition. E.L.B.S. and Nelson.
6	Boradale, L.A. and Potts, E.A. (1961) Invertebrates: A Manual for the use of Students. Asia Publishing Home.
7	Bushbaum, R. (1964) Animals without Backbones. University of Chicago Press.

Program Name	B.Sc.	Semester	V
Course Title	Chordates and Comparative Anatomy (Theory)		
Course Code:	ZOOC-11-T	No. of Credits	4
Contact hours	60 Hours (4hrs/week)	Duration of SEA/Exam	2 hours
Formative Assessment Marks	40	Summative Assessment Marks	60

Course Objectives:

- Understand the basic characteristics of chordates and their classification.
 - Learn about Balanoglossus, Herdmania, and Ascidian tadpole.
 - Discover Branchiostoma's type study.
 - Get to know the general characteristics of Agnatha and their classification.
- Memorize and remember the general characteristics and classifications of Pisces and Amphibia up to a certain level.
- Identify and list the general characteristics and classifications of different classes of Reptilia, Aves, and Mammalia up to a certain level with some examples.
- Learn about the comparative anatomy of vertebrates at a basic level.

Course Outcome	On successful completion of the course the students will be able to	Cognitive domain	POs	PSOs
CO1	Discuss the fundamental characteristics of chordates, their outline classification, the structural features and evolutionary significance of Hemichordata, Cephalochordata, Urochordata and Agnatha.	Understand	1,3,6	
CO2	Explain the characteristics and classify Pisces and Amphibia up to the order level, emphasizing the relationships and unique traits within these groups.	Understand	1,3, 6	

CO3	Critically assess the general characteristics and classification of Reptilia, Aves and Mammalia.	Evaluate	1, 8,9	
CO4	Compare the components and working of Integumentary, Respiratory, Circulatory, Skeletal, Excretory and Nervous systems of Fishes, Amphibians, Reptiles, Aves and Mammals.	Analyse	1,3,5	

Contents		60 Hrs
Unit-I		15hrs
<p>Chapter1:Chordates:</p> <ul style="list-style-type: none"> • Basic characters of chordates and classification upto classes. <p>Chapter2:Hemichordata:</p> <ul style="list-style-type: none"> • Type Study of <i>Balanoglossus</i>–Habit and Habitat, Morphology, Coelom. Tornaria larva and Affinities and systematic position of Hemichordata. <p>Chapter3:Urochordata:</p> <ul style="list-style-type: none"> • Type Study of <i>Ascidia</i>-Habit and Habitat, Morphology, Ascidian type structure and its retrogressive metamorphosis. <p>Chapter4:Cephalochordata:</p> <ul style="list-style-type: none"> • Type Study of <i>Branchiostoma</i> (<i>Amphioxus</i>)-Habit and Habitat ,Morphology, Digestive system and Feeding mechanism. <p>Chapter5:Agnatha</p> <ul style="list-style-type: none"> • General characters of Agnatha and classification upto classes. • Salient features of Cyclostomata and Ostracodermi with orders and examples. • Ammocoete larva and its significance. 		
Unit-II and III		15 15
<p>Chapter6:Vertebrates:</p> <p>➤ Pisces</p> <ul style="list-style-type: none"> ○ General characters and Classification of Pisces upto Class. ○ General characters of Chondrichthyes and Osteichthyes. ○ Interesting feature and evolutionary significance of Dipnoi. ○ Parental care in Pisces. ○ Migration in Pisces. ○ Types of caudal fins, scales and swim bladder in fishes. <p>➤ Amphibia</p> <ul style="list-style-type: none"> ○ General characters and Classification of different classes of Amphibia upto the order with five characters for each order citing examples. <ul style="list-style-type: none"> ○ Parental care in Amphibians. ○ Neoteny and Paedogenesis. <p>➤ Reptilia</p> <ul style="list-style-type: none"> ○ General characters and Classification of different classes of Reptilia upto the order with five characters for each order citing examples. <ul style="list-style-type: none"> ○ Temporal fossae in reptiles. 		

- Poison apparatus and biting mechanism in snakes.
- Interesting features of *Sphenodon*, crocodile and *Archaeopteryx*.

