PSGR
Krishnammal College for Women

College of Excellence, nirf 2023-4th Rank
Autonomous and Affiliated to Bharathiar University
Reaccredited with 'A++' grade by NAAC, An ISO 9001: 2015 Certified Institution
Peelamedu, Coimbatore-641004

DEPARTMENT OF ZOOLOGY

CHOICE BASED CREDIT SYSTEM (CBCS) & LEARNING OUTCOMES-BASED CURRICULAR FRAMEWORK (LOCF)
(I Semester)

(For the students admitted during the academic year 2024-27 Batch and onwards)

BACHELOR OF ZOOLOGY
2024 – 2027 BATCH

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PROGRAMME LEARNING OUTCOMES (PLOs)

After completion of the programme, the student will be able to:

PLO1: Appreciate the complexities of various levels of organization in the living forms and address controversial biological issues in a scientific way

PLO2: Imbibe transformational impact on the quality of education, and to adopt scientific temper and live with scientific values

PLO3: Assess the scope of animal biology, opt relevant areas for inter-disciplinary and trans-disciplinary studies

PLO4: Understand and apply the core strands of the knowledge acquired in various disciplines of life sciences to become a potential entrepreneur

PLO5: Acquire quality life science education to turn into an outstanding researcher/teacher/career woman/entrepreneur and a responsible citizen

PROGRAMME SPECIFIC OUTCOME (PSO's)

The students at the time of graduation will:

PSO1: Gain the knowledge of Zoology through theory and practical

PSO2: Analyze the relationships among animals with their ecosystems

PSO3: Learn to classify the major groups of organisms under different phyla, understanding the functioning of organisms, compare and contrast anatomical and physiological characteristics of animals

PSO4: Understand good laboratory practices as per laboratory standards, handling the sophisticated instruments/equipment to develop technical skills, research oriented skills about research methodologies, effective communication and skills of problem solving methods

PSO5: Understand the applications of zoological knowledge in Agriculture, Medical and daily life and apply the knowledge for employment - Indian Forest Service, Sericulture, Fisheries, Veterinary, Clinical Laboratory, Museum Curator, Departments and Entrepreneurship. They can go for Indian Forest Service and other competitive examinations

PSGR Krishnammal College for Women

DEPARTMENT OF ZOOLOGY
CHOICE BASED CREDIT SYSTEM (CBCS) &
LEARNING OUTCOME BASED CURRICULAR FRAMEWORK (LOCF)
BACHELOR OF ZOOLOGY – 2024-2027 BATCH
(I Semester)

(For the students admitted during the academic year 2024-27 Batch & onwards)

Sem	Part	Course code	Title of the Course	Course type	Instruction Hours/Week	Contact Hours	Tutorial	Duration of Examination	Examination Marks			Credits
									CA	ESE	Total	
I	I	TAM2301/ HIN2301/ FRE2301	Language I – T / H / F	Lang	6	88	2	3	25	75	100	3
	II	ENG2301	English Paper I	English	6	88	2	3	25	75	100	3
	III	AS23C01	Invertebrata	CC	6	88	2	3	25	75	100	5
	III	AS24CP1	Zoology Practical I	CC	3	45	-	-	-	-	-	-
	III	CE24A01	Chemistry for Biologists I	GE	4	58	2	3	20*	55*	75	4
	III	CE23AP1	Chemistry Practical for Biologists	GE	3	45	-	-	-	-	-	-
		Non Tamil Students										
	IV	NME23B1/ NME23A1	Basic Tamil I/ Advanced Tamil I	AEC	2	28	2	-	100	-	100	2
		Students with Tamil as Language										
	IV	NME23ES	Introduction to Entrepreneurship	AEC	2	30	-	-	100	-	100	
I-V	VI	24BONL1 24BONL2 24BONL3	Online Course I Online Course II Online Course III	ACC	-	-	-	-	-	-	-	-
I-V	VI	COM15SER	Community Service 30 hours	GC	-	-	-	-	-	-	-	-

L – Language **E - English**
CC – Core Courses **CA – Continuous Assessment**
GE – Generic Elective **ESE–End Semester Examination**
AEC – Ability Enhancement Course
ACC – Additional Credit Course
***CA conducted for 25 converted to 20, ESE conducted for 100 converted to 55**

QUESTION PAPER PATTERN

Examination System

One test for continuous assessment will be conducted on pre-determined dates i.e., commencing on the 50th day from the date of reopening. The Model exam will be conducted after completing 85th working days. Marks for ESE and CA with reference to the maximum for the courses will be as follows:

2023-2024 BATCH & ONWARDS

CA Question Paper Pattern and distribution of marks UG
Language and English
Section A 5 × 1 (No choice) : 5 Marks
Section B 4 × 5 (4 out of 6) : 20 Marks (250 words)
Section C 2 × 10 (2 out of 3): 20 Marks (500 words)
Total : 45 Marks

Core and Allied - (First 3 Units)

CA Question from each unit comprising of

One question with a weightage of 2 Marks (No choice) : 2 × 3 = 6
One question with a weightage of 5 Marks (Internal Choice at the same CLO level) : 5 × 3 =15
One question with a weightage of 8 Marks (Internal Choice at the same CLO level) : 8 × 3 =24
Total : 45 Marks

End Semester Examination – Question Paper Pattern and Distribution of Marks
Language and English
Section A 10 × 1 (10 out of 12) : 10 Marks
Section B 5 × 5 (5 out of 7) : 25 Marks (250 words)
Section A 4 × 10 (4 out of 6) : 40 Marks (600 - 700 words)
Total : 75 Marks

Core and Allied courses:
ESE Question Paper Pattern: 5 × 15 = 75 Marks
Question from each unit comprising of
One question with a weightage of 2 Marks : 2 × 5=10
One question with a weightage of 5 Marks (Internal Choice at the same CLO level): 5 × 5 =25
One question with a weightage of 8 Marks (Internal Choice at the same CLO level): 8 × 5 =40

Continuous Internal Assessment Pattern
Theory
I Year UG (23 Batch)

CIA Test : 5 marks (conducted for 45 marks after 50 days)
Model Exam : 7 marks(Conducted for 75 marks after 85 days (Each Unit 15 Marks))

Seminar/Assignment/Quiz	: 5 marks
Class Participation	: 5 marks
Attendance	: 3 marks
Total	**: 25 Marks**

Practical

Lab Performance	: 7 marks
Regularity	: 5 marks
Model Exam	: 10 marks
Attendance	: 3 marks
Total	**: 25 marks**

ESE Practical Pattern
The End Semester Examination will be conducted for a maximum of 75 marks respectively with a maximum 15 marks for the record and other submissions if any.

