M.Sc. Zoology
(Wild Life Biology)

Syllabus

AFFILIATED COLLEGES

Program Code:

2021 – 2022 onwards

BHARATHIAR UNIVERSITY

(A State University, Accredited with "A" Grade by NAAC,
Ranked 13th among Indian Universities by MHRD-NIRF,
World Ranking: Times -801-1000,Shanghai -901-1000, URAP - 982)

Coimbatore - 641 046, Tamil Nadu, India

Program Educational Objectives (PEOs)	
The **M. Sc. Zoology (Wildlife Biology)** program describe accomplishments that graduates are expected to attain within five to seven years after graduation	
PEO1	M.Sc., graduates can work as teaching faculty, researchers, scientists, Forest service & Biologists. They can also become teachers or animal trainers in all fields of biology.
PEO2	They can find jobs in any field of biological science including Forest Ecologist and biomedical related labs and field works.
PEO3	They can enter into environment, forest ecosystems and pollution control sectors.
PEO4	They can find employment in Zoos, Museums, Zoological Parks, Tiger Reserves, Sanctuaries and National Parks.
PEO5	They can fit into Wildlife Forensic labs
PEO6	They can earn and shine in Forest department& Research institutions
PEO7	They can work in Veterinary sector
PEO8	They are eligible to serve as Biologist & Scientist in wildlife institutions
PEO9	Appear exams to become forest officials
PEO10	Higher studies as Ph.D in Zoology and Wildlife Biology

Program Specific Outcomes (PSOs)	
After the successful completion of **Zoology(Wildlife Biology)** program, the students are expected to	
PSO1	Elucidate animal-animal, animal-plant, animal-microbe interactions and their consequences to animals, humans and the environment.
PSO2	Develop deeper understanding of key concepts of biology at biochemical, molecular and cellular level, physiology and reproduction at organismal level, and ecological impact on animal behavior.
PSO3	Strengthen knowledge of genetics and cytogenetic principle in light of advancements in understanding animal genome and other model organisms.
PSO4	Describe the expression of genome revealing multiple levels of regulation and strategies to manipulate the same in the benefit of animal life.
PSO5	Learn handling DNA sequence data and its analysis which equip students to get employed in R&D in the industry involved in DNA sequencing services, forensic analysis.
PSO6	Understand relationships of variations in phenotypic expression of genome.
PSO7	Develop an understanding of zoological science for its application in animal classification forest entomology and wildlife science.
PSO8	Develop theoretical and practical knowledge in handling the animals and using them as model organism.
PSO9	Maintain high standards of learning in animal sciences especially in wildlife.
PSO10	Focus to prepare them with research-oriented approach in frontier areas of research in Wildlife Biology and preparing them for carrying out advance research.

Program Outcomes (POs)	
On successful completion of the M. Sc. Zoology(Wildlife Biology) program	
PO1	Expected to attain written skills via assignment, reports , seminar & projects
PO2	To develop presentation & communication skills through research
PO3	To attain analytical skills like understanding & interpreting the results
PO4	To know the basics of instrumentation
PO5	To develop taxonomical skills in identifying the animal species
PO6	To learn about animal biodiversity, forest ecosystems
PO7	To understand animal by studying the biology, anatomy, physiology etc.,
PO8	To create an awareness of the impact of Zoology on the environment, forestry and development outside the scientific community.
PO9	To study and understand the classification of whole phyla includes in Non chordates with the help of charts/models/pictures/videos
PO10	To inculcate the scientific temperament in the students and creating interest in research.

BHARATHIAR UNIVERSITY : COIMBATORE 641 046
M.Sc., ZOOLOGY(Wildlife Biology) DEGREE COURSE (COLLEGES - CBCS PATTERN)
REVISED SCHEME OF EXAMINATION
(For the students admitted during the academic year 2021 – 22 onwards

Course Code	Paper	Title of the Course	Credits	Hours		Maximum Marks		
				Theory	Practical	CIA	ESE	Total
		FIRST SEMESTER						
13A	Core I	Structure and functions of Invertebrates	4	6	-	50	50	100
13B	Core II	Comparative anatomy of Chordates	4	6	-	50	50	100
13C	Core III	Animal Biodiversity & Conservation	4	6	-	50	50	100
13D	Core IV	Environmental Biology	4	6	-	50	50	100
23P	Practical I	(Comprises of Papers I,II&III)	-	-	2	-	-	-
23Q	Practical II	(Comprises of Papers IV&V)	-	-	2	-	-	-
23R	Practical III	(Comprises of Papers VI,VII&VIII)	-	-	2	-	-	-
		Total	**16**					**400**
		SECOND SEMESTER						
23A	Core V	Biochemistry	4	6	-	50	50	100
23B	Core VI	Cell & Molecular Biology	4	6	-	50	50	100
23C	Core VII	Developmental Biology	4	6	-	50	50	100
23D	Elective I	Vertebrate biology & conservation	4	6	-	50	50	100
23P	Practical I	(Comprises of Papers I,II&III)	4	-	2	50	50	100
23Q	Practical II	(Comprises of Papers IV&V)	4	-	2	50	50	100
23R	Practical III	(Comprises of Papers VI,VII&VIII)	4	-	2	50	50	100
		Total	**28**					**700**
		THIRD SEMESTER						
33A	Core IX	Comparative Animal Physiology	4	6	-	50	50	100
33B	Core X	Evolution	4	6	-	50	50	100
3EC	Core XI	Genetics	4	5	-	50	50	100
3EB	Elective II	Forestry, Silviculture and Entomology	4	5	-	50	50	100
43P	Practical IV	(Comprises of Papers IX&X)	-	-	2	-	-	-
43Q	Practical V	(Comprises of Papers XI)	-	-	2	-	-	-
43R	Practical VI	Wildlife management techniques, Forestry, Silviculture and Entomology (Elective II & III)	-	-	2	-	-	-
4ES	Practical VII	Ethology (Elective IV)	-	-	2	-	-	-
		Total	**16**					**400**
		FOURTH SEMESTER						
43A	Elective III	Wildlife management techniques	4	6	-	50	50	100
43B	Elective IV	Ethology	4	6	-	50	50	100
4EC	Paper XV	Project & viva – voce	12	-		50	100*	150
43P	Practical IV	(Comprises of Papers IX&XI)	4	-	2	50	50	100
43Q	Practical V	(Comprises of Papers X&XII)	4	-	2	50	50	100

43R	Practical VI	Wildlife management techniques, Forestry, Silviculture and Entomology (Elective II & III)	4	-	2	50	50	100
43S	Practical VII	Ethology r Elective -IV)	4	-	2	50	50	100
		Total	**36**					**750**
		Grand Total	**90**					**2250**

*For Project 200 marks (Project work =100 marks and Viva-voce =50 marks).

Project Guidelines:

1. Internal and external examiners will evaluate the project work and award marks out of 160.
2. Internal and external examiners will conduct viva-voce examination and award marks out of 40.

****

First Semester

Course code	13A	STRUCTURE AND FUNCTIONS OF INVERTEBRATES	L	T	P	C
Core/Elective/Supportive		Core Paper I	6	0	0	4
Pre-requisite		Basic knowledge about Invertebrate forms and their functions	Syllabus Version	2021 – 2022		

Course Objectives:

The main objectives of this course are:

1. To understand about the procedures and trends in taxonomy.
2. To understand important physiological functions in various Invertebrate forms.
3. To know about the larval forms of Invertebrates.
4. To know about the organization of Minor Phyla and its characters.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand concepts of taxonomy, its procedures, methods in collection and preservation of animals as well as classification of animals based on coelom.	K 2
2	Categorise locomotory organs, methods of locomotion, feeding and digestion in various Invertebrates.	K 3
3	Understand about organs of respiration, respiratory pigments, their mechanism, organs and products of excretion, mechanism and its relation to osmoregulation.	K 2
4	Discern the organization and function of nervous system in various Invertebrates and its evolutionary advances.	K 4
5	Integrate the strategies and evolutionary significance of free living and parasitic larval forms of Invertebrates as well as organization and characters of Minor Phyla groups.	K 5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	PRINCIPLES OF ANIMAL TAXONOMY	15 hours

Species concept; International code of Zoological nomenclature - Taxonomic procedures. New trends in taxonomy - Animal collection, handling and preservation - Organization of coelom – Acoelomates – Pseudocoelomates - Coelomates: Protostomia and Deuterostomia.

Unit:2	LOCOMOTION,NUTRITION AND DIGESTION	15 hours

Locomotion: Pseudopodia - Flagella and ciliary movement in Protozoa - Hydrostatic movement in Coelenterata, Annelida and Echinodermata - Nutrition and Digestion: Patterns of feeding and digestion in lower Metazoan - Filter feeding in Polychaeta, Mollusca and Echinodermata

Unit:3	RESPIRATION AND EXCRETION	15 hours

Respiration: Organs of respiration: gills, lungs and trachea - Respiratory pigments - Mechanism of respiration – Excretion: Organs and products of excretion - coelom, coelomoducts, nephridia and Malphigian tubules - Mechanisms of Excretion - Excretion and Osmoregulation.

Unit:4	NERVOUS SYSTEM	15 hours

Nervous system: Primitive nervous system: Coelenterata and Echinodermata - Advanced nervous system: Annelida, Arthropoda (Crustacea and Insecta) and Mollusca (Cephalopoda) - Trends in neural evolution.

Unit:5	LARVAL FORMS AND MINOR PHYLA	15 hours
Invertebrata larvae: Larval forms of free living invertebrates - Larval forms of parasites - Strategies and evolutionary significance of larval forms - Minor Phyla - Organization and general characters, morphology, anatomy and affinities of Rotifera, Phoronida and Chaetognatha.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars, Conferences and Workshops		
	Total Lecture hours	**77 hours**

Text Book(s)

1	Parker, T,J., Haswell, W.A. Text Book of Zoology (1962), Macmillan Co., London
2	Barnes, R.D. Invertebrate Zoology (1968), III edition. W.B. Saunders Co., Philadelphia
3	Barrington, E.J.W. Invertebrate structure and function (1967). Thomas Nelson and Sons Ltd., London
4	Young, J.Z. Life of Invertebrates (2004), Clarendon Press, Oxford.

Reference Books

1	Hyman, L.H. The invertebrates (1951). Vol. l Protozoa through Ctenophora, McGraw Hill Co., New York
2	Hyman, L.H. The Invertebrates (1951). Vol.2. McGraw Hill Co., New York.
3	Hyman, L.H. The Invertebrate smaller coelomate groups, (1951). Vol.5. McGraw Hill Co., New York
4	Hyman, L.H. The Invertebrates (1951). Vol.8. McGraw Hill Co., New York and London
5	Russel-Hunter, W.D. A biology of higher Invertebrates (1969), the Macmillan Co. Ltd., London
6	Jagerstein, G. Evolution of Metazoan life cycle (1972), Academic Press, New York & London.
7	Narendran, T.C. An Introduction to Taxonomy (2009), Zoological Survey of India.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	Systems Biology (NPTEL) web https://nptel.ac.in/courses/102/106/102106035/

Course Designed By: Dr. K. Sakthi Shree, Head and Associate Professor of Zoology, GAC, Coimbatore.