Aves

- General characters and Classification of different classes of Aves upto the order with five characters for each order citing examples.
- Salient features of Ratitae and Carinatae with examples.
- Flight adaptations in birds- Morphological, physiological and anatomical.

Mammalia

- General characters and Classification of different classes of Mammalia up to the order with five characters for each ~~order~~ citing examples.
- Interesting features of mammalian orders (Insectivora, Carnivora, Chiroptera, Cetacea, Proboscidea, Ungulata–Perissodactyla and Artiodactyla, and Primates–Platyrrhini and Catarrhini) with examples.
- Dentition in mammal- Dental formula and structure of teeth.

Unit-IV

Comparative Anatomy of Vertebrates:

Chapter -7 Integumentary System: Comparative account of Structure of skin and its derivatives.

Chapter-8 Respiratory system

- Comparative account of respiratory system in vertebrates: Pisces (Scoliodon), Amphibian (Frog), Reptiles (Lizard), Aves (Pigeon) and Mammals (Man).

Chapter-9 Circulatory System

- Comparative account of heart and aortic arches in vertebrates: Pisces (Scoliodon), Amphibian (Frog), Reptiles (Lizard), Aves (Pigeon) and Mammals (Man).

Chapter-10 Excretory System

- Succession of kidney in vertebrates. -Pronephros, mesonephros and metanephros.

Chapter-9 Nervous system

Comparative account of brain in vertebrates: Pisces (Scoliodon), Amphibian (Frog), Reptiles (Lizard), Aves (Pigeon) and Mammals (Man).

15

Blueprint of End semester examination

UNIT	PART A-2 MARK	PART B-6 MARK	PART C-10 MARK	TOTAL MARKS
I	2	1	1	20
II	2	1	1	20

III	2	1	1	20
IV	2	1	1	20

QUESTION PAPER PATTERN

Semester:		Subject: ZOOLOGY		
Course Title: Chordates and Comparative Anatomy			QP Code:	
Time: 2 ½ Hours		Max Marks: 60		
Instructions to the Candidates: Draw diagram wherever necessary.				
PART A				
I	Answer any SIX of the following.			2X6=12
1				
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8				
PART-B				
II	Answer any THREE of the following.			3X6=18
9				
10				
11				
12				
PART- C				
	Write explanatory notes on any THREE of the following.			10X3=30
13				

14		
15		
16		

Course Title	Chordates and Comparative Anatomy Zoology(Practical)	Practical Credits	2
Course Code	ZOOC12-P	Contact Hours	
Formative Assessment	25 Marks	Summative Assessment	25 Marks

Course Objectives

1. Learn about the different features of Protochordata, Cyclostomata, and Pisces.
2. Compare ornamental fishes and their accessory respiratory organs.
3. Identify and understand the features of amphibian and reptilian species. Describe the modifications in beaks and feet in birds and learn about mammalian species.
4. Simple Understanding: Gain a basic understanding of the afferent and efferent branchial systems, glosso-pharyngeal and vagus nerves of sharks and bony fish. Also, comprehend the circulatory system (arterial and venous) and urinogenital system of rats. Compare the skeletal systems of shark, frog, pigeon, and rabbit at a fundamental level.

Course Outcome	On successful completion of the course the students will be able to	Cognitive domain	POs	PSOs
CO1	Identify and comment on the distinctive characteristics of Balanoglossus, Branchiostoma, Herdmania, Petromyzon and their larvae.	Understand	1, 6, 9	
CO2	Compare the distinctive characteristics of different Pisces and Amphibian specimens.	Analyse	1, 3, 8	
CO3	Discuss the classification and characteristics of Reptilia including snakes, feet and beak modification of Birds and Mammalia.	Understand	1, 3, 6, 8	
CO4	Explain the components of afferent and efferent branchial systems, glosso-pharyngeal and vagus nerves of shark, circulatory system (arterial and venous) and urinogenital system of rats and skeletal systems in Shark, Frog, Pigeon, and Rabbit.	Understand	1, 3, 5, 8, 9	