Part IV
Introduction to Entrepreneurship
Quiz : 50 marks
Assignment : 25 marks
Project / Case study : 25 marks
Total : 100 Marks

MAPPING OF PLOS WITH CLOS

COURSE	PROGRAMME LEARNING OUTCOMES				
	PLO1	PLO2	PLO3	PLO4	PLO5
COURSE – AS23CO1					
CLO1	S	S	M	M	L
CLO2	S	S	M	M	M
CLO3	S	S	S	S	M
CLO4	S	S	S	S	M
COURSE – AS24CP1					
CLO1	S	S	S	S	S
CLO2	S	S	S	S	S
CLO3	S	S	S	S	S
CLO4	S	S	S	S	S

COURSE CODE	COURSE NAME	Category	L	T	P	Credit
AS23CO1	INVERTEBRATA	Theory	88	2	-	5

Preamble

To understand the basic classification, structure and functional details of invertebrates and to appreciate the diversity of life on earth with respect to invertebrates.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the distinguished characteristics, the biodiversity, habitat, adaptation, organization and taxonomic status of invertebrates K1	K1
CLO2	Understand the importance of multicellularity significant to anatomical and physiological up gradation of the invertebrates	K2
CLO3	Identify the evolution of organ systems and differences in functional morphology of higher invertebrates	K3
CLO4	Analyze the advancement in systemic organization of invertebrates and connecting link to Chordates. Infer the application of Recent emerging technologies in learning and research in Zoology	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	M	M	L
CLO2	S	S	M	M	M
CLO3	S	S	S	S	M
CLO4	S	S	S	S	M

S- Strong; M-Medium; L-Low

INVERTEBRATA – AS23CO1 (88 Hrs)

Unit 1 **(20 hrs)**

Phylum Protozoa

General characteristics and Classification up to classes.

Type Study: ***Paramecium caudatum*** – External features, Nutrition, Locomotion - effective stroke, recovery stroke, Metachronal rhythm, Reproduction – Asexual - Binary fission, Sexual reproduction Conjugation, Autogamy, Endomixis, Hemimixis and Cytogamy.

General Essays

- Locomotion and Reproduction in Protista
- ***Life cycle and pathogenicity of *Plasmodium vivax* and *Entamoeba histolytica***
- Evolution of symmetry and segmentation of Metazoa

Phylum Porifera

General characteristics and Classification up to classes.

Type Study: *Leucosolenia botryoides* **-** External features, Body wall, Spicules, Canal System, Nutrition, Reproduction.

General Essays:

- Canal System in sponges
- ***Economic importance of sponges**

Unit 2 **(20 hrs)**

Phylum Coelenterata

General characteristics and Classification up to classes.

Type Study: ***Obelia geniculata*** **-** External features, Histology of the colony, Cnidoblast and its functions, Life History of Obelia, Metagenesis.

General Essays

- ***Corals, coral reefs and coral bleaching**
- ***Polymorphism in Coelentrates**

Phylum Helminthes

General characteristics and Classification up to classes.

Type Study: ***Taenia solium*** **-** External features, Body wall, Feeding, Respiratory system, Excretory System-flame cells, Nervous system, Reproductive system, Life cycle - Onchosphere and Cysticercus larvae. Life cycle and pathogenicity of *Taenia solium.*

General Essays

1. ***Life cycle and pathogenicity of:**
    - **a)** ***Wuchereria bancrofti***
    - **b)** ***Drancunculus medinensis***
    - **c)** ***Ancylostoma duodenale***
2. ***Parasitic adaptations in Helminthes**

Unit 3 **(19 hrs)**

Phylum Annelida

General characteristics and Classification up to classes.

Type Study: *Megascolex mauritii* - External features, Body wall, Coelom, Locomotion, Digestive system, Respiratory system, Excretory system - Meganephridia, Micronephridia, Pharyngeal nephridia, Nervous system, Reproductive system.

General Essays

- Metamerism in annelids
- ***A Brief Account on Vermiculture**

Phylum Arthropoda

General characteristics and Classification up to classes.

Type study: *Periplaneta americana* - External features, Body wall, Mouthparts, Digestive system, Respiratory system, Circulatory system, Nervous system, Sense organs, excretory system, Reproductive system.

General Essays

- Peripatus- Affinities as a living fossil.
- Metamorphosis in Insects
- ***A Brief Account on Apiculture**

Unit 4 **(19 hrs)**

Phylum Mollusca

General characteristics and Classification up to classes.

Type Study: *Pila globosa* - External features, Shell, Digestive system, Respiratory system, Circulatory system, Nervous system, Sense organs - Eyes, Osphradium, Statocyst, Tentacles, Excretory system, Reproductive system.

General Essays

- Torsion in Mollusca
- ***A Brief Account on Pearl Culture**

Phylum Echinodermata

General characteristics and Classification up to classes.

Type Study: *Asterias rubens* - External features, Pedicellaria - Structure and Function, Digestive system, Respiratory system, Water vascular system - Structure and Function, Circulatory system - Perihaemal and Haemal system, Nervous system, Sense organs, Excretory system, Reproductive system.

General Essays

- ***Larval forms of Echinoderms and their evolutionary significance**
- ***Economic importance in Echinoderms**
- Affinities with Chordates

Unit 5 **(10 hrs)**

Introduction to technologies in Industrial 4.0, Applications –Automated taxonomic Identification of invertebrates, Confocal Image processing of invertebrates for identification and classification, Bio mimicry/biomimetics of invertebrates – Ant colony optimization algorithms, Beekeeping using Machine learning, Detection and identification of Stored – Grain insects using Deep learning, IOT based smart monitoring for sericulture, ***Virtual e-museum.**

***Blended Mode**

Text Books:

S. No.	Authors	Title of the Book	Publishers	Year and Edition
1	Jordan E.L and Verma P.S	Invertebrate Zoology	S. Chand and Co	2022, 1 edition
2	Nair N. C.	A Text Book of Invertebrates	Saras Publications	2015, 5 edition
3	Kaliraj, P. and Devi, T.	Artificial Intelligence Theory, models and Applications	CRC Press, Taylor & Francis Group	2022
4	Kaliraj, P. and Devi, T.	Innovating with Augmented Reality : Applications in Education and Industry	CRC Press, Taylor & Francis Group	2022
5	Kaliraj, P. and Devi, T.	Big Data Applications in Industry 4.0	CRC Press, Taylor & Francis Group	2022

Reference Books:

S. No.	Authors	Title of the Book	Publishers	Year and Edition
1.	Barrington E J W	Invertebrate Structures and Function	English Language Book Society	1979, 1 edition
2.	Ekambaranatha Ayyar, M. & Ananthakrishnan, T.N.	Manual of Zoology Vol-I (Invertebrata) Part I & II	Vishwanathan (P) Ltd. Chennai	1995, 1 edition
3.	Mandal Eatik Baran	Biology of Non chordates	PHI Learning Private Limited	2018, 2 edition
4.	Kotpal R.L., Agarwal S.K and Ketarpal R.P.R	Modern Text Book of Zoology Invertebrates	Rastogi Publications	2011, 3 edition
5.	Robert	Invertebrate Zoology	W. B. Saunders International	1974, 1 edition
6.	Pechenik Jan A	Biology of the Invertebrates	McGraw-Hill International	2016, 7 edition

Related Online Contents

1. Introduction to Industry 4.0 and Industrial Internet of Things by Prof. Sudip Mishra, IIT Kharagpur.
2. A Complete Guide to Industry 4.0-Udemy
3. Introduction to Industry 4.0

Reference

1. https://academic.oup.com/sysbio/article/68/6/876/5368535
2. https://besjournals.onlinelibrary.wiley.com/doi/10.1111/2041-210X.13428
3. https://www.mdpi.com/2313-7673/4/3/62/htm
4. https://www.bio-mar.com/biological-materials-biomimetics
5. https://www.sciencedirect.com/science/article/abs/pii/S1568494609000672
6. https://www.hyperhyve.com/post/beekeeping-using-machine-learning
7. https://www.researchgate.net/publication/322958397_Detection_of_stored-grain_insects_using_deep_learning
8. https://www.ijrte.org/wp-content/uploads/papers/v8i2/B1801078219.pdf
9. https://www.perlego.com/book/3799692/industry-40-technologies-for-education-transformative-technologies-and-applications-pdf