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	S	S	L	S	M	S	S	M	L
CO2	S	M	M	L	S	S	S	M	S	M
CO3	S	M	M	L	S	S	S	M	S	M
CO4	L	L	L	L	S	M	S	M	S	S
CO5	M	M	S	L	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Course code	13B	COMPARATIVE ANATOMY OF CHORDATES	L	T	P	C
Core/Elective/Supportive		Core Paper II	6	0	0	4
Pre-requisite		Basic knowledge about vertebrate anatomy and physiology	Syllabus Version		2021 – 2022	

Course Objectives:

The main objectives of this course are

1. To understand about vertebrate morphology and its origin.
2. To study about structure and function of Protochordate types.
3. To study about vertebrate classification and development, structure and function of integument types.
4. To understand the flow of blood and evolution of circulatory organs and process of respiration.
5. To know about the various aspects of skeletal system and evolution of urinogenital system
6. To understand the working of nervous system and sense organs.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the origin of Chordata, concept of Protochordata, importance of Vertebrate morphology and biology of some Protochordates.	K2
2	Comprehend about Vertebrate classification, as well as structure and function of integument and its derivatives.	K2
3	Analyze the evolution of heart, aortic arches and portal systems, blood components as well as respiratory mechanisms and organs in various Vertebrates.	K4
4	Distinguish the comparative form and function of skeletal system and its parts and analyze the evolution of urinogenital system in different Vertebrates.	K2& K5
5	Analyze comparatively the anatomy of nervous system and its components in different Vertebrates as well as receptors of olfaction, taste and hearing and other organs.	K4

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	PROTOCHORDATA AND CHORDATE MORPHOLOGY	15 hours

Origin of Chordata: Concept of Protochordata - The nature of vertebrate morphology - Definition, scope and relation to other disciplines - Importance of the study of vertebrate morphology, Biology of Cephalochordata, Hemichordata and Urochordata.

Unit:2	VERTEBRATE CLASSIFICATION AND INTEGUMENT	15 hours

Origin and classification of vertebrates. Vertebrate integument and its derivatives - Development, general structure and functions of skin and its derivatives - Glands, scales, horns, claws, nail, hoofs, feathers and hairs.

Unit:3	CIRCULATION AND RESPIRATION	15 hours

Blood - Evolution of heart - Evolution of aortic arches and portal systems - Respiratory system - Characters of respiratory tissue - Internal and external respiration - Comparative account of respiratory organs in Vertebrate classes.

Unit:4	SKELETAL SYSTEM AND URINOGENITAL SYSTEM	15 hours

Skeletal system: Form, function, body size and skeletal elements of the body - Comparative account of jaw suspensorium, vertebral column - Limbs and girdles - Evolution of urinogenital system in different vertebrates (Pisces, Amphibians, Reptiles, Birds and Mammals).

Unit:5	NERVOUS SYSTEM AND SENSE ORGANS	15 hours
Nervous system - Comparative anatomy of the brain in relation to its functions - Comparative anatomy of spinal cord – Nerves-Cranial, Peripheral and Autonomous nervous system. Sense organs: Simple receptors - Organs of olfaction, taste and hearing - Lateral line system- Electroreception		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**77 hours**

Text Book(s)

1	Kingsley J S. Outline of Comparative Anatomy of Vertebrates (1974). Central Book Depot, Allahabad.
2	Kent, George C &Carr, Robert K. Comparative Anatomy of Vertebrates(2009), Mc Graw-Hill Science.
3	Young, J.Z. Life of vertebrates (1950). The Oxford University Press, London.
4	Weichert, C.K. and Presch, W. Elements of chordate anatomy , 4th Edn. McGraw Hall Books Co., New York
5	Malcom Jollie, Chordata morphology. East-West Press Pvt. Ltd., New Delhi.

Reference Books

1	Smith, H.S. Evolution of chordate structure (1960). Hold Rinehart and Winstoin Inc., NewYork
2	MilltonHilderbrand. Analysis of vertebrate structure(1988). IV. Ed. John Wiley and Sons Inc., New York.
3	Romer, A.S. Vertebrate body (1949), IIIrd Ed. W.B. Saunders Co., Philadelphia.
4	Montagna, W. Comparative anatomy (1960). John Wiley and Sons Inc.
5	Walters, H.E. and Sayles, L.D. Biology of vertebrates (1959). Macmillan & Co., New York
6	Torrey, T.W. Morphogenesis of vertebrates (1963), John Wiley and Sons Inc.,New York and London
7	Colbert, E.H. Evolution of the vertebrates (1969), John Wiley and Sons Inc., New York.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	General Human Anatomy (WMA): https://www.mooc-list.com/course/general-human-anatomy-wma
2	Evolutionary Biology: https://onlinecourses.swayam2.ac.in/cec20_bt06/preview

Course Designed By: Dr. K. Sakthi Shree, Head and Associate Professor of Zoology, GAC, Coimbatore.

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	M	L	S	S	S	L	S	M
CO2	S	M	L	L	S	S	S	S	S	M
CO3	M	L	M	L	S	S	S	S	S	M
CO4	S	M	M	L	S	S	S	S	S	M
CO5	S	M	M	L	S	S	S	S	S	M

*S-Strong; M-Medium; L-Low

Course code	13C	ANIMAL BIODIVERSITY AND CONSERVATION	L	T	P	C
Core/Elective/Supportive		Core Paper III	6	0	0	4
Pre-requisite		Basic knowledge about animal biodiversity and conservation	Syllabus Version		2021-2022	

Course Objectives:

The main objectives of this course are to:
1. Acquire the knowledge of biodiversity in different geographical areas.
2. Understand the strategies evolved to conserve biodiversities and their habitats.
3. Know the measures in vogue to restore the biodiversity and environment.
4. Levels of organization in animals.
5. Analyze the evolutionary affinities of vertebrates.
6. Create awareness against wildlife crimes and pollution in conserving biodiversity.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1.	Understand the significance of conservation of biodiversity.	K2
2.	Appreciate the various conservation strategies to protect biodiversity.	K4
3.	Know the comparative anatomy and evolutionary affinities of vertebrates.	K2
4.	Admire the values of ethical committee in animal research	K3
5.	Develop awareness against wildlife crimes and wildlife degradation	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	BIODIVERSITY	15 hours

Biodiversity – Types: Genetic, species and ecological diversities - Species – Endemic, Keystone, flagship and ecological indicator - Major Biomes of India and wildlife diversity - Tropical Humid Forests, Tropical Deciduous Forests, Tropical rain forests, Warm deserts and semi-deserts, Coniferous forests and Alpine meadows- Hotspots – significance of Western Ghats, Indo-Burma region and Gulf of Mannar - Biosphere reserves of India - Rare endemic and endangered species of India – IUCN Red list category.

Unit:2	CONSERVATION BIOLOGY	15 hours

In-situ and Ex-situ conservation - Project Tiger and Project Elephant - Population explosion - Deforestation, Human animal conflicts, Poaching, Forest fire and Afforestation - CITES - Convention on International Trade in Endangered Species of Wild Fauna and Flora - Animal ethics – Ethical committee Discontinuation of dissection in educational institutions - Biodiversity measurement – significance - Simpson's diversity index.

Unit:3	SYSTEMATIC ZOOLOGY	15 hours

Species concept - Levels of structural organization – Unicellular – Multicellular forms – Colonial - Levels of organization: Kingdom Animalia – salient features of all phylum – classification up to class for invertebrates and up to orders for vertebrates with examples

Unit:4	SCOPE AND IMPORTANCE OF WILDLIFE OF INDIA	15 hours

India - the country of mega wildlife biodiversity - Objectives of wildlife conservation - Biodiversity loss and causes of wildlife depletion - Biodiversity and climate change - Economic importance of wildlife.

Unit:5	MODERN CONCEPTS IN WILDLIFE CONSERVATION	15 hours

Wildlife Crimes: Wildlife forensics and its applications in detecting wildlife crimes - Wildlife toxicology:

Types of contaminants, concentration, bio accumulation and bio magnifications in wildlife populations - Environmental Impact Assessment (EIA) Methods and their role in wildlife conservation - Geographical information system - Biodiversity exploration & conservation - Artificial intelligence technology in conserving biodiversity-Environmental policy of India and legislations.		
Unit:6	**Contemporary Issues**	**2 hour**
Expert lectures, online seminars – webinars,		
	Total Lecture hours	**77 hours**

Text Book(s)

1.	Textbook of Biodiversity - K V Krishnamurthy, by Science Publishers (2003).
2.	Glimpses of Biodiversity (2002)- B.Blosetti.
3.	Biodiversity: An Introduction (2004), 2nd Edition- Kevin J. Gaston, John I. Spicer, Wiley- Blackwell.
4.	Comparative Anatomy, Function, Evolution (1994) – Kenneth V.Kardong
5.	The life of vertebrates – J.Z.Young 6. Comparative anatomy – Nigam
6.	Manual of Zoology – EgambaranatharIyyer
7.	The life of vertebrates – J.Z.Young
8.	An advanced Text book on biodiversity: Principles and Practice – K.V. Krishnamurthy

Reference Books

1.	Biodiversity loss in the 21stCentuary – Griffin. N
2.	Glimpses of Biodiversity- B.Blosetti.
3.	Agrobiodiversity -David Wood, Jillian M. Lenné, CABI Pub., Nature
4.	Biodiversity -WILLIAM MN
5.	Biodiversity: Conserving Endangered Species - Anne Elizabeth Maczulak
6.	Conservation - Clive Hambler, Susan M. Canney

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	Ecology and Wildlife Conservation (FutureLearn): https://www.mooc-list.com/course/ecology-and-wildlife-conservation
2	Wildlife Conservation: https://nptel.ac.in/courses/102/104/102104068/
3	Wildlife Ecology: https://swayam.gov.in/nd1_noc20_bt38/preview

Course Designed By: Dr. A. Thangaraj, Assistant Professor, Department of Zoology, Chikkaiah Naicker College, Erode-4.

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	L	S	S	M	M	M	S
CO2	S	S	S	L	S	S	M	M	M	S
CO3	S	S	S	L	S	S	S	S	S	S
CO4	S	S	S	L	S	M	M	M	S	S
CO5	S	S	S	L	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Course code	13D	ENVIRONMENTAL BIOLOGY	L	T	P	C
Core/Elective/Supportive		Core Paper IV	6	0	0	4
Pre-requisite		Basic understanding about our own environment	Syllabus Version		2021-2022	

Course Objectives:

The main objectives of this course are,

1. To explain the core concepts of ecology for a better understanding of the environment.
2. To motivate,identify and solve environmental problems.
3. To create awareness about the improvement and protection of the environment.
4. To make understand the need for conservation of biodiversity and natural resources.
5. To help understand the concepts of exobiology.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand the ecological dynamics and the significance of environmental integrity	K2
2	Recognize various global and regional environmental concerns that affectsthe biosphere and analyze the impact of human activities on the environment.	K1
3	Appreciate the significance of the conservation of native biodiversity.	K4
4	Scrutinize specific cases of environmental pollution and challenges, and their impacts on ecology.	K5
5	Apply knowledge of chemistry, biology, molecular biology and microbiology to arrive at innovative solutions to environment issues and extra-terrestrial habitats	K3

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	THE ENVIRONMENT	15 hours

Scope of environmental biology - Physical and biotic components of environment and their interactions - Habitat and Niche – Concepts - niche width and overlap- fundamental and realized niche- resource partitioning; character displacement - Limiting factors: light and temperature - effect on organisms.

Unit:2	POPULATION ECOLOGY	15 hours

Characteristics of a population- population growth curves- population regulation - Life history strategies (r and K selection) - Concepts of metapopulation – demes and dispersal, interdemic extinctions and age structured populations - Species Interactions: Types of animal interactions – Neutralism, symbiosis and antagonism.

Unit:3	COMMUNITY ECOLOGY	15 hours

Nature of communities- community structure and attributes - Levels of species diversity and its measurement; edges and ecotones - Ecological Succession: Types- mechanisms- concept of climax - Animal migration: Fish, Bird and mammals.

Unit:4	ECOLOGY OF ECOSYSTEM	15 hours

Ecosystem: Typical structure - functions- energy flow - Primary production and decomposition – Ecological pyramids - Biogeochemical cycles (C, N, P) - Indian ecosystems: Structure and function - terrestrial (forest, grassland) and aquatic (fresh water, marine, estuarine) - Biogeography: Major terrestrial biomes- theory of island biogeography- biogeographical zones of India.