<p>1. Protochordata:</p> <ul style="list-style-type: none"> ○ Balanoglossus and its T.S. through proboscis ○ Ascidian/<i>Herdmania</i> and <i>Amphioxus</i>, T.S. of <i>Amphioxus</i> through pharynx and intestine. <p>2. Cyclostomata:-<i>Petromyzon</i>, Ammocoete larva and <i>Myxine</i>.</p> <p>3. Pisces</p> <ul style="list-style-type: none"> ○ Cartilaginous Fishes-<i>Narcine</i>, <i>Trygon</i>, <i>Pristis</i>, <i>Myxobolus</i> ○ Bony Fishes- Zebrafish, Hippocampus, Muraena, Ostracion, Tetradon, Pleuronectes, Diodon, Echeuis. (Any four). <p>4. Ornamental fishes: -Siamese, Koi, Oscar, Betta Sp., Neontetra, Guppies, Goldfish, Angelfish, Rainbowfish, Mollies (Locally available any five aquarium fishes).</p> <p>5. Accessory respiratory organs-<i>Saccobranchus</i>, <i>Clarias</i> and <i>Anabas</i>.</p> <p>6. Amphibia: <i>Rana</i>, <i>Bufo</i>, <i>Ambystoma</i>, <i>Axolotl</i> larva, <i>Necturus</i> and <i>Ichthyophis</i>.</p> <p>7. Reptilia: Turtle, Tortoise, <i>Mabuya</i>, <i>Calotes</i>, Chameleon, <i>Varanus</i>. snakes-Dryophis, Ratsnake, Brahmini, Cobra, Krait, Russell 's viper and Hydrophis.</p> <p>8. Aves: Beak and feet modifications in the following examples: Duck, Crow, Sparrow, Parrot, Kingfisher, Eagle or Hawk. (Any four)</p> <p>9. Mammalia: Mongoose, Squirrel, Pangolin, Hedge Hog, Rat and Loris. (Any four)</p> <p>10. Virtual Dissection/ Cultured specimens: Shark/Bony fish: Afferent and efferent branchial systems, glosso-pharyngeal and vagus nerves.</p> <p>11. Virtual Dissection/ Cultured specimens: Rat: Dissection (only demonstration)- Circulatory system (arterial and venous), Urinogenital system.</p> <p>12. Skeletal System</p> <ul style="list-style-type: none"> • Comparative account of Axial Skeletal system in vertebrates; Skull-Amphibian (Frog), Reptiles (Lizard), Aves (Pigeon) and Mammals (Man). • Comparative account of Appendicular skeletal system in vertebrates- Pectoral and Pelvic girdles of Amphibian (Frog), Reptiles (Lizard), Aves (Pigeon) and Mammals (Man). 	<p>15 units</p>
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References	
1	Colbert <i>etal</i> : Colbert's Evolution of the Vertebrates: A history of the back boned animals through time.(5 th ed2002,Wiley–Liss).
2	Hildebrand: Analysis of vertebrate Structure(4 th ed1995,JohnWiley)
3	KennethV.Kardong(20015)vertebrates:ComparativeAnatomy,Function,EvolutionMcGrawHill
4	Mc Farland <i>etal.</i> ,: Vertebrate Life(1979, Macmillan publishing)
5	Parker and Haswell: Text Book of Zoology, Vol. II(1978,ELBS)
6	Romer and Parsons: The Vertebrate Body(6 th ed1986, CBS Publishing Japan)
7	Young: The Life of vertebrates (3 rd ed2006,ELBS/Oxford)
8	Weichert C. K. and William Presch (1970). Elements of Chordate Anatomy, Tata McGraw Hills

Note:

FieldvisittonearbyNationalpark/Wildlifesanctuary/anyNationallaboratory at the end of semester is compulsory and the report of this is to be submitted along with practical record as a part of practical examination.

Semester VI BSc ZOOLOGY

Core Course Content

Course Title: Evolutionary & Developmental Biology	Course Credits: 4
Course Code: ZOOC15-T	L-T-P per week: 4-0-0
Total Contact Hours: 60 Hours	
Formative Assessment Marks:40	Summative Assessment Marks: 60

Course Objectives:

1. To understand the theories, forces, process and evidences of organic evolution.
2. To learn the dynamics of Population Genetics.
3. To study the various stages of embryonic development.
4. To understand the genetic basis of embryonic development.