COURSE CODE AS24CP1	COURSE NAME ZOOLOGY PRACTICAL I	Category	L	T	P	Credit
		Practical	-	-	90	4

Preamble

- To enable the students to expose practically
- To learn the taxonomy of invertebrates and Chordates.
- To understand the relationships between invertebrates, Chordates and their environment.
- To learn the location and appearance of internal organs in a typical insect.
- To understand the structure and functional organization of animals.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	To understand the basic concepts of zoological classification and identify the invertebrates and chordates	K1
CLO2	To distinguish the diversity and relationships between major groups of invertebrates and Chordates.	K2
CLO3	To examine the morphology and anatomy of invertebrates and Chordates	K3
CLO4	To relate the diversity and culture/rearing of invertebrates and chordates and infer their economic utility.	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO2	S	S	S	S	S
CLO3	S	S	S	S	S
CLO4	S	S	S	S	S

S- Strong

CORE PRACTICAL - I AS23CPI (90 Hrs)

Dissections (**35 hrs)**

1. **Cockroach**
   - a. Digestive system (3 hrs)
   - b. Nervous system, (3 hrs)
   - c. Male & Female Reproductive systems (3 hrs)

2. **Fish**
   - a. Viscera, (3 hrs)
   - b. Digestive system, (3 hrs)
   - c. Reproductive system, (3 hrs)
   - d. Brain and Cranial nerves system (4 hrs)

3. **Earthworm**
   - a. Digestive system, (3 hrs)
   - b. Nervous system (4 hrs)
   - c. Reproductive system (3 hrs)

4. **Prawn** – Nervous system (3 hrs)

Mounting (**15 hrs)**

1. Mounting of scales of fishes (2 hrs)
2. Mounting of gill arch (2 hrs)
3. Mounting of earthworm setae (2 hrs)
4. Mounting of mouth parts of cockroach/mosquito/honey bee (3 hrs)
5. Mounting of Prawn appendages (3 hrs)
6. Whole mount of Euglena, Amoeba and Paramecium (3 hrs)

Spotters:

Classify giving reasons:-Parамecium, Leucosolenia, Obelia colony, Prawn, Octopus, Star fish, Ascidian, Shark, Salamander, Pigeon, Bat. **(2 hrs)**

Draw labelled sketches:-T.S. of Tape worm, Leech, Amphioxus, Frog – Skull, Pectoral girdle, Pelvic girdle, Fore limb and Hind limb. **(2 hrs)**

Relate Structure and function: - Gemmule, Entire & Scolex of tapeworm, Nereis -parapodium, Heteronereis, Honey bee-Queen, Drone, Worker; Quill feather, Tortoise, Narcine-Electric organ. **(2 hrs)**

Write descriptive notes:- Nauplius larva, Pila, Bipinnaria larva, Balanoglossus, Echeneis - Sucker fish, Draco - Flying lizard, Rat snake, Cobra, Hyla. **(2 hrs)**

Give biological significance: - Chaetopterus, Peripatus, Limulus, Scorpion, Pearl oyster, Hippocampus male and female, Exocetus – Flying fish, Chameleon. **(2 hrs)**

Field observations combined with photography and/or videography

1) Study of live water specimens in nearby water bodies/pond ecosystem **(5 hrs)**
2) Study of insect fauna in the college campus **(5 hrs)**
3) Visit to a sericulture farm/ Apiary/Museum **(5 hrs)**
4) Study of six common birds from different orders **(5 hrs)**

Culture Methods

1) Culture of unicellular organisms (Amoeba/Paramecium/Euglena)
2) Culture of multicellular organisms (Earthworm) **(10 hrs)**

Reference Books:

S. No.	Authors	Title of the Book	Publishers	Year and Edition
1	Sinha. J, Chatterjee. A. K, Chattopadhyay. P	Advanced Zoology Practical	Arunabha Sen Books and Allied (P) Ltd	2019, 9th edition
2	Lal S. S.	Textbook of Practical Zoology Vertebrate	Rastogi Publication	2004, 8th edition
3	Lal S. S.	Textbook of Practical Zoology Invertebrate	Rastogi Publication	2004

Pedagogy:

Demonstration, practical, dissection, slides, spotters, field visit, culture methods, power point presentation, e-content, group discussion.

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DEPARTMENT OF ZOOLOGY

CHOICE BASED CREDIT SYSTEM (CBCS) & LEARNING OUTCOMES- BASED CURRICULAR FRAMEWORK (LOCF)

(II Semester)

(For the students admitted during the academic year 2024-27 Batch and onwards)

BACHELOR OF ZOOLOGY
2024 – 2027 BATCH

PROGRAMME LEARNING OUTCOMES (PLOs)

After completion of the programme, the student will be able to:

PLO1: Appreciate the complexities of various levels of organization in the living forms and address controversial biological issues in a scientific way

PLO2: Imbibe transformational impact on the quality of education, and to adopt scientific temper and live with scientific values

PLO3: Assess the scope of animal biology, opt relevant areas for inter-disciplinary and trans-disciplinary studies

PLO4: Understand and apply the core strands of the knowledge acquired in various disciplines of life sciences to become a potential entrepreneur

PLO5: Acquire quality life science education to turn into an outstanding researcher/teacher/career woman/entrepreneur and a responsible citizen

PROGRAMME SPECIFIC OUTCOME (PSO's)

The students at the time of graduation will:

PSO1: Gain the knowledge of Zoology through theory and practical

PSO2: Analyze the relationships among animals with their ecosystems

PSO3: Learn to classify the major groups of organisms under different phyla, understanding the functioning of organisms, compare and contrast anatomical and physiological characteristics of animals

PSO4: Understand good laboratory practices as per laboratory standards, handling the sophisticated instruments/equipment to develop technical skills, research oriented skills about research methodologies, effective communication and skills of problem solving methods

PSO5: Understand the applications of zoological knowledge in Agriculture, Medical and daily life and apply the knowledge for employment - Indian Forest Service, Sericulture, Fisheries, Veterinary, Clinical Laboratory, Museum Curator, Departments and Entrepreneurship. They can go for Indian Forest Service and other competitive examinations

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DEPARTMENT OF ZOOLOGY
CHOICE BASED CREDIT SYSTEM (CBCS) & LEARNING OUTCOME BASED CURRICULAR FRAMEWORK (LOCF)
BACHELOR OF ZOOLOGY – 2024-2027 BATCH
SCHEME OF EXAMINATION
SEMESTER II