Unit:5	APPLIED ECOLOGY	15 hours
Biodiversity: status, monitoring and documentation - Global environmental issues and remedies: Pollution, climate change and global warming – solid waste management - Conservation biology: Principles of conservation and management of Indian biosphere reserves – Deforestation - Exobiology: Ecological conditions of space - Physiological changes in man during space travel - Concepts of Controlled Ecological Life Support System (CELSS).		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars, Workshop		
	Total Lecture hours	**77 hours**

Text Book(s)

1	Odum: Fundamentals of Ecology (1953)
2	Odum: Basic Ecology (1983)
3	Turk and Turk: Environmental Science
4	Environmental biology – Dr.P.S. Verma & Dr. V.K. Agarwal

Reference Books

1	Controlled Ecological Life Support system – NASA conference publication (2378) (e-content)
2	Environmental Science: Earth as a Living Planet by Daniel B. Botkin, Edward A. Keller
3	Environmental Science: Systems and solutions – Michael L. McKinney & Robert M.Schoch.
4	Ecology and Environment – P.D. Sharma

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	Primark: A Primer of Conservation Biology
2	Calabrese: Pollutants and High-Risk Groups
3	Controlled Ecological Life Support system – NASA conference publication (2378) (e-content)

Course Designed By: Dr. A. Thangaraj, Assistant Professor, Department of Zoology, Chikkaiah Naicker College, Erode-4.

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	L	S	S	S	S	S	S
CO2	S	S	S	L	S	S	M	S	L	S
CO3	S	S	S	L	S	S	M	S	L	S
CO4	S	S	S	L	L	M	L	M	S	S
CO5	S	S	S	L	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Second Semester

Course code	23B	BIOCHEMISTRY	L	T	P	C
Core/Elective/Supportive		Core Paper VI	6	0	0	4
Pre-requisite		Basic knowledge about Biochemistry	Syllabus Version		2021-2022	

Course Objectives:

The main objectives of this course are to:

1. To understand the fundamental principles that governs complex biological systems.
2. To understand the molecular machinery of living cells and mechanisms of metabolic control.
3. To demonstrate knowledge and understanding basic biological and chemical facts and to be familiar in the concepts in biochemistry.
4. To gain knowledge about principles of chemical reactivity, bonding, thermodynamics and Kinetics.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	The student will learn about structure of atoms, chemical bonds and get knowledge about principles of biophysical chemistry	K2
2	Learn about the chemical nature of biomolecule, their structural and metabolic role in cellular system.	K2
3	Gain knowledge about enzymes, mechanism of enzyme action and able to identify the enzyme kinetics..	K3
4	Understand the simple changes in molecules and interactions in biochemical process and cellular functions.	K4
5	Understand and analyze the structure and properties of Nucleosides and Nucleotides.	K4

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	BASIC PRINCIPLE	15 hours

Structure of atoms, molecules and chemical bonds
Principles of biophysical chemistry (pH, buffer, reaction kinetics, thermodynamics, colligative properties).

Unit:2	STABILIZING INTERACTION	15 hours

Stabilizing interactions (Van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction, etc.). Composition, nature of bonds/linkages, structure of biomolecules (carbohydrates, lipids, proteins, nucleic acids and vitamins).

Unit:3	BIOENERGETICS	15 hours

Bioenergetics, glycolysis, oxidative phosphorylation, coupled reaction, group transfer, biological energy transducers. Principles of catalysis, classification of enzymes and enzyme kinetics, enzyme regulation, inhibitors of enzymes - mechanism of enzyme catalysis, isozymes

Unit:4	CONFORMATION OF PROTEINS	15 hours

Conformation of proteins (Ramachandran plot, primary, secondary, tertiary and quaternary structures, domains, motif and folds). Conformation of nucleic acids (helix (A, B, Z), t-RNA, micro-RNA).

Unit:5	METABOLISM	15 hours

Stability of proteins and nucleic acids. Metabolism of amino acids, carbohydrates, lipids, nucleotides and vitamins.

Unit:6	Contemporary Issues	2 hours
Expert lectures, online seminars – webinars		
	Total Lecture hours	77 hours

Text Book(s)	
1	Arumugam. (2016). *Fundamentals of Biochemistry*, Saras publication, Nagercoil, Tamilnadu
2	Prasanna Kumar S, Arumugam N, Narayanan LM, Meyyan RP and Nallasingam K. (2019). *Biochemistry*, 6th edition, Saras publication, Nagercoil, Tamilnadu.
3	Satyanarayana, chakrapani. (2017). *Biochemistry*, 5th edition, Elesvier Publication, India.
4	Seema Pavgi Upadhye. (2020).*Textbook of Biochemistry*, Publication, Dreamtech Press, India.
Reference Books	
1	Appling Dean R, Anthony-Cahill Spencer J and Mathews Christopher K. (2017). 1st edition, *Biochemistry*, Concepts and Connections, Pearson Education Publication, India.
2	Naik P. (2012).*Essentials of Biochemistry*, 2nd edition, Jaypee Brothers Medical Publication, New Delhi.
3	Voet D and Voet JG. (2016). *Biochemistry*, 5th edition, John wiley and Sons, New Jersey.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	Biochemistry: https://swayam.gov.in/nd1_noc20_cy10/preview
2	Biochemistry & Molecular Biology: https://swayam.gov.in/nd2_cec19_bt02/preview
3	Biochemistry: Biomolecules, Methods, and Mechanisms (edX): https://www.mooc-list.com/course/biochemistry-biomolecules-methods-and-mechanisms-edx
Course Designed By: Dr. A.Rajarajeswari, Assistant Professor of Zoology, SVC, Erode	

Mapping with Programme Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	M	L	L	M	M	L	S
CO2	S	S	S	M	L	L	M	M	L	S
CO3	S	S	S	M	L	L	M	M	L	S
CO4	S	S	S	M	L	L	M	M	L	S
CO5	S	S	S	M	L	L	M	M	L	S

*S-Strong; M-Medium; L-Low

Course code	23C	CELL AND MOLECULAR BIOLOGY	L	T	P	C
Core/Elective/Supportive		Core Paper VII	6	0	0	4
Pre-requisite		Basic knowledge about Cell and its functions	Syllabus Version	2021-2022		

Course Objectives:

1. To provide an overview of cell structure, basic components of cells and their function..
2. To learn the fundamental concepts of cell structure, dynamic character of cellular organelles and relationship between molecular levels.
3. To make aware of how cellular components generate and utilize energy inside the cells.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understand and apply the principles and techniques of molecular biology in basic research, or in the health professions.	K3
2	Gain knowledge about molecular level regulation of cellular processes, cell signalling, transportation and proliferation in cells.	K2
3	Analyze the picture of the cellular environment and regulation of cellular process at the molecular level.	K4
4	Students will learn about the mechanisms and regulation of cell communication, gene expression, genome maintenance and regulation involved in the flow of genetic information.	K4
5	Ensuring accurate macromolecular biosynthesis, unity and diversity at the molecular and cellular levels and the relationship.	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	INTRODUCTION OF BIOMEMBRANE	15 hours

Introduction – experimental systems in Cell Biology Biomembranes - Molecular composition and arrangement functional consequences - Transport across cell membrane- Diffusion, active transport and pumps and uniports, symports and antiport - Membrane potential - Co-transport by symports or antiporters - Transport across epithelia.

Unit:2	CYTOSKELETON	15 hours

Microfilaments and microtubules-structure and dynamics - Microtubules and mitosis - Cell movements-intracellular transport, role and kinesin and dynein, signal transduction mechanisms Cilia and flagella - Cell-cell signalling - Cell surface receptors - Second messenger system - MAP kinase pathways - Signalling from plasma membrane to nucleus.

Unit:3	CELL- CELL ADHESION AND COMMUNICATION	15 hours

Ca++ dependent homophilic cell-cell ahension - Ca++ independent homophilic cell-cell ahension Gap junctions and connexions - Cell matrix adhesion – Integrins – Collagen - Non-collagen components - Cell cycle - cyclins and cyclin dependent kinases - Regulation of CDK-cycline activity.

Unit:4	GENOME ORGANIZATION	15 hours

Hierarchy in organization - Chromosomal organization of coding and non-coding DNA – Regulation of gene expression - Mobile DNA - Morphological and functional elements of eukaryotic chromosomes - Genetic analysis in Cell Biology.

Unit:5	INTRACELLULA RPROTEIN TRAFFIC	15 hours
Protein synthesis on free and bound polysomes - Uptake into ER - Membrane proteins, Golgi sorting, post-translational modifications - Biogenesis of mitochondria, and nuclei - Trafficking mechanisms - Biology of cancer - Biology of aging - Apoptosis-definition, mechanism and significance.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**77 hours**

Text Book(s)

1	Arumugam N, (2007) 6 th edition. *CellBiology*, Saras Publications,Nagercoil.
2	Meyyan RP. (2005). Cell Biology, Saras Publications, Nagercoil.
3	Singh SP and Thomas BS. (2012). *Cellbiology*. Rastogi Publications, Meerut - 02,
4	Verma, PS and Agarwal VK (2004). *Cell biology, Genetics, Molecular Biology, Evolution and Ecology*. S.Chand& Company Ltd. New Delhi.

Reference Books

1	Chariotte J. Averse. (1995). *MolecularCellBiology*. AddisionWesley Publ. Co.
2	De Robertis EDP and De Robertis EMF, (1987).*CellandMolecularBiology*, Lippincott Williams &Wilkins., India.
3	Gupta PK., (2008). *Cellandmolecularbiology*, Rastogi publications, Shivaji Road, Meerut
4	Power CB. (2009).*CellBiology*, Himalaya Publishing House, Mumbai.
5	Tomar and Singh, (1999). *CellBiology*. Rastogi Publication, Meerut.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://www.classcentral.com/course/swayam-cell-biology-13937
2	https://www.universalclass.com/i/course/cell_molecular_biology_101.htm
3	https://www.edx.org/learn/cellular-biology

Course Designed By: Dr. A.Rajarajeswari, Assistant Professor of Zoology, SVC, Erode

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	L	L	M	M	L	M
CO2	S	S	S	S	L	L	M	M	L	M
CO3	S	S	S	S	L	L	M	M	L	M
CO4	S	S	S	S	L	L	L	L	L	M
CO5	S	S	S	S	L	L	L	L	L	M

*S-Strong; M-Medium; L-Low

Course code	23D	DEVELOPMENTAL BIOLOGY	L	T	P	C
Core/Elective/Supportive		Core Paper VIII	6	0	0	4
Pre-requisite		Basic information on animal embryology	Syllabus Version		2021-2022	

Course Objectives:

The main objectives of this course are to:

1. To make aware of the students about the theories, concepts and basics of Developmental Biology.
2. To provide students the idea of sex cells, fertilization, cleavage, differentiation and development of organs.
3. To make aware of the induction, organizers and development of extra embryonic structures.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	The learner will be able to understand methodological approaches to the study of embryonic development and the characteristics of the principle experimental models.	K2
2	The students will be able to identify embryonic structures in preparations, photographs and diagrams	K5
3	The students will able to develop an idea, how to arrange sequences in developmental processes in order.	K4
4	The learner will be able to understand the derivatives of embryonic structures.	K2
5	The students will attain a basic conceptual knowledge of the principle cellular mechanisms of development and identify the genetic and molecular elements that are involved.	K4

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	BASIC CONCEPTS OF DEVELOPMENT	15 hours

Potency, commitment, specification, induction, competence, determination and differentiation; morphogenetic gradients; cell fate and cell lineages; stem cells; genomic equivalence and the cytoplasmic determinants; imprinting; mutants and transgenics in analysis of development

Unit:2	GAMETOGENESIS, FERTILIZATION AND EARLY DEVELOPMENT	15 hours

Production of gametes, cell surface molecules in sperm-egg recognition in animals; zygote formation, cleavage, blastula formation, embryonic fields, gastrulation and formation of germ layers in animals; embryogenesis, establishment of symmetry.