Course Outcome	On successful completion of the course the students will be able to	Cognitive domain	POs	PSOs
CO1	Analyse the data to calculate allele frequencies using Hardy Weinberg's Principle.	Analyse	1, 4, 5,9	
CO2	Discuss the evidence for organic evolution, causes of mass extinctions and modes of speciation.	Understand	1, 8, 10, 12	
CO3	Summarize the general processes in embryonic development till gastrulation.	Understand	1, 6, 9	
CO4	Explain the processes like placentation, metamorphosis and organogenesis of Vertebrates.	Understand	1, 6, 8	

Contents	60Hrs
Unit-I	16
Chapter 1: Theories of Evolution: Origin of Life-Abiogenesis, biogenesis and modern theory, Experiment on origin of life, Historical review of evolutionary concept: Lamarckism, Darwinism (Natural, Sexual and Artificial selection), Modern synthetic theory of evolution, Adaptive radiations: Patterns of evolution (Divergence, Convergence, Parallel, Co-evolution)	8
Chapter 2: Population Genetics Microevolution and Macroevolution: allele frequencies, genotype frequencies, Hardy-Weinberg equilibrium and conditions for its maintenance, Forces of evolution: mutation, selection, genetic drift	8
Unit-II	14
Chapter 3: Direct Evidences of Evolution: Types of fossils, Incompleteness of fossil record, Dating of fossils, Phylogeny of horse.	7
Chapter 4: Species Concept and Extinction: Biological species concept (Advantages and Limitations); Modes of speciation (Allopatric, Sympatric), Mass extinction (Causes, Names of five major extinctions.	7
Unit-III	14
Chapter 5: Gamete Fertilization and Early Development: Gametogenesis, Fertilization with reference to sea urchin,. Cleavage- planes, pattern, types based on yolk content, Gastrulation-morphogenetic movements , fate maps- significance and methods and Morphogenesis- general concept.	6
Chapter 6: Developmental Genes: General concepts of organogenesis and Developmental control genes in <i>Drosophila melanogaster</i> (Homeobox genes)	8
Unit-IV	16
Chapter 7: Early Vertebrate Development: Early development of mammals including placentation-types based on origin, distribution of chorionic villi and histology, Metamorphosis- in Frog, regeneration-types, Limb regeneration in Salamander and Environmental regulation of development.	8
Chapter 8: Late Developmental Processes Development of eye, kidney, limb in amphibian. Female reproductive cycles - menstruation, Aging: Theory	8

Blueprint of End semester examination

UNIT	PART A-2 MARK	PART B-6 MARK	PART C-10 MARK	TOTAL MARKS
I	2	1	1	20
II	2	1	1	20
III	2	1	1	20
IV	2	1	1	20

QUESTION PAPER PATTERN

Semester : VI		Subject: ZOOLOGY
Title: Evolutionary & Developmental Biology		QP Code:
Time: 2 1/2 Hours		Max Marks: 60
Instructions to the Candidates: Draw diagram wherever necessary.		
PART A		
I	Answer any SIX of the following.	2X6=12
1		
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PART-B		
II	Write short notes on any THREE of the following.	6X3=18
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12		
PART- C		
III	Write explanatory notes on any THREE of the following.	10X3=30

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16		

**Semester VI
BSc**

Core Course Content

Course Title: Evolutionary & Developmental Biology (Practical)	Course Credits: 2
Course Code: ZOOC16-P	L-T-P per week: 0-0-4
Formative Assessment Marks: 25	Summative Assessment Marks: 25

Pedagogy: Lectures, Presentations, Videos, Assignments and Weekly Formative Assessment Tests

Formative Assessment for Practical	
Assessment Occasion / type	Marks
House Examination/ Test (Conducted for 25 marks and reduced to 10)	10
Record	10
Classroom Performance / Participation/ viva	05
Total	25 Marks

Course Objectives:

1. To study fossils.
2. To learn about Hardy Weinberg Equilibrium.
3. To understand adaptive radiation.
4. To study the various stages of embryonic development.