Sem	Part	Course code	Title of the Course	Course type	Instruction Hours/Week	Contact Hours	Tutorial	Duration of Examination	Examination Marks			Credits
									CA	ESE	Total	
II	I	TAM2302/ HIN2302/ FRE2302	Tamil Paper II/ Hindi Paper II/ French Paper II	L	6	88	2	3	25	75	100	3
	II	ENG2302	English Paper II	E	5	73	2	3	25	75	100	3
	III	AS24C02	Chordata	CC	6	88	2	3	25	75	100	5
		AS24CP1	Zoology Practical I	CC	3	45	-	3	25	75	100	5
		CE24A02	Chemistry for Biologists II	GE	5	73	2	3	20	55#	75#	4
		CE23AP1	Chemistry Practical for Biologists	GE	3	45	-	3	15	35#	50#	2
	IV	NM24UHR	Universal Human Values and Human Rights	AECC	2	30	-	-	100	-	100	2
		NM23GAW	General Awareness	AEC	SS	-	-	-	100	-	100	Gr.
		*NME23B2/ *NME23A2	Basic Tamil II/ Advanced Tamil II	AEC	SS	-	-	-	100	-	100	Gr.
I-V	VI	COM15SER	Community Service 30 Hours	GC	-	-	-	-	-	-	-	-
		24BONL1 24BONL2 24BONL3	Online Course 1 Online Course 2 Online Course 3	ACC	-	-	-	-	-	-	-	-

* After class hours
# CA conducted for 25 converted to 20, ESE conducted for 75 converted to 55

L – Language
CC – Core Courses
GE – Generic Elective
AEC – Ability Enhancement Course
ACC – Additional Credit Course
E - English
CA – Continuous Assessment
ESE–End Semester Examination
SS – Self study

QUESTION PAPER PATTERN

Examination System

One test for continuous assessment will be conducted on pre-determined dates i.e., commencing on the 50th day from the date of reopening. The Model exam will be conducted after completing 85th working days. Marks for ESE and CA with reference to the maximum for the courses will be as follows:

2023-2024 BATCH & ONWARDS

CA Question Paper Pattern and distribution of marks UG
Language and English
Section A 5 × 1 (No choice) : 5 Marks
Section B 4 × 5 (4 out of 6) : 20 Marks (250 words)
Section C 2 × 10 (2 out of 3): 20 Marks (500 words)
Total : 45 Marks

Core and Allied - (First 3 Units)

CA Question from each unit comprising of

One question with a weightage of 2 Marks (No choice) : 2 × 3 = 6
One question with a weightage of 5 Marks (Internal Choice at the same CLO level) : 5 × 3 =15
One question with a weightage of 8 Marks (Internal Choice at the same CLO level) : 8 × 3 =24
Total : 45 Marks

End Semester Examination – Question Paper Pattern and Distribution of Marks
Language and English
Section A 10 × 1 (10 out of 12) : 10 Marks
Section B 5 × 5 (5 out of 7) : 25 Marks (250 words)
Section A 4 × 10 (4 out of 6) : 40 Marks (600 - 700 words)
Total : 75 Marks

Core and Allied courses:
ESE Question Paper Pattern: 5 × 15 = 75 Marks
Question from each unit comprising of
One question with a weightage of 2 Marks : 2 × 5=10
One question with a weightage of 5 Marks (Internal Choice at the same CLO level): 5 × 5 =25
One question with a weightage of 8 Marks (Internal Choice at the same CLO level): 8 × 5 =40

Continuous Internal Assessment Pattern
Theory
I Year UG (23 Batch)

CIA Test : 5 marks (conducted for 45 marks after 50 days)
Model Exam : 7 marks(Conducted for 75 marks after 85 days (Each Unit 15 Marks))
Seminar/Assignment/Quiz : 5 marks
Class Participation : 5 marks
Attendance : 3 marks
Total : 25 Marks

Practical
Lab Performance : 7 marks
Regularity : 5 marks
Model Exam : 10 marks
Attendance : 3 marks
Total : 25 marks

ESE Practical Pattern
The End Semester Examination will be conducted for a maximum of 75 marks respectively with a maximum 15 marks for the record and other submissions if any.

Part IV
Foundation Course – Universal Human Values and Human Rights
Quiz : 50 marks
Assignment : 25 marks
Project / Case study : 25 marks
Total : 100 Marks

MAPPING OF PLOS WITH CLOS

COURSE	PROGRAMME LEARNING OUTCOMES				
	PLO1	PLO2	PLO3	PLO4	PLO5
COURSE – AS24CO2					
CLO1	S	S	M	M	L
CLO2	S	S	M	M	M
CLO3	S	S	S	S	M
CLO4	S	S	S	S	M
COURSE – AS24CP1					
CLO1	S	S	S	S	S
CLO2	S	S	S	S	S
CLO3	S	S	S	S	S
CLO4	S	S	S	S	S

COURSE CODE	COURSE TITLE	Category	L	T	P	Credit
AS24CO2	CHORDATA	Theory	88	2	-	5

Preamble

To understand the basic classification, structure and functional details of invertebrates and to appreciate the diversity of life on earth with respect to invertebrates.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the distinguished characteristics, the biodiversity, habitat, adaptation, organization and taxonomic status of invertebrates K1	K1
CLO2	Understand the importance of multicellularity significant to anatomical and physiological up gradation of the invertebrates	K2
CLO3	Identify the evolution of organ systems and differences in functional morphology of higher invertebrates	K3
CLO4	Analyze the advancement in systemic organization of invertebrates and connecting link to Chordates. Infer the application of Recent emerging technologies in learning and research in Zoology	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	M	M	L
CLO2	S	S	M	M	M
CLO3	S	S	S	S	M
CLO4	S	S	S	S	M

S- Strong; M-Medium; L-Low

CHORDATA-AS24CO2 (88 hrs)

UNIT I: **(20 Hrs)**

Phylum Chordata Introduction, Three fundamental Chordate characters, Advancements of Chordates over other phyla. Brief classification of chordate with characters.

PROTOCHORDATA- General Characters and affinities of Urochordata and Hemichordata

Type study:Cephalochordata, Amphioxus- Affinities and Systematic Position, Habits and Habitat, External features, Body wall, Coelom, Atrium, Digestive System, Respiratory mechanism, Circulatory system, excretory system and Reproductive system.

General Essays

- *Dipnoi- lung fishes-affinities and systematic Position
- Overview of Phylogenetic analysis using Machine learning

PISCES- General Characters

General characteristics of Chondrichthyes and Osteichthyes, classification upto class

Type study: Shark - Systematic Position, Habits and Habitat, External features, Exoskeleton- Placoid Scales, Digestive System, Respiratory, Nervous system- Sense organs-Olfactory organs, Eyes, Internal ears, Neuromast or lateral line system, Ampullae of Lorenzini. Urinogenital system.

General Essays

- Migration, in fishes
- *Virtual E-museum to identify and learn different species of Pisces

UNIT II: AMPHIBIA **(17 hrs)**

General characteristics and classification upto order

Type study: Frog- Systematic Position, Habits and Habitat, External features, Sexual dimorphism, Digestive System, Respiratory system- Cutaneous respiration, Buccal respiration and Pulmonary respiration. Respiratory, Circulatory system, Nervous system, Urinogenital system

General Essays

- *Parental care in Amphibia
- Outline on Image processing for taxonomic classification

UNIT III: REPTILIA **(17 hrs)**

General characteristics and classification upto order

Type study: Calotes - Systematic Position, Habits and Habitat, External features, Digestive System, Respiratory system- Respiratory mechanism, Circulatory system, Nervous system, Sense organs, Jacobson's organs, Structure and function of Eye and Ear, Urinogenital system

General Essays

- *Poison apparatus and Biting mechanism in snakes, First aid treatment for snake bite and common poisonous and non – poisonous snakes in India
- Overview of artificial intelligence for modelling to study Reptile behavior

UNIT IV: AVES **(17 hrs)**

General characteristics and classification upto superorder

Type study: Pigeon -Systematic Position, Habits and Habitat, External features, Feathers- Structure of a typical feather in Pigeon, Types of feathers in pigeon. Muscular System- Flight muscles, Digestive System, Respiratory system- Syrinx and voice production, Air sacs and functions. Respiratory mechanism, Circulatory system, Nervous system-Brain, Spinal cord, cranial nerves and spinal nerves, Urinogenital system.