Unit:3	MORPHOGENESIS AND ORGANOGENESIS IN ANIMALS	15 hours

Cell aggregation and differentiation in *Dictyostelium;* axes and pattern formation in *Drosophila*, amphibia and chick; organogenesis – vulva formation in *Caenorhabditis elegans*, eye lens induction, limb development and regeneration in vertebrates; differentiation of neurons, post embryonic development- larval formation, metamorphosis; environmental regulation of normal development; sex determination.

Unit:4	NEOTENY AND REGENERATION	15 hours
Neoteny: Occurrence and significance – Regeneration: Regenerative capacity in the Animal Kingdom – Factors influencing regeneration – Stimulation and Suppression – Polarity and Gradients – Development of immune system in vertebrates.		
Unit:5	**AGING AND ASSISTED REPRODUCTIVE TECHNOLOGY**	**15 hours**
Programmed cell death, aging and senescence - Assisted Reproductive Technology (ART) – Male infertility – Sperm abnormalities – Superovulation – IVF, ICSI, GIFT – Screening of genetic disorders.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars		
	Total Lecture hours	**77 hours**

Text Book(s)	
1	Balinsky., Introduction to Embryology (1960)
2	Grant, Biology of Developing System (1978)
Reference Books	
1	Austen, C.R. and short, R.V., Reproduction in animals (1989).
2	Schatten and Schatten. Molecular biology of fertilization (2012).
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	NOC: Introduction to Developmental Biology, Prof. Subramaniam K, IIT Madras, https://nptel.ac.in/courses/102/106/102106084/]
Course Designed By: Dr. A. Reniprabha, Head and Associate Professor, CN College, Erode-4	

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	M	L	M	M	L	S
CO2	S	S	S	S	M	L	M	M	L	S
CO3	S	S	S	S	M	L	M	M	L	S
CO4	S	S	S	S	M	L	M	M	L	S
CO5	S	S	S	S	M	L	M	M	L	S

*S-Strong; M-Medium; L-Low

Course code	23D	VERTEBRATE BIOLOGY AND CONSERVATION	L	T	P	C
Core/Elective/Supportive		Elective I	6	0	0	4
Pre-requisite		Basic information about Importance and Conservation of Wildlife	Syllabus Version	2021-2022		

Course Objectives:

The main objectives of this course are to:

1. To develop awareness about the application of vertebrate biology and application in wildlife biology.
2. To learn the taxonomy and classification of animals.
3. To study about economic importance of animals and health care of wild animals.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Understanding the beneficial role of animals.	K2
2	To elucidate various reason for infectious and non-infectious diseases among wild animals.	K5
3	The course will give an idea about ex-situ management of animals.	K4
4	The students will be capable of interpreting and understanding wildlife administration and legislation of wild animals.	K2
5	The learners will be trained in animal keeping, Handling, Feeding, Transport and Captive breeding.	K4

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	TAXONOMY AND IDENTIFYING CHARACTER	18 hours

Taxonomy & Identifying Characters of Fishes, Amphibians and Reptiles (upto orders). Fish migration- Hill stream adaptations. Parental care in amphibians& Fishes – Venomous, mildly-venomous & Non venomous snakes – Economic importance of Reptiles & fishes.

Unit:2	TAXONOMY AND IDENTIFYING CHARACTER OF BIRDS and MAMMALS	18 hours

Taxonomy& Identifying Characters of Birds (upto orders) and Mammals (upto family) with examples. Migration of birds – Bird watching – Feet and beak modifications – Nesting behavior –Endemic birds of Western Ghats- Economic value of birds and mammals

Unit:3	HEATH CARE OF WILDLIFE	16 hours

Infectious wildlife diseases: viral (rabies, rinder pest, foot and mouth, viral-encephalities, yellow fever) bacterial (anthrax, brucellosis, clostridiosis, listeriosis), protozoan (trypanosomiasis-toxoplasmosis-babesiosis-coccidiosis) helminth diseases: (Fasciolopsis-schistosomiasis-taeniosis-hydatidosis). Non infectious diseases of wild animals: diseases of the digestive sysytem; stomatitis-catarrhal, gastroenteritis-haemorrhagic gastroenteritis; respiratory system; catarrhal, brochopnemonia-exudative pleurishy, excretory system, paralysis of urinary bladder-urolithiasis.

Unit:4	WILDLIFE ADMINISTRATION AND LEGISTRATION	18 hours

Administrative set up - Advisory bodies - National Board for Wildlife, Wildlife Protection Act 9192) & amendments, Wildlife trade and regulations; biodiversity act (2000) Eco-development,

Eco-restoration and Eco-tourism programmes; Anti-poaching operations; Village forest council; Role of Government and Non-Governmental organizations in wildlife conservation.		
Unit:5	**FORMATION AND MANAGEMENT OF ZOOS**	**18 hours**
Zoo Management - Animal exhibits design & signage - Animal handling, transport & training - food and feeding - National zoo policy - Diseases of zoo animals- their prevention and cure- zoo sanitation; Marketing. Central Zoo Authority, Captive breeding (aims, principles and methods).		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars, Conferences and Workshop and internship programmes		
	Total Lecture hours	**90 hours**

Text Book(s)	
1	R.L. Kotpal. (2007). *Modern Text Book of Zoology – Vertebrates*
2	S. H. Prater. (1971). *Book of Indian Animals*
3	Gray A. Wobeser. (2013). *Essentials of Disease in Wild Animals.* Wiley – Blackwell Publishers
4	Rajesh Jani. (2012). *Basics of Wildlife Health Care and Management.* Narendra Publishing House
5	*The Wild Life (Protection)Act, 1972.(2012).*
6	Rajesh Gopal. (2012) *Fundamentals of WILDLIFE MANAGEMENT.*
Reference Books	
1	Vivek menon . (2003) . *A Field Guide to mammals of India–*
2	JC Daniel . (2002)*– A Book of Indian Reptiles*
3	A.K Gupta. *The Prevention of Cruelty to Animals Act, 1960*
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	**https://canterbury.libguides.com/biol**
Course Designed By: Dr. S VIDYA	

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	S	M	L	M	M	L	S
CO2	S	S	S	S	M	L	M	M	L	S
CO3	S	S	S	S	M	L	M	M	L	S
CO4	S	S	S	S	M	L	M	M	L	S
CO5	S	S	S	S	M	L	M	M	L	S

*S-Strong; M-Medium; L-Low

Course code	23P	STRUCTURE AND FUNCTION OF INVERTEBRATES, COMPARATIVE ANATOMY OF CHORDATES AND ANIMAL BIODIVERSITY & ORGANIZATION	L	T	P	C
Core/Elective/Supportive		PRACTICAL – I	0	0	2	4
Pre-requisite		Fundamental knowledge on animal anatomy and biodiversity	Syllabus Version		2021-2022	

Course Objectives:

The main objectives of this course are to:

1. To understand important physiological functions in various Invertebrate forms.
2. To understand the working of nervous system and sense organs.
3. Acquire the knowledge of biodiversity in different geographical areas.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Attain knowledge about locomotory organs, locomotion,feeding and digestion in various Invertebrates.	K2
2	Integrate the strategies and evolutionary significance of free living and parasitic larval forms of Invertebrates as well as organization and characters of Minor Phyla groups.	K5
3	Understand the origin of Chordata, concept of Protochordata, importance of Vertebrate morphology and biology of some Protochordates.	K1
4	Gain knowledge about Vertebrate classification, as well as structure and function of integument and its derivatives.	K2
5	Appreciate the various conservation strategies to protect biodiversity.	K4

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

STRUCTURE AND FUNCTIONS OF INVERTEBRATA — **12 hours**

1. Comparative study of system: Invertebrata (any two animals)
   Appendages, external morphology, digestive system, nervous system and reproductive system.
2. Culture of earthworm in laboratory to identify the stages.
3. Culture and identification of morphology of Drosophila.

COMPARATIVE ANATOMY OF CHORDATES — **12 hours**

1. Comparative study of system: chordate (any two animals) External morphology, digestive and reproductive system.
2. Identification of Beak and feet in different birds (any locally available birds) Photography of Beak and feet.
3. Comparative study of scales of any preserved fish Cycloid, ctenoid, placoid and ganoid scales.
4. Comparative study of different types of chordate bones (any four animals) Skull, fore limb, hind limb.
5. Morphological modification of limb in fish, amphibia, reptiles, birds and mammals.

ANIMAL BIODIVERSITY AND ORGANIZATION — **12 hours**

1. Plankton identification of from fresh/marine water (5 slides preparation).
2. Quantitative estimation of plankton using haemocytometer.

SPOTTERS (Non-chordate and chordate) (each any five specimens)	**12 hours**
1. Biological importance 2. Medical importance 3. Beneficial pests 4. Evolutionary significance 5. Economic importance	
FIELD STUDY AND FIELD TRIP – Zoological visit, biodiversity area	
Submission at the time of Practical Examination 1. Plankton: 5 slides 2. Report on the Field study and Field trip 3. Bonafide Record	
Total Lecture hours	**88 hours**

Text Book(s)	
1	Advanced Practical Zoology by Sinha, J., Chatterjeee A.K., Chattopadhyay P. 2011. Arunabha Sen Publishers.
2	Practical Zoology Invertebrate by H.S. Bhamrah. 2003. Dominant Publishers.
3	K V. Krishnamurthy. *An Advanced Textbook on Biodiversity Principles and Practice.* Oxford & IBH Publishing Co Pvt. Ltd.

Reference Books	
1	Preeti Guptha and Mridula Chaturvedi. (2000). *Modern Experimental Zoology*
2	Verma.(2000). *Manual of Practical Zoology*: *Chordates* S. Chand Publishing

Course Designed By: Dr. J. Ebanasar

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	S	S	L	S	M	S	S	M	L
CO2	S	M	M	L	S	S	S	M	S	M
CO3	S	M	M	L	S	S	S	M	S	M
CO4	L	L	L	L	S	M	S	M	S	S
CO5	M	M	S	L	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Course code	23Q	ENVIRONMENTAL BIOLOGY, BIOCHEMISTRY,CELL AND MOLECULAR BIOLOGY	L	T	P	C
Core/Elective/Supportive		PRACTICAL - II	0	0	2	4
Pre-requisite		Basic information on ecology, biochemistry ,cell and molecular biology	Syllabus Version		2021-2022	

Course Objectives:

The main objectives of this course are to:

1. Explain core concepts in ecology, and summarize our ecological understanding of environmental problems.
2. To train how the biological data are processed and interpretations are made.
3. To develop skill in understanding & handling molecular science & instrumentation.
4. To elucidate its interaction of molecules.
5. To provide an overview of cell structure, basic components of cells and their function.
6. To provide students the idea of sex cells, fertilization, cleavage, differentiation and development of organs.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Investigate specific cases of environmental pollution or natural challenges & their impact molecular issues	K5
2	The students will be capable of interpreting and understanding the basis of molecular biology and will be trained in preparing solutions and handling instruments at basic level.	K2 & K4
3	Understand the physical and chemical concepts in biology.	K2
4	Understand metabolism of nucleic acid, amino acid and lipid.	K2
5	Understand and apply the principles and techniques of molecular biology in basic research and ensuring accurate unity and diversity at the molecular and cellular levels	K3

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

I. ANALYSIS OF WATER	12 hours

Determination of:

1. pH
2. Total dissolved solids
3. Turbidity / light penetration
4. CO2 and O2
5. Hardness (Temporary and permanent)
6. Calcium and Magnesium

II. BIOCHEMISTRY	12 hours

1. Qualitative and quantitative estimation of Carbohydrates, Proteins and Lipids from the given samples.
2. Preparation of Haemin crystals.
3. Quantitative estimation of Haemoglobin.
4. Separation of plasma, Serum and cells from blood.
5. Colorimetric estimation of glucose from blood
6. Estimation of cholesterol in the blood
7. Estimation of alkaline and acid phosphatases

III. CELL AND MOLECULAR BIOLOGY	12 hours
1. Mounting of Polytene chromosome from the salivary gland of a *Chironomus* larva. 2. Squash preparation of onion root tip to study the stages of Mitosis. 3. Isolation of DNA and RNA from an animal tissue (Demonstration only) 4. Study of different cells from the vertebrate animal (Brain, Liver, Gonad, Kidney and Muscle)	
FIELD TRIPS 1. Visit to – Drinking water treatment plant; Industrial effluent treatment plant; Pollution control lab.	
Submission at the time of Practical Examination 1. Report on the Field study and Field trips 2. Bonafide Record	
Total Lecture hours	**88 hours**

Text Book(s)	
1	Advanced Practical Zoology by Sinha, J., Chatterjeee A.K., Chattopadhyay P. 2011. Arunabha Sen Publishers.
2	Environmental biology and ecology laboratory manual by Lynn. (2003). Kendall Hunt Publishing
Reference Books	
1	Modern Experimental Zoology by Preeti Guptha and Mridula Chaturvedi. 2000
2	Fundamentals of Biochemistry by Jain J.L, Sunjay Jain, Nitin Jain. 2007.
3	Toxicology Laboratory Lab Manual by 5. Oberdorster Eva. 2009. Kendall Hunt Publishing
Course Designed By: Dr. J. Ebanasar	

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	L	S	S	S	S	S	S
CO2	S	S	S	L	S	S	M	S	L	S
CO3	S	S	S	L	S	S	M	S	L	S
CO4	S	S	S	L	L	M	L	M	S	S
CO5	S	S	S	L	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Course code	23R	DEVELOPMENTAL BIOLOGY VERTEBRATE BIOLOGY AND CONSERVATION	L	T	P	C
Core/Elective/Supportive		PRACTICAL - III	0	0	2	4
Pre-requisite		Basic understanding on and developmental biology and vertebrate biology and conservation	Syllabus Version		2021-2022	

Course Objectives:

The main objectives of this course are to:

1. To provide students the idea of sex cells, fertilization, cleavage, differentiation and development of organs.
2. To understand the taxonomy, health care, administration, legislation and management of Zoos.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	The learner will able to understand methodological approaches to the study of embryonic development and the characteristics of the principle experimental models.	K2
2	Understand venomous and non-venomous snakes of India.	K2
3	To make understand the students about feacal load of wild animals.	K3
4	The learner will be able to gain knowledge on ex-situ conservation and captive breeding of wild animals .	K5
5	Mapping of Zoos across the country.	K4

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

DEVELOPMENTAL BIOLOGY:	12 hours

1.Regeneration study in Tadpole/Earth-worm
2. Study the life cycle of *Drosophila melanogaster*.
3. Patterning of the adult wing and *Drosophila* and demonstration of the effect of cell death on the pattering of the adult wing.
4. Effect of Thyroxin on the growth of tadpoles (Demonstration only)
5. Study of Embryonic developmental stages (Frog and Chick)
6. Blastoderm mounting of chick embryo using vital stains

VERTEBRATE BIOLOGY AND CONSERVATION	12 hours

1. Identification of vertebrates for its taxonomical classifications through virtual models.
2. Identification of endo- parasites through feacal analysis.
3. Identification of birds nest using abandoned nests.
4. Designing of animal cages.
5. Preparing food schedules for Zoo animals.
6. Marking the locations oif various Zoos using Indian outline map.

SUBMISSION AT THE TIME PRACTICAL EXAMINATION	12 hours

(Should not exceed 20% of total marks)

1. Training report of Zoo management.
2. Study report of eco-tourism.
3. Study report of eco-development programme.
4. Study report of interpretation centre.

Total Lecture hours	88 hours

Text Book(s)	
1	Wildlife management techniques by Rejesh Gopal.
2	A Manual of Practical Zoology by Verma P. S., 2000. S. Chand Publication.
Reference Books	
1	Clinical Embryology: A Practical Guide by 1. Zsolt Peter Nagy, Alex C. Varghese, Ashok Agarwal. 2013. Springer-Verlag New York Inc
2	Modern Text Book of Zoology: Vertebrates, 2007. R. L. Kotpal.
3	
Course Designed By: Dr. J. Ebanasar	

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	L	L	M	M	L	S
CO2	S	S	S	M	L	L	M	M	L	S
CO3	S	S	S	M	L	L	M	M	L	S
CO4	S	S	S	M	L	L	M	M	L	S
CO5	S	S	S	M	L	L	M	M	L	S

*S-Strong; M-Medium; L-Low

Third Semester

Course code	33A	COMPARATIVE ANIMAL PHYSIOLOGY	L	T	P	C
Core/Elective/Supportive		Core Paper IX	6	0	0	5
Pre-requisite		Basic knowledge about the physiological activities of all the systems in both non-chordates and chordates	Syllabus Version		2021-2022	

Course Objectives:

The main objectives of this course are to:

1. To study about the adaptive characters in animals
2. To acquire knowledge on the physiological aspects about all organ systems.
3. To acquire knowledge on the osmo and thermoregulatory mechanisms.
4. Understand the concepts of hormonal activities
5. To understand the role of hormones in the biological activities such as pregnancy and lactation

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Acquire the knowledge of organisms surviving in various environments.	K4
2	Learn the significance of osmo and thermo regulations to cope well with the ecological stress	K3
3	Understand the physiological responses of the meditation practices in human	K2
4	Factors involved in the mechanism of respiratory, excretory physiology, neural and muscular physiology and the influence of hormones in reproduction.	K2
5	Evaluate the various mode of life and adaptive modification of their organ systems in animals	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit: I	ADAPTATION AND HOMEOSTASIS	18 hours

Adaptation - Levels and Mechanism of adaptation - Significance of body size – Adaptation, acclimation and acclimatization - Concepts of homeostasis. Physiological adaptations of different environments: Marine - Shores and Estuaries – Freshwater - Extreme aquatic environments - Terrestrial life. Extreme terrestrial environments - Parasitic habitats. Stress Physiology - Basic concept of environmental stress and strain; concept of elastic and plastic strain; stress resistance, stress avoidance and stress tolerance.

Unit: II	MECHANISM OF THERMO AND OSMO REGULATIONS	18 hours

Physiological mechanism of thermo regulation. Physiological adaptation to osmatic and ionic stress; mechanism of cell volume regulation. Osmoregulation in aquatic and terrestrial environments. Physiological response to oxygen deficient stress. Physiological effects of physical exercises and yogic practices – Meditation & Yoga

Unit: III	RESPIRATORY PHYSIOLOGY	16 hours

Respiratory physiology – Respiratory organs - Structure and function.
Respiratory gases – uptake – respiratory pigments – O2 & CO2 dissociation curves – transport of respiratory gases.

Unit: IV	EXCRETORY PHYSIOLOGY AND ENDOCRINOLOGY	18 hours
Excretory physiology – Excretory organs – mechanism of excretion – physiology – adaptations of excretion to environment – Excretory products: synthesis and elimination. Endocrine glands – Feedback regulation – Pituitary – gonadal axis. Role of reproductive hormones - gamete formation – fertilization - embryonic development – parturition – lactation -neuroendocrine regulation		
Unit: V	**NEURAL AND MUSCULAR PHYSIOLOGY**	**18 hours**
Neural physiology – Neurons structure and types. Nerve impulse transmission - resting and action potential — neurotransmitters – mechanism of neural transmission. Neuro-degenerative diseases. Muscular physiology - Muscle contraction – theories – molecular mechanism of muscle contraction.		
Unit: VI	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars, workshops and conferences.		
	Total Lecture hours	**90 hours**

Text Book(s)	
1	Animal Physiology Vol I &II by Chatterjee
2	Animal Physiology by Verma & Agarwal
3	Essential of ANIMAL Physiology by Rastogi
4	Principles of Animal Physiology by Christopher Moyes and Patricia Schulte
Reference Books	
1	Comparative Animal physiology by Philip C Withers
2	Comparative Physiology: Primitive Mammals" by Knut Schmidt-Nielsen and Liana Bolis
3	Advances in Comparative and Environmental Physiology: Animal Adaptation to Cold" by J A Boulant and R J Brooks
4	"Advances in Comparative and Environmental Physiology" by J Machin and S H Wright
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://swayam.gov.in/
2	https://www.mooc.org/
3	https://nptel.ac.in/
Course Designed By: Dr. BANU RAVIGANESH, Assistat Professor of zoology, LRGCASW. Tirupur.	

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	M	M	S	S	L	S
CO2	S	S	S	S	M	M	S	S	L	S
CO3	S	S	S	S	M	M	S	S	L	S
CO4	S	S	S	S	M	M	S	S	L	S
CO5	S	S	S	S	M	M	S	S	L	S

*S-Strong; M-Medium; L-Low

Course code	33B	EVOLUTION	L	T	P	C
Core/Elective/Supportive		Core Paper XII	6	0	0	4
Pre-requisite		Basic information about animal evolution	Syllabus Version		2021-2022	

Course Objectives:

The main objectives of this course are to:

1. To impart knowledge on evolution and its concepts.
2. To make them understand how life originated.
3. To realize the current working of evolution and genetic diversity.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	To understand the prehistoric life and its origin.	K2
2	To evaluate the impact of evolution and make them aware of key events in human evolution.	K4
3	To analyze how the higher animals evolved by speciation.	K5
4	To understand the evolution of genes by educating phylogeny	K2
5	To imagine how the future evolution will be by comparing the past.	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	THEORIES OF EVOLUTION	18 hours

Concepts of evolution – Lamarckism – Darwinism – Neo Darwinism – evolutionary synthetic theory – Trends in evolution – Human evolution – Stages of primate evolution including Homo – Species concept

Unit:2	NATURAL SELECTION & ADAPTATION	16 hours

Concept of stabilizing, directional & disruptive selection – sexual selection – group selection – Kin selection – Altruism – Co evolution – Neutral theory of evolution – Adaptation and evolution – mimicry and colouration.

Unit:3	MOLECULAR EVOLUTION	18 hours

Role of gene in evolution - Evolution of gene families, Molecular drive - Assessment of molecular variation Origin of higher categories Phylogenetic gradualism and punctuated equilibrium – Major trends in the origin of higher categories - Micro- and Macro-evolution – Speciation.

Unit:4	MOLECULAR PHYLOGENETICS	18 hours

Construction of phylogenetic trees - Phylogenetic inference –Distance methods, parsimony methods, maximum likelihood method - Immunological techniques – DNA- DNA hybridization and molecular clocks.

Unit:5	POPULATION GENETICS	18 hours

Metapopulations - Monitoring natural populations - Why small populations become extinct? - Loss of genetic variations – Hardy – Weinberg equilibrium - Conservation of genetic resources in diverse taxa – Artificial evolution (in vitro). Impact of DNA bar coding in modern evolutionary studies.