Course Outcome	On successful completion of the course the students will be able to	Cognitive domain	POs	PSOs
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CO1	Compare different models of different fossils and specimens of homologous and analogous organs.	Analyse	1, 5, 6, 9, 12	
CO2	Analyse the data and calculate gene and allele frequencies.	Analyse	1, 3, 4, 5, 6	
CO3	Illustrate adaptive radiation in feet of birds and mouthparts of insects	Apply	1, 7, 11	
CO4	Comment on the identifying characters of various developmental stages in Frog and Chick.	Understand	1, 6, 12	

**Practical
Content**

1. Study of fossils from models/ pictures- Archeopteryx, Brontosaurus and stegosaurus.
2. Study of homology (Comparative homology and serial homology) and analogy from suitable specimens
3. Study and verification of Hardy-Weinberg Law by chi square analysis. (Any three problems)
- 4 & 5. Graphical representation and interpretation of data of height / weight of a sample of 100 humans in relation to their age and sex.
6. Types of eggs based on quantity and distribution of yolk: Sea urchin, insect, frog, Chick.
7. Study of development of chick embryo-Window Technique
- 8 & 9. Study of adaptive radiations in feet of birds and mouthparts of insects.
10. Frog embryology: Egg, Sperm, Early cleavage stages, Blastula, Gastrula and Neurula
- 11 & 12. Chick Embryology: Egg, Sperm, Primitive streak, 24H, 36H, 48H, 72H and 96 Hours embryo whole mount.

Semester VI ZOOLOGY

Core Course Content

Course Title: Environmental Biology, Wildlife Management & Conservations	Course Credits: 4
Course Code: ZOOC17-T	L-T-P per week: 4-0-0
Total Contact Hours: 60 Hours	
Formative Assessment Marks: 40	Summative Assessment Marks: 60

Pedagogy: Written Assignment/Presentation/Project / Term Papers/Seminar/Field studies

Formative Assessment		
Assessment Occasion	Assessment type	Weightage in Marks
C1 First component	Test-40 marks test for 90 minutes	10
C1 Second Component	Assignment	10
C2 First component		10
C2 Second Component		10
Total		40

Note: Any two different activities for C2 First component and C2 Second component can be selected from the below

Quiz/Project/Class room exercise/Practice exercise/Educational (industry/ institutes/ NGOs) visit/ field trip/ Field work/Viva voce/Role Play/Charts/ Models/Case study/Group discussion/Crosswords/ Presentation/seminar/Review – movie / Book/Research articles/e – content preparation

Course Objectives:

1. To learn scope of Ecology.
2. To understand physico- chemical properties of different ecosystems.
3. To study the causes, effects and control measures of environmental issues.
4. To know about various wildlife conservation and management practices, policies and tools

Course outcome	On successful completion of this course the students will be able to	Cognitive Domain	PO's	PSO's
CO-1	Explain how animals interact with each other and their natural environment. Analyze the adaptive features of different environment.	Understanding	1,2,3,10,12	
CO-2	Integrate fundamental principles of wildlife ecology to solve local, regional and national conservation and management issues.	Analyzing	3,6,8,10,12	
CO-3	Apply modern tools of scientific inquiry in the field of wildlife management. Interprete wildlife conservation strategies.	Applying	3,6,7,8,10,12	
CO-4	Interpret wildlife management information.	Analyzing	3,6,7,8,10,12	

Contents	60Hrs
Unit-I	15
<p>Chapter 1: Ecology: Introduction to ecology, Definition of ecosystem, types of ecology, structure of an ecosystem, ecosystem, classification of ecosystem, food chain and food web, trophic levels, Ecological pyramids.</p> <p>Environment: Definition, types of environment-terrestrial (desert, grassland),aquatic, and aerial environment.</p> <p>Environmental Biology: Adaptive features of plants and animals to terrestrial aquatic, and aerial environment. Ecological factors- Light, temperature, Humidity and soil.</p>	
Unit-II	15
<p>Chapter 2. Pollution: Definition, types of pollutants, air, soil, water and thermal pollution and effects of pollution on plants and animals. Ozone layer and its depletion, biomagnifications, bioaccumulation and bioremediation.</p>	
Unit-III	15
<p>Chapter 3. Wildlife Conservation: National parks, Wildlife sanctuaries, biosphere reserve. Project tiger. Project Elephant. Habitat preservation, breeding in captivity. Ex-situ And in-situ conservation. Wildlife Protection Act 1972.</p>	
Unit-IV	15
<p>Chapter 4:Wildlife Management: Values of wildlife, Causes and depletion of wildlife, wetlands and their biotic components, general strategies and issues, concept of home range, wildlife corridors and territory, animal census, tracing movement - remote sensing, Quadrature method and GIS.</p>	