General Essays

- *Archaeopteryx*—a connecting link
- *Flightless birds, Migration in birds

UNIT V: MAMMALIA **(17 hrs)**

General characteristics and classification upto subclass

Type study: Rabbit- Systematic Position, Habits and Habitat, External features, Digestive System, Respiratory system, Circulatory system. Nervous systemStructure and function of Eye and Ear, Excretory system, Reproductive system.

General Essays

- *Aquatic adaptations in mammals
- *GPS Tracking systems for monitoring the locomotion of wild animals.

***Blended Mode**

Text Books

S. No.	Authors	Title of the Book	Publishers	Year of Publication
1	Jordan.E.L and Verma.P.S	Chordate Zoology	S.Chand& Co	2014
2	A. Thangamani S. Prasannakumar L.M. Narayanan N. Arumugam,	A Text Book of Chordates	Saras Publications	2013

Reference Books

S.No.	Authors	Title of the Book	Publishers	Year of Publication, Edition
1	Ekambaranatha Ayyar.M & Ananthakrishnan.T.N	A Manual of Zoology Vol.II-Part I & II	S.Vishwanathan Pvt.Ltd	2010
2	Kotpal R.L	Modern Text Book of Zoology – Vertebrates	Global Media Publications	2012
3	B Waterman, Allyn J	Chordate Structure and Function	Mac Milan & Co.,	1971
4	Young, J. Z	The Life of Vertebrates	Oxford university press	2004, 3rdEdn.

5	Pough H	Vertebrate life (e-book)	Pearson International	2018, 9thEdn.
6	Marshall and Williams Edited by Veer Baala Rastogi	Parker and Haswell Textbook of ZOOLOGY - Vertebrates -	Med tech Science Press	Volume I 2021
7	Ezra Samberg	Vertebrate Zoology	Syrawood Publishing House	2018

References

1. https://www.biorxiv.org/content/10.1101/2020.01.10.902239v4.full
2. https://www.sciencedirect.com/science/article/abs/pii/S0920548919300935 3
3. https://link.springer.com/article/10.1007/s10336-012-0908-1
4. https://wildlifeact.com/about-wildlife-act/monitoring-tracking-technology/
5. http://emuseum.psgrkcw.com/

COURSE CODE AS24CP1	COURSE TITLE ZOOLOGY PRACTICAL I	Category	L	T	P	Credit
		Practical	-	-	90	4

Preamble

- To enable the students to expose practically
- To learn the taxonomy of invertebrates and Chordates.
- To understand the relationships between invertebrates, Chordates and their environment.
- To learn the location and appearance of internal organs in a typical insect.
- To understand the structure and functional organization of animals.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	To understand the basic concepts of zoological classification and identify the invertebrates and chordates	K1
CLO2	To distinguish the diversity and relationships between major groups of invertebrates and Chordates.	K2
CLO3	To examine the morphology and anatomy of invertebrates and Chordates	K3
CLO4	To relate the diversity and culture/rearing of invertebrates and chordates and infer their economic utility.	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO2	S	S	S	S	S
CLO3	S	S	S	S	S
CLO4	S	S	S	S	S

S- Strong

ZOOLOGY PRACTICAL I AS24CP1 (90 Hrs)

Dissections (**35 hrs)**

1. **Cockroach**
   - a. Digestive system **(3 hrs)**
   - b. Nervous system, **(4 hrs)**
   - c. Male & Female Reproductive systems **(3 hrs)**

2. **Fish**
   - a. Viscera, **(4 hrs)**
   - b. Digestive system, **(4 hrs)**
   - c. Reproductive system, (**4 hrs)**

3. **Earthworm**
   - a. Digestive system, **(3 hrs)**
   - b. Nervous system **(4 hrs**)
   - c. Reproductive system **(3 hrs)**

4. **Prawn** – Nervous system **(3 hrs)**

Mounting (**15 hrs)**

1. Mounting of scales of fishes **(2 hrs)**
2. Mounting of gill arch **(2 hrs)**
3. Mounting of earthworm setae **(2 hrs)**
4. Mounting of mouth parts of cockroach/mosquito/honey bee **(3 hrs)**
5. Mounting of Prawn appendages **(3 hrs)**
6. Whole mount of Euglena/Amoeba/Paramecium **(3 hrs)**

Spotters:

Classify giving reasons:-Paramecium, Leucosolenia, Obelia colony, Prawn, Octopus, Star fish, Ascidian, Shark, Salamander, Pigeon, Bat. **(2 hrs)**

Draw labelled sketches:-T.S. of Tape worm, Leech, Amphioxus, Frog – Skull, Pectoral girdle, Pelvic girdle, Fore limb and Hind limb. **(2 hrs)**

Relate Structure and function: - Gemmule, Tapeworm Entire & Scolex of tapeworm, Nereis -parapodium, Heteronereis, Honey bee-Queen, Drone, Worker; Quill feather, Tortoise, Narcine-Electric organ. **(2 hrs)**

Write descriptive notes:- Nauplius larva, Pila, Bipinnaria larva, Balanoglossus, Echeneis - Sucker fish, Draco - Flying lizard, Rat snake, Cobra, Hyla. **(2 hrs)**

Give biological significance: - Chaetopterus, Peripatus, Limulus, Scorpion, Pearl oyster, Hippocampus male and female, Exocetus – Flying fish, Chameleon. **(2 hrs)**

Field observations combined with photography and/or videography

1) Study of live water specimens in nearby water bodies/pond ecosystem **(5 hrs)**
2) Study of insect fauna in the college campus **(5 hrs)**
3) Visit to a sericulture farm/ Apiary/Museum **(5 hrs)**
4) Study of six common birds from different orders **(5 hrs)**

Culture Methods

1) Culture of unicellular organisms (Amoeba/Paramecium/Euglena)
2) Culture of multicellular organisms (Earthworm) **(10 hrs)**

Reference Books:

S. No.	Authors	Title of the Book	Publishers	Year and Edition
1	Sinha. J, Chatterjee. A. K, Chattopadhyay. P	Advanced Zoology Practical	Arunabha Sen Books and Allied (P) Ltd	2019, 9th edition
2	Lal S. S.	Textbook of Practical Zoology Vertebrate	Rastogi Publication	2004, 8th edition
3	Lal S. S.	Textbook of Practical Zoology Invertebrate	Rastogi Publication	2004

Pedagogy:

Demonstration, practical, dissection, slides, spotters, field visit, culture methods, power point presentation, e-content, group discussion.