Unit:6	Contemporary Issues	2 hours
Expert lectures, online seminars – webinars, workshops and conferences.		
	Total Lecture hours	**90 hours**

Text Book(s)	
1	Verma P.S & Agarwal V.K., Concept of Evolution, S.Chand & Co, 2002
2	Dobzhansky, Th. Genetic and Origin of Species. Columbia University Press.
3	Dobzhansky, Th., F.J. Ayala, G.L. Stebbines and J.M Valentine. Evolution. Surjeet Publication, Delhi
4	Jha, A.P. Genes and Evolution. John Publication, New Delhi.
Reference Books	
1	Futuyama, D.J. Evolution Biology, 1986, Suinuaer Associates, INC Publishers, Dunderland.
2	Hartl, D.L. A Primer of Population Genetics. Sinauer Associates, 2001. Inc, Massachusetts.
3	Strickberger, M.W(2005). Evolution, Jones and Bartett publishes, London.
4	Arthur, W-2011 – Evolution – A developmental approach, wiley – Blackwell, oxford, U.K.
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	Paleontology: Theropod Dinosaurs and the Origin of Birds: https://www.classcentral.com/course/theropods-birds-5236
2	Evolutionary Biology: https://swayam.gov.in/nd2_cec20_bt06/preview
Course Designed By: Dr.J. Ebanasar	

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	L	L	L	M	M	M	S
CO2	S	S	S	L	L	L	M	M	M	S
CO3	S	S	S	L	L	L	M	M	M	S
CO4	S	S	S	L	L	L	M	M	M	S
CO5	S	S	S	L	L	L	M	M	M	S

*S-Strong; M-Medium; L-Low

Course code	3EC	GENETICS	L	T	P	C
Core/Elective/Supportive		Core Paper XI	6	0	0	4
Pre-requisite		Basic knowledge about Genes and Chromosomes which have learned in undergraduate course	Syllabus Version		2021-2022	

Course Objectives:

The main objectives of this course are to:

1. To study the nature and function of Genes and Chromosomes
2. To acquire knowledge on the structure of Mendelian principles, Gene mapping methods, Microbial genetics, Human genetics, Mutation and Molecular Genetics.
3. To acquire knowledge on the Gene concepts and their role in inheritance.
4. Understand the Chromosomes and their nature
5. To understand the role of DNA,RNA and Nucleotides and their functions

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Acquire knowledge on the Nature and functions of Genes and learn the mechanism of their action	K4
2	Learn the structure and functions of Gene mapping and Mutations and familiarize on their functions	K3
3	Understand the Microbial genetics and Molecular Genetics and their role in molecular biology	K2
4	Able to learn the Structure and functions of the Nucleotides	K2
5	Know the factors about genes and their role in the development of an organism	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	BASIC CONCEPTS OF GENETICS	18 hours

Mendelian principles: Dominance, segregation, independent assortment. Concept of gene: Allele, multiple alleles, pseudoallele, complementation tests Extensions of Mendelian principles: Co-dominance, incomplete dominance, gene interactions, pleiotropy, genomic imprinting, penetrance and expressivity, phenocopy, linkage and crossing over, sex linkage, sex limited and sex influenced characters.

Unit:2	GENE MAPPING METHODS	16 hours

Linkage maps, tetrad analysis, mapping with molecular markers, mapping by using somatic cell hybrids, DNA foot printing. Extra chromosomal inheritance: Inheritance of Mitochondrial genes, maternal inheritance

Unit:3	MICROBIAL GENETICS AND HUMAN GENETICS	18 hours

Methods of genetic transfers – transformation, conjugation, transduction and sexduction, mapping genes by interrupted mating, fine structure analysis of genes Pedigree analysis, karyotypes, genetic disorders - Human Genome Project. Quantitative genetics: Polygenic inheritance, heritability and its measurements,

Unit:4	MUTATION, POPULATION GENETICS	18 hours

Types, causes and detection, mutant types – lethal, conditional, biochemical, loss of function, gain of function, germinal verses somatic mutants, insertional mutagenesis. Structural and numerical alterations of chromosomes: Deletion, duplication, inversion, translocation, ploidy

and their genetic implications; Recombination: Homologous and non-homologous recombination including transposition. Population Genetics: Genetic equilibrium – distinguishing forces – natural selection – mutation and genetic drift.		
Unit:5	**MOLECULAR GENETICS**	**18 hours**
. Structure of gene – genetic code – gene regulation – genome analysis – functional genomics – RNA processing – Transcription: factors and regulation – Translation: control and regulation; Patterns of change in nucleotide and amino acid sequences.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars, workshops and conferences		
	Total Lecture hours	**90 hours**

Text Book(s)	
1	Brooker: *Genetics: Analysis and Principles*
2	Gardener. , (2006); *Principles of Genetics*
3	Versha Katira.(2017). *Basics of Human Genetics*,
4	Russell, 2009: *Genetics*
Reference Books	
1	James.D.Watson, *Recombinant DNA technology*
2	*Emery's Elements of Medical Genetics*
3	Klug W.S. *Concepts of Genetics*.
4	Siddhartha Mukherjee *The Gene*
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://swayam.gov.in/
2	https://www.mooc.org/
4	https://nptel.ac.in/
Course Designed By: Dr. S. Vidya	

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	S	M	L	L	M	S	S
CO2	S	S	S	S	M	L	L	M	S	S
CO3	S	S	S	S	M	L	L	M	S	S
CO4	S	S	S	S	M	L	L	M	S	S
CO5	S	S	S	S	M	L	L	M	S	S

*S-Strong; M-Medium; L-Low

Course code	33D	FORESTRY, SILVICULTURE AND ENTOMOLOGY	L	T	P	C
Core/Elective/Supportive		Elective Paper - II	6	0	0	4
Pre-requisite		Basic knowledge about Conservation of Forest, Afforestation and Forest management techniques	Syllabus Version		2021-2022	

Course Objectives:

The main objectives of this course are to:

1. To make the students to understand forestry, silviculture practice and insect pest.
2. To study forest working plan, forest management techniques.
3. To identify various forest types in India.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	To learn about natural and artificial regeneration of forest.	K4
2	To understand various working plans of forest	K3
3	To learn about forest management techniques	K2
4	To know basic classification of insects	K2
5	To learn the feeding behavior of various forest insects.	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	REGENERATION OF FORESTS	18 hours

Natural and artificial regeneration of forests - nursery and planting techniques. Clear felling, uniform shelter wood selection, coppice and conversion systems. Silviculture management - Mangroves- Cold desert & Plantation . Tree improvement & Seed Technology (colletion, storage, pre-treatment and germination, establishment and tendings) –Non timber forest products – Wood seasoning and preservation - Anatomical structure of wood, defects and abnormalities of wood, timber identification.

Unit:2	FOREST WORKING PLAN	18 hours

Forest working Plan –Planning, evaluation, monitoring and forest industries. Silvicultural systems - Clear felling, uniform shelter wood selection, coppice and conversion systems; Indian forest act 1927); forest conservation act (1980); Role of Forest in soil Conservation: – erosion-reclamation – role of microorganisms – Watershed – forest hydrology – river channel stabilization – avalanche and landslide control –ground water recharge.

Unit:3	FOREST MANAGEMENT TECHNIQUES	18 hours

Forest management techniques - Methods of measuring - diameter, girth, height and volume of trees - form-factor - volume estimation of stand Sampling methods and sample plots. Yield calculation - forest cover monitoring through remote sensing - GIS management and modeling - Forest survey - map reading.

Unit:4	TYPES OF FORESTS	16 hours

Forest types in India, identification - dendrology, Establishment of herbaria and arboreta. Agro forestry systems - Social/Urban Forestry – Joint Forest Management. Watershed management - Deforestation & Impacts. Forest Inventory.

Unit:5	INSECTS AND THEIR CLASSIFICATIONS	18 hours
Classification of insects up to order with example. Feeding and reproductive behaviour of insects, Forecasting, assesses risk of insect outbreaks. Insect Management- Insect Plant interaction.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars, workshops and conferences		
	Total Lecture hours	**90 hours**

Text Book(s)

1	Agarwala V P, 1980. *Forests in India*. Oxford and IBH Publishing Co., New Delhi.
2	Puri G S, Meher V M, Gupta R K and Puri S, 1981. *Forest Ecology*. Oxford and IBH Publishing Co., New York.
3	Stebbin E P, 1977. *A Manual of Elementary Forest Zoology For India. International Book* Distributors, Dehra Dun.
4	Tiwari K M and Singh R V, 1980. *Social Forestry Plantations*. Oxford and IBH Publishing Co., New Delhi.

Reference Books

1	Tiwari K M and Singh R V, 1980. *Social Forestry Plantations*. Oxford and IBH Publishing Co., New Delhi.
2	Warning R H and Schlesinger W H, 1985. *Forest Ecosystems*: Concepts and Management. Academic Press, New York.
3	Imms A D, 1965. *A General Textbook of Entomology*, ELBS, London.
4	Metcalfe C L and Flint W P, 1973. *Destructive and Useful Insects*, McGraw-Hill, NewYork.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://swayam.gov.in/
2	https://www.mooc.org/
4	https://nptel.ac.in/

Course Designed By: Dr. S. Vidya

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	L	S	S	M	S	S	S
CO2	S	S	S	L	S	S	M	S	S	S
CO3	S	S	S	L	S	S	M	S	S	S
CO4	S	S	S	L	S	S	M	S	S	S
CO5	S	S	S	L	S	S	M	S	S	S

*S-Strong; M-Medium; L-Low

Fourth Semester

Course code	43A	WILDLIFE MANAGEMENT TECHNIQUES	L	T	P	C
Core/Elective/Supportive		Elective - III	6	0	0	4
Pre-requisite		Basic knowledge about Techniques used in Management of Wildlife	Syllabus Version		2021-2022	

Course Objectives:

The main objectives of this course are to:

1. To make understand the applications and basic wildlife equipments.
2. To acquire the knowledge on handling the equipment related to wildlife.
3. To learn GIS and Remote sensing uses and its applications on wildlife management.
4. To sensitize the students on wildlife population estimation techniques.
5. To understand drugs related to chemical restraints the animals.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Acquire the knowledge in wildlife and equipments usage in the field	K4
2	Learn the significance of various field equipments	K3
3	Understanding molecular methods in wildlife	K2
4	Appreciate the mechanism of GIS, Remote sensing and Radio Collaring methods in wildlife	K2
5	Evaluate various types of population estimation, mapping techniques and wild animals health monitoring and postmortem techniques	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	EQUIPMENT IN WILDLIFE	18 hours

Making observations and records – field notes & datasheets - Planning wildlife management Investigations and projects – funding agencies. Wildlife Photography - types of cameras & binoculars - camera traps – altimeter – pedometer - field compass. Sound recording & Media players - activity recording - weight measurement.

Unit:2	TRACKING OF ANIMALS	18 hours

Radio isotopes - radio collaring – GPS – GIS & Remote sensing. Q GIS – Map Info –Arch view (outlines only). Molecular methods in Wildlife; Impact and removal of invasive alien species; Habitat manipulation: food, water and shade improvement.

Unit:3	ESTIMATION OF POPULATION	16 hours

Planning census – sample counts – Block counts – Roadside counts – Dung count – Pugmark & waterhole census – Identifying animals based on indirect signs – Capture recapture techniques – tiger, co-predator monitoring census methods. – Distance software – Creation of capture matrix and softwares used in wildlife sciences.

Unit:4	CONSERVATION OF FOREST	18 hours

Survey & mapping water sources – rain gauge setting – supplementary water source – providing access to natural & artificial water sources –Fire as a tool. Wildlife damage control – assessment methods – reasons for conflicts – Fences – trenches & other methods – Human pressure classification – Trail survey in boundary – Forest product collection – Village survey – Anti poaching operations –VFC.