Blueprint of End semester examination

UNIT	PART A-2 MARK	PART B-6 MARK	PART C-10 MARK	TOTAL MARKS
I	2	1	1	20
II	2	1	1	20
III	2	1	1	20
IV	2	1	1	20

QUESTION PAPER PATTERN

Semester : VI		Subject: ZOOLOGY	
Title: Environmental Biology, Wildlife Management & Conservations		QP Code:	
Time: 2 1/2 Hours		Max Marks: 60	
Instructions to the Candidates: Draw diagram wherever necessary.			
PART A			
I	Answer any SIX of the following.	2X6=12	
1			
2			
3			
4			
5			
6			
7			
8			
PART-B			
II	Write short notes on any THREE of the following.	6X3=18	
9			
10			
11			
12			

PART- C

III	Write explanatory notes on any THREE of the following.	10X3=30
13		
14		
15		
16		

Semester VI
BSc

Core Course Content

Course Title: Environmental Biology, Wildlife Management & Conservation (Practicals)	Course Credits: 2
Course Code: ZOOC-18-P	L-T-P per week: 0-0-4
Formative Assessment Marks: 25	Summative Assessment Marks: 25

Pedagogy: Lectures, Presentations, Videos, Assignments and Weekly Formative Assessment Tests

Formative Assessment for Practical	
Assessment Occasion / type	Marks
House Examination/ Test (Conducted for 25 marks and reduced to 10)	10
Record	10
Field visit report	05
Total	25 Marks

Course Objectives:

1. To learn the procedures for analysis of water quality parameters.
2. To understand the methods used to analyse the physico-chemical parameters of soil.
3. To study the collection, identification and preservation of flora and fauna of different ecosystems.
4. To know the field techniques for wildlife census.

Course outcome	On successful completion of this course the students will be able to	Cognitive Domain	PO's	PSO's
CO-1	Analyze water quality through estimation of Dissolved Oxygen (O ₂), Carbon Dioxide (CO ₂), Biological Oxygen Demand (BOD) Chemical Oxygen Demand (COD), chlorides, Hardness and salinity in water.	Analyzing	1,4,5,6,8,12	
CO-2	Compare the pH, soil moisture, soil temperature, organic matter of different soil samples.	Analyzing	3,4,5,6,8,12	
CO-3	To identify flora and fauna of different ecosystems.	Understanding	3,5,6,8,10,12	
CO-4	Demonstrate wildlife census using various equipments and techniques.	Applying	2,4,5,8,10	

Practical Content
1, 2 & 3. Water quality parameters assessment: Dissolved Oxygen(O ₂),Carbon Dioxide(CO ₂), chlorides and Hardness
4 & 5. Analysis of physico-chemical parameters of soil: pH, soil moisture, soil temperature, organic matter In soil.
6. Analysis of air pollution: Analysis and representation of Air Quality index data
7. Visit of pond and lakes: Collection and identification of flora and fauna of selected ecosystems.
8 & 9. Collection, preservation of phytoplanktons, zooplanktons and insect larva and Identification of phytoplanktons, zooplanktons
10. Demonstration of field equipment used in wildlife census: Compass, Binoculars, Spotting scope, Range Finders and Global Positioning System.
11. Identification wild animals: Wild animal's pugmarks, hoof marks scats, pellet groups, nest, antlers. 10. 12. Demonstration of field techniques for wild flora and fauna.

Note: Field visit to nearby National park/ Wildlife sanctuary/ any National laboratory at the end of semester is compulsory and the report of this is to be submitted along with practical record as a part of practical examination.