College of Excellence, nirf 2024-7th Rank
Autonomous and Affiliated to Bharathiar University
Reaccredited with 'A++' grade by NAAC
Peelamedu, Coimbatore-641004

DEPARTMENT OF ZOOLOGY

CHOICE BASED CREDIT SYSTEM (CBCS) & LEARNING OUTCOMES- BASED CURRICULAR FRAMEWORK (LOCF)

(III Semester)

(For the students admitted during the academic year 2024-27 Batch and onwards)

BACHELOR OF ZOOLOGY

2024 – 2027 BATCH

DEPARTMENT OF ZOOLOGY
BACHELOR OF SCIENCE - ZOOLOGY
CHOICE BASED CREDIT SYSTEM (CBCS)
LEARNING OUTCOME BASED CURRICULAR FRAMEWORK (LOCF)
SYLLABUS & SCHEME OF EXAMINATION
2024-2027 BATCH
SEMESTER III

Sem	Part	Course code	Title of the Course	Course type	Instruction Hours/Week	Contact Hours	Tutorial	Duration of Examination	Examination Marks			Credits
									CA	ESE	Total	
III	I	TAM2303/ HIN2303/ FRE2303	Tamil Paper III/ Hindi Paper III/ French Paper III	L	6	88	2	3	25	75	100	3
	II	ENG2403	English Paper III	E	5	73	2	3	25	75	100	3
	III	AS23C03	Ecology and Embryology	CC	4	58	2	3	25	75	100	4
		AS24CP2	Zoology Practical II	CC	-	-	-	-	-	-	-	-
		PL24A01	Fundamentals of Botany I	GE	5	73	2	3	20	55	75	4
		TH24A19	Mathematics for Sciences I	GE	7	103	2	3	25	75	100	5
		PL23AP1	Botany Practical I	GE	2	30	-	-	-	-	-	-
		AS24SB01	Medical Coding	DSE/SEC	3	41	4	-	100	-	100	3
	IV	NM23DTG	Design Thinking	AEC	2	30	-	-	100	-	100	2
I-III	VI	COM15SER	Community Services 30 hours	GC	-	-	-	-	-	-	-	-
I-V	VI	24BONL 1 24BONL 2 24BONL 3	Online Course I Online Course II Online Course III	ACC	-	-	-	-	-	-	-	-

L – Language
E - English
CC – Core Courses
GE – Generic Elective
DSE –Discipline Specific Elective
SEC- Skill Enhancement Course
AEC – Ability Enhancement Course
GC- General Courses
ACC-Additional Credit Course
CA – Continuous Assessment
ESE - End Semester Examination

QUESTION PAPER PATTERN

Examination System

One test for continuous assessment will be conducted on pre-determined dates i.e., commencing on the 50th day from the date of reopening. The Model exam will be conducted after completing 85th working days. Marks for ESE and CA with reference to the maximum for the courses will be as follows:

2023-2026 BATCH & ONWARDS

CA Question Paper Pattern and distribution of marks UG
Language and English
Section A 5 × 1 (No choice) : 5 Marks
Section B 4 × 5 (4 out of 6) : 20 Marks (250 words)
Section C 2 × 10 (2 out of 3): 20 Marks (500 words)
Total : 45 Marks

Core and Allied - (First 3 Units)

CA Question from each unit comprising of

One question with a weightage of 2 Marks (No choice) : 2 × 3 = 6
One question with a weightage of 5 Marks (Internal Choice at the same CLO level) : 5 × 3 =15
One question with a weightage of 8 Marks (Internal Choice at the same CLO level) : 8 × 3 =24
Total : 45 Marks

End Semester Examination – Question Paper Pattern and Distribution of Marks
Language and English
Section A 10 × 1 (10 out of 12) : 10 Marks
Section B 5 × 5 (5 out of 7) : 25 Marks (250 words)
Section A 4 × 10 (4 out of 6) : 40 Marks (600 - 700 words)
Total : 75 Marks

Core and Allied courses:
ESE Question Paper Pattern: 5 × 15 = 75 Marks
Question from each unit comprising of
One question with a weightage of 2 Marks : 2 × 5=10
One question with a weightage of 5 Marks (Internal Choice at the same CLO level): 5 × 5 =25
One question with a weightage of 8 Marks (Internal Choice at the same CLO level): 8 × 5 =40

Continuous Internal Assessment Pattern

Theory

II Year UG (24 Batch)

CIA Test : 5 marks (conducted for 45 marks after 50 days)
Model Exam : 7 marks(Conducted for 75 marks after 85 days (Each Unit 15 Marks))
Seminar/Assignment/Quiz : 5 marks
Class Participation : 5 marks
Attendance : 3 marks
Total : 25 Marks

Practical

Lab Performance : 7 marks
Regularity : 5 marks
Model Exam : 10 marks
Attendance : 3 marks
Total : 25 marks

ESE Practical Pattern

The End Semester Examination will be conducted for a maximum of 75 marks respectively with a maximum 15 marks for the record and other submissions if any.

Part IV

Foundation Course – NM23DTG-Design Thinking
Quiz : 50 marks
Assignment : 25 marks
Project / Case study : 25 marks
Total : 100 Marks

ATTENDANCE: 3 Marks (Attendance 75% - 80%- 1 Mark, 81% - 90% - 2 Mark, 91%-100% - 3 Mark)

MAPPING OF PLOS WITH CLOS

COURSE	PROGRAMME LEARNING OUTCOMES				
	PLO1	PLO2	PLO3	PLO4	PLO5
COURSE – AS23CO3					
CLO1	S	S	M	M	L
CLO2	S	S	M	M	M
CLO3	S	S	S	S	M
CLO4	S	S	S	S	M
COURSE – AS23CP2					
CLO1	S	S	S	S	S
CLO2	S	S	S	S	S
CLO3	S	S	S	S	S
CLO4	S	S	S	S	S

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
AS23CO3	ECOLOGY AND EMBRYOLOGY	Core	58	2	-	4

Preamble

To understand the basic concepts of ecology & Embryology and to understand the functional details of environments and embryo & its stages.

Course Learning Outcomes

On the successful completion of the course, students will be able to

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the basic aspects of ecology and Gametogenesis, Organogenesis in frog and Human Reproduction.	K_1
CLO2	Understand the concepts of ecological attributes and physiological processes in Embryology that are distinct and significant	K_2
CLO3	Apply the systemic and functional morphology of various aspects of ecology and embryology	K_3
CLO4	Analyze the general and specific characteristics within and other environments in relation to abiotic & biotic factors, stages and development of an embryo	K_4

Mapping with Programme Outcomes

CLO	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	L	S	M	M	S
CLO2	S	S	M	M	S
CLO3	S	S	S	S	M
CLO4	S	S	S	S	M

S- Strong; M-Medium; L-Low

ECOLOGY AND EMBRYOLOGY – AS23CO3 **58 Hrs**

Syllabus

Unit I **11 Hrs**

Scope of Environmental Biology, Abiotic factors – Soil, Water, Light,Temperature. Biotic Factors, *__Animal Relationships: Symbiosis, Mutualism, Commensalism, Antagonism, Parasitism, Predation,Competition__, Population attributes: natality, mortality, population growth, population density, growth curves, Age pyramids, Biotic potential, Population regulation. *__Biogeochemical cycles–Carbon, Oxygen, Nitrogen, Phosphorus and Sulphur cycles.__