Unit:5	INSECTS AND THEIR ECONOMIC IMPORTANCE	18 hours
Classification of insects up to order with example. Feeding and reproductive behaviour of insects, Forecasting, assesses risk of insect outbreaks. Insect Management- Insect Plant interaction.		
Unit:6	**Contemporary Issues**	**2 hours**
Expert lectures, online seminars – webinars, workshops and conferences		
	Total Lecture hours	**90 hours**

Text Book(s)

1	Agarwala V P, 1980. *Forests in India.* Oxford and IBH Publishing Co., New Delhi.
2	Puri G S, Meher V M, Gupta R K and Puri S, 1981. *Forest Ecology*. Oxford and IBH Publishing Co., New York.
3	Stebbin E P, 1977. *A Manual of Elementary Forest Zoology For India*. International Book Distributors, Dehra Dun.
4	Tiwari K M and Singh R V, 1980. *Social Forestry Plantations*. Oxford and IBH Publishing Co., New Delhi.
5	Manikandan k & Prabhu S. (2019). *Indian Forestry A Breakthrough Approach to Forest Service.* Jain Brother Publishers.
6	Vasanthraj David. B & Ramamurthy V V. (2016). *Elements of Economic Entomology*. Brillion Publishing
7	Dasmann R F, 1964. *Wildlife Biology*, John Wiley & Sons, New York, p 231

Reference Books

1	Warning R H and Schlesinger W H, 1985. *Forest Ecosystems: Concepts and Management*. Academic Press, New York.
2	Imms A D, 1965. *A General Textbook of Entomology*, ELBS, London.
3	Metcalfe C L and Flint W P, 1973. *Destructive and Useful Insects*, McGraw-Hill, NewYork.

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1	https://swayam.gov.in/
2	https://www.mooc.org/
4	https://nptel.ac.in/

Course Designed By: Dr. S. Vidya

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	L	S	S	M	S	S	S
CO2	S	S	S	L	S	S	M	S	S	S
CO3	S	S	S	L	S	S	M	S	S	S
CO4	S	S	S	L	S	S	M	S	S	S
CO5	S	S	S	L	S	S	M	S	S	S

*S-Strong; M-Medium; L-Low

Course code	43B	ETHOLOGY	L	T	P	C
Core/Elective/Supportive		Elective – IV	6	0	0	4
Pre-requisite		Basic knowledge about behavior of animals	Syllabus Version	2021-2022		

Course Objectives:

The main objectives of this course are to:

1. To understand behavior pattern of animals.
2. To acquire the knowledge on animal communications.
3. To learn the methodology of studying animal behaviour.
4. To understand parental care of animals.
5. To sensitize the students to study social behavior of animals.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Acquire the knowledge on behaviour of various wild animals.	K4
2	Learn significance of wild animals behaviour for their management.	K3
3	Understanding behavior pattern, hormones and pheromones of wild animals	K2
4	Evaluate various biological rhythms, foraging and courtship behaviour of various wild animals	K2
5	Understand the seasonal breeding behaviour of animals	K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

Unit:1	BEHAVIOUR PATTERN	18 hours

Instinctive behaviour- classical and modern concepts- fixed action pattern and ritualization. Learning-Imprinting-habituation. Analysis of behaviour pattern- taxis, kinesis and reflexes.

Unit:2	HORMONES AND PHEROMONES	16 hours

Physiological mechanism of behaviour – Perceptual mechanism - Role of hormones - pheromones -predator detection, predator tactics. Altruism and evolution- Methods of studying behavior.

Unit:3	FORAGING BEHAVIOUR	18 hours

Biological rhythms- Circadian, Lunar, Tidal and animal rhythms. Animal communication- Visual, Auditory, Chemical and Vocalisation in Mammals, Birds and Insects. Foraging behaviour. Origin and significance of play.

Unit:4	BREEDING BEHAVIOUR OF ANIMALS	18 hours

Courtship, display - sexual selection - pair bond - sexual dimorphism - polymorphism - polyandry, polygamy - promiscuity - cooperative breeding - brood parasites – parental care in Mammals & Birds.

Unit:5	COMMUNICATION IN ANIMALS	18 hours

Aggression – Competition – Social spacing – Territory – Dominance. Social commensalim – mutalism – Parasitism . Social behaviour of elephants and lion.

Unit:6	Contemporary Issues	2 hours
Expert lectures, online seminars – webinars, workshops and conferences		
	Total Lecture hours	**90 hours**

Text Book(s)	
1	Agarwal V.K. (2009). *Animal Behaviour(ETHOLOGY).* S. Chand Publishing
2	Leshner A I, 1978. An Introduction to Behavioural Endocrinology, Oxford University Press, New York
3	McFarland D (ed.), 1981. *The Oxford Companion to Animal Behaviour*, Oxford University Press, Oxford.
4	Ridley M,1968. *Animal Behaviour - A concise Introduction*, Blackwell Scientific Publications, Oxford.
5	Slater P J B, 1985. *An Introduction to Ethology*, Cambridge University Press, Cambridge.
6	Natarajan P and Arumugam N. *Animal Behaviour – Ethology.* Saras Publication
Reference Books	
1	Wallace R A, 1979. *The Ecology and Evolution of Animal Behaviour*, Goodyear Publishing Company Inc., Santa Monica, California.
2	Wilson E O, 1978. *Sociobiology*, The Belknap Press, Harvard University Press, Cambridge, MA.
3	Tristram D.Wyatt. *Pheromones and Animal Behaviour.* Cambridge University Press
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://student.societyforscience.org/international-rules-pre-college-science-research
2	https://www.etho-ges.de/wordpress/
Course Designed By: Dr. S. Vidya	

Mapping with Programme Outcomes										
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	L	S	S	M	S	S	S
CO2	S	S	S	L	S	S	M	S	S	S
CO3	S	S	S	L	S	S	M	S	S	S
CO4	S	S	S	L	S	S	M	S	S	S
CO5	S	S	S	L	S	S	M	S	S	S

*S-Strong; M-Medium; L-Low

Course code	43P	COMPARATIVE ANIMAL PHYSIOLOGY AND EVOLUTION	L	T	P	C
Core/Elective/Supportive		PRACTICAL-IV	0	0	2	4
Pre-requisite		Basic information on physiology and evolution of animals	Syllabus Version	2021-2022		

Course Objectives:

The main objectives of this course are to:
1. To make them understand physiology through practicals
2. To equip them to do the experiments individually
3. To understand the basics of evolution

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	To understand the physiological mechanisms.	K1
2	To evaluate the experimental design	K4
3	To interact their result.	K3
4	To analyze how the higher animals evolved.	K4
5	To understand the evolution of genes.	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

COMPARATIVE ANIMAL PHYSIOLOGY — **12 hours**
(Use any two cultured species which are not in endangered list)

1. Determination of the rate of activity of salivary amylase(Human Saliva)
   i. Ptyalin activity in relation to temperature and calculation of Q10.
   ii. Ptyalin activity in relation to pH and calculation of Q10
2. Recording of diastolic and systolic pressure during standing, sitting and lying posture
3. Biological responses of animals to various osmotic concentrations and their effect.
   i. Change in weight of Earthworm in hetero osmotic media
   ii. Pattern of osmotic responses of Crab in hetero osmotic media
   iii. Active uptake of Na^+ and Cl^- of a fish from the environmental water and change in salinity
4. Determination of the specific gravity of the blood of a vertebrate animal by copper sulphate method
5. Effect of temperature on the opercular movement of fish and calculation of Q10
6. Determination of the median threshold concentration of sucrose for housefly population
7. Effect of drugs on the heart beat of Cockroach (Result with graphical representation corresponding to different concentration and time intervals expected)
8. Determination of the rate of ammonia and urea excretion in Fish
9. Determination of the Haemoglobin content in Fish blood

EVOLUTION — **12 hours**

1. Evolutionary significances: Any five Fossils from five Non-Chordate and Chordates
2. Analogous and Homologous organs of Vertebrate animals(Frog, Calotes, Pigeon and Rabbit)
3. Mimicry and colouration of animals

Total Lecture hours — **86 hours**

TEXT BOOK

1	Advanced Practical Zoology by Sinha, J., Chatterjeee A.K., Chattopadhyay P. 2011. Arunabha Sen Publishers.

2	
Reference Books	
1	Manual of practical Zoology: Chordatas by Verma. 2000. S Chand publication
2	Manual of practical Zoology: Invertebrates by Verma. 2000. S Chand publication
3	Modern experimental Zoology by Preethi Guptha and Mirdula Chaturvedi. 2000.

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	M	S	L	M	S	S	S
CO2	S	S	S	M	S	L	M	S	S	S
CO3	S	S	S	M	S	L	M	S	S	S
CO4	S	S	S	M	S	L	M	S	S	S
CO5	S	S	S	M	S	L	M	S	S	S

*S-Strong; M-Medium; L-Low

Course code	43Q	GENETICS	L	T	P	C
Core/Elective/Supportive		ELECTIVE II PRACTICAL	0	0	2	4
Pre-requisite		Basic knowledge about Genetics in Animals	Syllabus Version		2021-2022	

Course Objectives:

The main objectives of this course are to:

1. To study the nature and function of genes and Chromosomes.
2. To acquire knowledge on the structure of Mendelian principles, Gene mapping methods, Microbial Genetics, Human Genetics, Mutation and Molecular Genetics.
3. To realize the importance of molecular genetics.

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	Acquire knowledge on the Nature and Functions of genes and chromosomes and learn their mechanism and actions.	K1
2	Learn the structure and functions of gene mapping and mutations and familiarize on their functions	K4
3	Able to learn the structure and function of the Nucleotides	K3
4	To analyse the causes of genetic disorders.	K4
5	To understand the recombination techniques	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

GENETICS: **12 hours**

1. Genetic characteristics of a classroom sample
   i. Dermatoglyphic pattern(Finger Print)
   ii. Ear lobe
   iii. Rolling of tongue
   iv. Mid digital Hair
   v. Widow's peak
   vi. Inward bending of little finger.
2. Study of morphology of *Drosophilla melanogaster*
3. Culture of *Drosophilla melanogaster*
4. Identification of sex and mutant characters *Drosophilla melanogaster*
5. Demonstration of dosage compensation in *Drosophilla* males and females
6. Preparation of genital plate of *Drosophilla melanogaster*
7. Estimation of allelic Frequency based on ABO Blood Group
8. Identification of Rh factor in blood groups
9. Preparation of Buccal smear to show squamous epithelial cells
10. Study of Barr body using buccal smear of volunteers
11. Study of stages of mitosis and meiotic chromosomes of Grasshopper by observation of permanent slides and calculations of chiasma frequency

Total Lecture hours **36 hours**

TEXT BOOK

1	*Advanced Practical Zoology* by Sinha, J., Chatterjeee A.K., Chattopadhyay P. 2011. Arunabha Sen Publishers.
2	*Manual of practical Zoology*: Chordatas by Verma. 2000. S Chand publication

Reference Books	
1	*Genetics* Book by Gardner
2	*Manual of practical Zoology: Invertebrates* by Verma. 2000. S Chand publication
3	*Manual of practical Zoology: Chordatas* by Verma. 2000. S Chand publication

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	M	S	L	M	S	S	S
CO2	S	S	S	M	S	L	M	S	S	S
CO3	S	S	S	M	S	L	M	S	S	S
CO4	S	S	S	M	S	L	M	S	S	S
CO5	S	S	S	M	S	L	M	S	S	S

*S-Strong; M-Medium; L-Low

Course code	43R	WILDLIFE MANAGEMENT TECHNIQUES AND FORESTRY, SILVICULTURE AND ENTOMOLOGY	L	T	P	C
Core/Elective/Supportive		PRACTICAL VI	0	0	2	4
Pre-requisite		Understanding recent developments in Wildlife Management Techniques	Syllabus Version		2021-2022	

Course Objectives:

The main objectives of this course are to:

1. To make the students understand planning and usage of various field equipments including GPS, GIS and Remote Sensing
2. To know the principle of wild animal population estimation techniques and methods applied in animal capturing
3. To know the principles of survey and mapping techniques
4. To make the students to understand Forestry, Silvicultural practices and insect pests in forest
5. To learn about sampling techniques involved in vegetation analysis

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	To obtain knowledge on field equipment used in wildlife management.	K1
2	Integrate the strategies involved in various population estimation techniques including molecular methods	K4
3	To gain knowledge on survey and mapping techniques	K3
4	To learn about current forest management practices	K4
5	To understand about Forest Insects and its management	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

WILDLIFE MANAGEMENT TECHINQUES: **12 hours**

1. Estimation of diversity and species richness of an area
2. Estimation of carrying capacity of an area
3. Population Viability Analysis(PVA) and Population Habitat Viability Analysis(PHVA)
4. Geo-referencing of an image file to create better image using Q-GIS/Map-Info/ARC-GIS
5. Estimating herbivore population using Distance Software
6. Estimating Tiger population using M-STRIPE software
7. Identification of an Elephant Corridor
8. Preparation of EIA of an area

FORESTRY, SILVICULTURE AND FOREST ENTOMOLOGY

1. Identification of important insects and butterflies (Any Five)
2. Identification of plants of silviculture importance (Any Five)
3. Preparation of Quadarts and Transects to estimate vegetative analysis in an area
4. Identification of various forest types
5. Estimation of tree height
6. Estimation of log volume
7. Estimation of Canopy volume
8. Forest cover monitoring, map reading and surveying techniques of forest area

SUBMISSIONS AT THE TIME OF PRACTICAL EXAMINATIONS	
1. Report on the field study and field trips 2. Bonafied record 3. A report on GIS training 4. A report on various softwares used in wildlife management 5. Report on the participation of Tiger / Wildlife census 6. Report of visit to a Nursery 7. Report of visit to a Timber depot 8. Report of visit to different Forest types	
Total Lecture hours	**86 hours**

TEXT BOOK	
1	Dasmann R F, 1964. *Wildlife Biology*, John Wiley & Sons, New York,
2	Gilas R H Jr.(ed.), 1984. *Wildlife Management Techniques*, 3rd ed. The Wildlife Society, Washington D.C., Nataraj Publishers, Dehra Dun.
3	Robinson W L and Eric G Bolen, 1984. *Wildlife Ecology and Management*, Maxmillan Publishing Company, New York
4	Rodgers W A, 1991. *Techniques for Wildlife Census in India* - A Field Manual: Technical Manual - T M - 2. WII.
5	*Silviculture* by S S Negi

Reference Books	
1	Saharia V B, 1982. *Wildlife of India*, Natraj Publishers, Dehra Dun
2	Teague R D (ed.), 1987. *A Manual of Wildlife Conservation* (The Wildlife Society, Washington D.C.). Nataraj Publishers, Dehra Dun
3	WII. *A Guide to Chemical Restraint of Animals*.

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	S	M	S	L	M	S	S	S
CO2	S	S	S	M	S	L	M	S	S	S
CO3	S	S	S	M	S	L	M	S	S	S
CO4	S	S	S	M	S	L	M	S	S	S
CO5	S	S	S	M	S	L	M	S	S	S

Course code	43S	ETHOLOGY	L	T	P	C
Core/Elective/Supportive		PRACTICAL VI	0	0	2	4
Pre-requisite		Basic information on Behaviour of animals	Syllabus Version		2021-2022	

Course Objectives:

The main objectives of this course are to:

1. To make the students understand behaviours and animal communication
2. To study on the influence of hormones and pheromones in animals
3. To know the influence of various biological rhythms on the behaviour of animals
4. To understand the courtship and display behaviour of animals

Expected Course Outcomes:

On the successful completion of the course, student will be able to:

1	To identify various behaviour pattern of animals	K1
2	To understand the physiological mechanism involved in behaviour of animals	K4
3	To analyse the significance of courtship for breeding behaviour	K3
4	To know the principles of social behaviour of animals	K4
5	To recognize the calls and songs of different types of Birds	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

ETHOLOGY: **12 hours**

1. Focal animal sampling method- video clippings
2. Courtship and display – peacock, Monkey and Elephant
3. Social behaviour – Lion and Elephant
4. Animal communications – Recording Bird Call and Identifying
5. Identification of sexual dimorphism in birds and mammals
6. Aggression behaviour of Macaques
7. Territory marking in Carnivores
8. Identification of Commensalism, Mutualism and Parasitism
9. Brood parasite
10. Significance of play in animals

Total Lecture hours **90 hours**

TEXT BOOK

1	Leshner A I, 1978. *An Introduction to Behavioural Endocrinology*, Oxford University Press, New York
2	McFarland D (ed.), 1981. *The Oxford Companion to Animal Behaviour*, Oxford University Press, Oxford
3	Ridley M,1968. *Animal Behaviour - A concise Introduction* , Blackwell Scientific Publications, Oxford
4	Agarwal V.K. (2009). *Animal Behaviour(ETHOLOGY).* S. Chand Publishing

Reference Books

1	Slater P J B, 1985. *An Introduction to Ethology*, Cambridge University Press, Cambridge.
2	Wallace R A, 1979. *The Ecology and Evolution of Animal Behaviour*, Goodyear Publishing Company Inc., Santa Monica, California

3	Wilson E O, 1978. *Sociobiology*, The Belknap Press, Harvard University Press, Cambridge, MA Revised edition.
4	DevayaniKhemka, *Animal Behaviour*, Dominant publishers

Mapping with Programme Outcomes										
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**
CO1	S	S	S	M	S	L	M	S	S	S
CO2	S	S	S	M	S	L	M	S	S	S
CO3	S	S	S	M	S	L	M	S	S	S
CO4	S	S	S	M	S	L	M	S	S	S
CO5	S	S	S	M	S	L	M	S	S	S

Annexure

COURSE CODE 23P

STRUCTURE AND FUNCTION OF INVERTEBRATES, COMPARATIVE ANATOMY OF CHORDATES AND ANIMAL BIODIVERSITY & ORGANIZATION

MAJOR (Marks 15)

1. Comparative study of Invertebrate- Annelida and Arthropoda Eg. Earthworm and Millipedes
2. Earthworm culture in laboratory
3. Comparative study of Chordates - Aves and Mammals Eg. Pigeon and Rabbit
4. Morphological modification of limbs in Fish Eg. Cutla, Amphibians Eg. Frog, Reptiles Eg Lizard, Birds Eg. Pigeon or Chicken and mammals Eg. Rabbit or Guniea pig

MINOR (Marks 10)

1. Culture of Drosophilla
2. Comparative study of Scales of Fishes
3. Comparative study of different types of bones Eg. Frog, Snake, Pigeon and Elephant or Rabbit
4. Estimation of plankton using Haemocytometer.

SPOTTERS (Marks 15)

1. **Biological importance**
   a. Frog,
   b. Barn owl,
   c. Flycatchers,
   d. Tiger
   e. Snakes
2. **Medical Importance**
   a. Honey bee
   b. Wax insect
3. **Beneficial pest**
   a. Lady beetle
   b. Ground beetle
   c. Munite Pirate Bug
   d. Green Lacewing
4. **Evolutionary Significance**
   Four leg modification
   a. Fishes
   b. Snakes
   c. Frogs
   d. Birds
   e. Mammals
5. **Economic importance**
   a. Silk worm
   b. Honey bees
   c. Lac insect
   d. Frog
   e. Garden lizard
   f. Insectivores Birds

SUBMISSION

Visit to Zoological parks, Wildlife Sanctuaries and Biosphere reserve (Marks 10)
Preparation of slides and collection of fresh water planktons (Marks 05)
Record (Marks 05)
Total marks 60

COURSE CODE 23P

STRUCTURE AND FUNCTION OF INVERTEBRATES, COMPARATIVE ANATOMY OF CHORDATES AND ANIMAL BIODIVERSITY & ORGANIZATION

MAJOR (Marks 15)
MINOR (Marks 10)
SPOTTERS (Marks 5 X 3 = 15)
SUBMISSION (Marks 15)
Record (Marks 5)
Total marks 60

SUBJECT CODE : 23Q TIME 4 HRS

ENVIRONMENTAL BIOLOGY, BIOCHECISTRY, CELL AND MOLECULAR BIOLOGY

MAJOR (Marks 2 X 10 = 20) TIME 2x 1Hrs=2Hrs
MINOR (Marks 2 X 7.5= 15) TIME 35MINS x 2 = 1Hrs 10 Mins
SPOTTERS (Marks 5X2 = 10) TIME 50 Mins
SUBMISSION (Marks 4 X 2.5 = 10)
RECORD (marks 5)
TOTAL MARKS 60

SUB CODE 23Q

DEVELOPMENTAL BIOLOGY, VERTEBRATE BIOLOGY AND CONSERVATION

MAJOR (Marks 20)
MINOR (Marks 2 X 10= 20)
SPOTTERS (Marks 5 X # 15)
RECORD (Marks 5)
TOTAL MARKS 60

SUB CODE 43P

COMPARATIVE ANIMAL PHYSIOLOGY AND EVOLUTION

MAJOR (Marks 20)
MINOR (Marks 2 X 10 = 20)
SPOTTERS (Marks 5 X 3 = 15)
RECORD (Marks 5)
TOTAL MARKS : 60

SUB CODE 43Q
GENETICS

MAJOR (Marks 25)
MINOR (Marks 15)
SPOTTERS (Marks 5 X 3 = 15)
RECORD (Marks 5)
TOTAL MARKS 60

SUB CODE 43R
WILDLIFE MANAGEMENT TECHNIQUES AND FORESTRY, SILVICULTURE AND ENTOMOLOGY

MAJOR (Marks 20)
MINOR (Marks 10)
SPOTTERS (Marks 5 X 3 = 15)
SUBMISSION (Marks 10)
RECORD (Marks 5
TOTAL MARKS 60

SUB CODE : 43S
ETHOLOGY

MAJOR (Marks 20)
MINOR (Marks 2 X 10 = 20)
SPOTTERS (Marks 5 X 3 = 15)
RECORD (Marks 5)
TOTAL MARKS : 60

General Instructions:

1. **Elective Courses:** Minimum Two for Each Semester.
2. **Supportive Courses:** Minimum One for first three Semesters.
3. **Value Added Courses:** Minimum 2 and maximum 5 for Each Department for Entire Program
4. **Job Oriented Certificate Courses:** Two Courses (Each one on First and Second Year)
5. All the Board of Studies are requested to follow the same template and use the TIMES NEW ROMAN FONT with the Size of 12.
6. The Course Designer should be mentioned in each of the corses.

Details for the Certificate Course

1	**Name of the Course**	
2	**Name of the Department**	
3	**Name of the Faculty Member**	
4	**Inter/Intra Department**	
5	**Objectives of the Course**	
6	**Topics to be Covered**	
7	**Duration of the Course**	
8	**Eligibility**	
9	**Registration**	
10	**Description of the Course**	
11	**Job Opportunities**	
12	**Number of Candidates**	
13	**Course Fee**	

BHARATHIAR UNIVERSITY: COIMBATORE 641046
POST GRADUATE PROGRAM IN
ZOOLOGY (WILDLIFE BIOLOGY)

VISION

To increase the knowledge in the area of Animal Science for understanding the value of wildlife biology and conservation of ecosystem and societal oriented applied research using ecosystem management by students through high-quality education and research.

MISSION

- To create awareness for understanding the importance of animal diversity and conservation of bio diversity.
- To mold the students in the field of Zoological sciences in both theory and practical to equip themselves in the area of wildlife biology and its related field for their employment opportunities. To involve the students in activities of conservation of wildlife and its related research activities.