Unit II **11 Hrs**

Community ecology – Definition, Types and Characteristics of community, Ecotone and Edge Effect, Ecological niche, Concepts of community, Ecological succession- sere and climax, Significance of succession. Habitat ecology – *__Marine Habitat-Definition, Stratification__, Pelagic region – communities, plankton, Pelagic adaptations; Intertidal seashore – rocky, muddy, sandy – biota and adaptations. *__Mangroves –Definition, Mangrove fauna and flora, Ecological conditions of mangroves.__

Unit III **12 Hrs**

Scope of Developmental Biology-definition, sub-divisions (Descriptive, Comparative, Experimental and Chemical). Early history of embryology.(Preformation and Epigenesis, Recapitulation theory or Biogenetic law, Germplasm theory (Weisman). *__Gametogenesis-Spermatogenesis –Spermiogenesis, Structure and types of sperms; Oogenesis- Growth of oocyte, vitellogenesis__, organization of egg cytoplasm, Polarity and Symmetry, Maturation of egg, egg envelopes, Structure of Ovum; *__Fertilization-Definition , External and internal fertilization, Mechanism of fertilization.__ Cleavage-Patterns of cleavage-radial, spiral and bilateral; Types of cleavage - meroblastic and holoblastic. Blastulation-Types of Blastula; Fate map of frog , Gastrulation in frog. Morphogenetic movements-epiboly and emboly.*__Types of eggs.__

Unit IV **12 Hrs**

Organogenesis in frog – Development of eye,ear ,brain & heart.Organizer concept: Embryonic Induction, Role of organizers in development- Transplantation experiments of Spemann and Mangold. Chemistry of organizers. Extra-embryonic membranes in chick. *__Placentation in mammals-Classification of placenta based on Nature of contact,Mode of implantation,Histological intimacy of foetal and maternal tissue.Functions of placenta. * Metamorphosis in frog, Regeneration__

Unit V **12 Hrs**

*__Human Reproduction: Puberty, *Menstrual cycle, Reproductive Hormones Menopause, Pregnancy, Parturition, Lactation, Infertility__, Artificial insemination, Cryopreservation, Embryo transfer, Amniocentesis, Artificial Reproductive Technology-. ZIFT, GIFT and IVF. Birds eye view of stem cells. * __In vitro fertilization and its ethics__.

*** Denotes Blended Learning**

TEXT BOOKS

S. No.	Author	Title of the Book	Publisher	Year & Edition
1	Arumugam, N	A Text Book of Embryology	Saras Publication	2003, 2nd Edn.
2	Verma P.S., Agarwal., V.K	Environmental Biology	S. Chand & Company	2000, 8th Edn.

REFERENCE BOOKS

S. No.	Author	Title of the Book	Publisher	Year & Edition
1	Balinsky, B.I	Introduction to Embryology	Saunders College Publishing	1981, 5th Edn.
2	Berrill, N.J	Developmental Biology	Tata Mc Graw Hill Publication Co.Ltd	1986, 2nd Edn.
3	Clarke,G.L.	Elements of Ecology	John Wiley & Son Inc. New York & London	1954, 1st Edn.
4	Kotpal,R.L. and Bali,N.P.	Concepts of Ecology	Vishal Publication, Delhi	1986, 1st Edn.
5	Odum, E.P.	Basic Ecology	Saunders College Publishing , New York	1983, 2nd Edn.
6	Scott F. Gilbert,	Developmental Biology	Sinauer Associates, Inc. Publishers, Sunderland, Massachusetts	1997, 5th Edn.
7	Vijayaraghavan Nair K & P.V. George	A Manual of Developmental Biology	Academica	-
8	Vincent Terrence Robello, John P.C. and Prema A K	Developmental Biology	Zoological Society Study Material Series, Zoological Society of Kerala, Kottayam	2012, 1st Edn.

Pedagogy: Chalk and talk, PPT, e-content, group discussion, assignment, quiz, peer learning, seminar

Course Designers

1. Dr. G. Sasikala
2. Dr. M. Sheeba

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
AS23CP2	ZOOLOGY PRACTICAL II	Practical	-	-	90	4

Preamble

To provide practical knowledge on cell biology, environmental and developmental biology and to develop practical biological skills.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the basic concepts biology-based knowledge on the life of animal forms and the environment. To understand the concepts of natural habitats and the effects of ecological parameters. To understand the process by which organisms grow and develop	K_1
CLO2	Understand the components of the ecosystem and their interactions and inter-relationships to sustain life on earth. Analyse the different ecological parameters and to analyse the mechanisms that intervene in developmental alterations	K_2
CLO3	Application of the acquired skills and adopting it for future research	K_3
CLO4	Analyze the practical knowledge on cell biology, environmental and developmental biology and develop practical biological skills	K_4

Mapping with Programme Outcomes

CLO	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	L	S	S	S	S
CLO2	S	M	S	S	S
CLO3	S	S	M	S	M
CLO4	S	S	S	S	S

S- Strong; M-Medium; L-Low

ZOOLOGY PRACTICAL II – AS23CP2 **90 Hrs**

Syllabus

CELL BIOLOGY **12 Hrs**

1. Squash preparation of onion root tip.
2. Mounting of giant chromosomes in Drosophila larva

BIOCHEMISTRY **6 Hrs**

1. Qualitative analysis of carbohydrates, proteins and lipids.

ENVIRONMENTAL BIOLOGY **42 Hrs**

1. Estimation of dissolved oxygen in water samples by Winkler's method.
2. Estimation of salinity, pH and temperature in water samples.
3. Estimation of free carbon dioxide in water samples.
4. Mounting and identification of Marine and Fresh water plankton.
5. Identification and study of inter tidal, rocky sandy and muddy shore fauna.
6. Estimation of total alkalinity of water.
7. Estimation of total hardness of water.
8. Trip to a terrestrial ecosystem

DEVELOPMENTAL BIOLOGY **30 Hrs**

Spotters

1. Observation of different types of eggs – Amphioxus, frog, hen's egg, ovum of mammal
2. Observation of different types of sperms- Sperm of frog, sperm of man.
3. Embryology of Frog – Cleavage, Blastula, Gastrula, Yolk plug.
4. Chick embryo whole mount – 24, 48, 72 & 96 hours.
5. Metamorphosis in frog.
6. Placenta of mammals - pig, sheep and man.

REFERENCE BOOKS

S. No.	Author	Title of the Book	Publisher	Year & Edition
1	Sinha. J, Chatterjee. A. K, Chattopadhyay. P	Advanced Zoology Practical	Arunabha Sen Books and Allied (P) Ltd	2011, 1st Edn.
2	Lal S. S., A	Textbook of Practical Zoology Vertebrate	Rastogi Publication	2004, 3rd Edn.
3	Lal S. S., A	Textbook of Practical Zoology Invertebrate	Rastogi Publication	2004, 3rd Edn.

Pedagogy: Demonstration, practical, dissection, slides, spotters, field visit, culture methods, power point presentation, e-content, group discussion.

Course Designers

1. Dr. G. Sasikala
2. Dr. M. Sheeba

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	Credit
AS23A01	**INVERTEBRATA AND CHORDATA**	**Theory**	**73**	**2**	**-**	**4**

Preamble

An introduction to basic concepts in biology through study of the major lineages of invertebrate and vertebrate animals, with emphasis on the ontogeny, structure, and function of organ systems in an evolutionary context in allied Zoology to understand biodiversity, adaptation, organization and taxonomic position, explaining the basic aspects of classification, structural and functional details of the invertebrates and chordates.

Course Learning Outcomes

On the successful completion of the course, students will be able to fill up the lacunae in the study of natural sciences.

CLO Number	CLO Statement	Knowledge Level
CLO1	To recall the various types of animals, habits, habitat and general characteristic features and classification based on their diversity into invertebrates and chordates	K_1
CLO2	To understand the need for taxonomic position of invertebrates and chordates based on their distribution	K_2
CLO3	To apply the knowledge of systematics, morphology, functional, and structural modification in invertebrates & chordates during the course of evolution and their significance	K_3
CLO4	To analyse the knowledge of anatomy of invertebrates and chordates comparatively to recognize their history, evolutionary trends and significance	K_4

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	L	L	L	M	M
CLO2	S	S	M	M	S
CLO3	S	S	S	S	S
CLO4	S	S	S	S	S

S- Strong; M-Medium; L-Low

INVERTEBRATA AND CHORDATA AS23A01 73 Hrs

Syllabus

Outline classification of Kingdom Animalia upto class level with two examples, one type study under each phylum to deal with structure, organization, and life cycle.

Unit 1 14 Hrs

Phylum Protozoa: **Structure and life cycle of *Paramecium caudatum* – External features,** Nutrition, Locomotion - effective stroke, recovery stroke, Metachronal rhythm, Reproduction-**Asexual - Binary fission, Sexual reproduction – Conjugation,** Autogamy, Endomixis, Hemimixis and Cytogamy.

Phylum Porifera: **Structure and life cycle of Leucosolenia botryoides- *External features*,** Body wall, Spicules ***Canal System**, *Nutrition, Reproduction*.

Phylum Coelenterata: **Structure and life cycle of Hydra vulgaris- *External features***, Histology of body wall, Cnidoblast and its functions, Nutrition, locomotion, Respiration, Excretion and Osmoregulation, Nervous System, ***Reproduction – asexual – budding; sexual – testis and spermatogenesis, ovary and oogenesis, fertilization, development, hatching - regeneration in Hydra.**

Unit 2 14 Hrs

Phylum Helminthes: ***Structure and life cycle of *Taenia solium* - External features, Body wall**, Feeding, Respiratory system, Excretory system-flame cells, Nervous system, Reproductive system, ***Life cycle-Onchosphere and Cysticercus larvae.**

Phylum Annelida: ***Structure and life cycle of *Megascolex mauritii* - External features,** Body wall, Coelom, Locomotion, Digestive system, Respiratory system, Excretory system-Meganephridia, Micronephridia, Pharyngeal nephridia, Nervous system, ***Reproductive system.**

Phylum Arthropoda: ***Structure and life cycle of *Periplaneta americana* - External features,** ***Body wall,** ***Mouthparts,** ***Digestive system,** Respiratory system, Circulatory system, Nervous system, Sense organs, Excretory system, ***Reproductive system.**

Unit 3 15 Hrs

Phylum Mollusca: ***Structure and life cycle of *Pila globosa* - External features, Shell,** Digestive system, Respiratory system, Circulatory system, Nervous system, ***Sense organs- Eyes, Osphradium, Statocyst, Tentacles,** Excretory system, Reproductive system.

Phylum Echinodermata: ***Structure and life cycle of *Asterias rubens* - External features,** Pedicellaria-Structure and Function, Digestive system, Respiratory system, Water vascular system-Structure and Function, Circulatory system – Perihaemal and Haemal system, Nervous system, ***Sense organs**, Excretory system, Reproductive system.

Unit 4 15 Hrs

Phylum Chordata-Morphology and organ systems of Shark & Frog (Excluding endoskeleton)

Class Pisces:* Scoliodon sorrakowah**- Systematic Position, Habits and Habitat, ****External features, *Exoskeleton - Placoid Scales, *Digestive System, Respiratory system & Mechanism of respiration, Circulatory system, Nervous system,* ****Sense organs-Olfactory organs, Eyes, Internal ears, Neuromast or lateral line system, Ampullae of Lorenzini***. *Urinogenital system.*

Class Amphibia: *Rana hexadactyla*-Systematic Position, Habits and Habitat**, External features, Sexual dimorphism,** Digestive System, Respiratory system, Circulatory system, Nervous system-***Sense organs -**

Tangoreceptors, Tastebuds, Olfactory organs, *Internal structure and functions of Eye and Ear, Urinogenital system

Class Reptilia: *Calotes versicolor*- Systematic Position, Habits and Habitat, External features, Digestive System, Respiratory system - Respiratory mechanism, Circulatory system - Blood, Heart - Internal structure, Arterial system, Venous system. Nervous system - Brain, Spinal cord, cranial nerves and spinal nerves. ***Sense organs, Jacobson's organs, *Internal structure and functions of Eye and Ear,** Urinogenital system

Unit 5 **15 Hrs**

Phylum Chordata - Morphology and organ systems of Pigeon & Rabbit (excluding endoskeleton)

Class Aves: *Columba livia domestica*- Systematic Position, Habits and Habitat, ***External features, Feathers** - Structure of a typical feather in Pigeon, ***Types of feathers in pigeon**, Muscular System - Flight muscles, Digestive System, ***Respiratory system- Syrinx and voice production,** *Air sacs and functions.** Respiratory mechanism, Circulatory system - Nervous system, ***Structure and function of Eye and Ear,** Urinogenital system.

Class Mammalia: *Oryctolagus cuniculus domesticus*- Systematic Position, Habits and Habitat, ***External features**, Digestive System, Respiratory system, ***Circulatory system,** Nervous system. ***Structure and function of Eye and Ear,** *Excretory system,** Reproductive system.

***Denotes Blended Learning**

Text Books

S. No.	Authors	Title of the Book	Publishers	Year & Edition
1	Jordon. E L & Verma PS	Invertebrate Zoology	S. Chand & Co., New Delhi	1993, 12th Edn.
2	Jordan E L and Verma PS	Chordate Zoology	S. Chand & Co, New Delhi	2014, 15th Edn.

REFERENCE BOOKS:

S. No.	Authors	Title of the Book	Publishers	Year & Edition
1	Ekambaranatha Ayyar M	Outlines of Zoology	Viswanathan Publication	1992, 3rd Edn.
2	Fatik Baran Mandal	Invertebrate Zoology 1st Edn	Eastern Economy Edition	2012, 1st Edn.
3	Jan A Pechenik	Biology of the Invertebrates 7th Revised Edition	McGraw-Hill Companies,	2014, 7th Revised Edn.
4	Barrington EJW	Invertebrate Structure and Function 2nd Edn	ELBS and Nelson,	1979, 2nd Edn.
5	Waterman, Allyn J	Chordate structure and Function	Mac Milan & Co., New York	1971, 1st Edn.

Pedagogy: Chalk and Talk method, Seminar, Quiz, Group discussion, Powerpoint presentation, videos, e-contents, etc.

Course Designer(s)

Dr. Susheela.P
Dr. G. Sasikala

COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	CREDIT
AS23AP1	ZOOLOGY PRACTICAL	PRACTICAL	-	-	60	2

Preamble

Topics related to fundamentals of zoology, including exposure to diversity in animal groups based on the zoological areas are covered. The practical course is aimed to equipped the students with skills required for animal identification and classification and also applications of zoology in the various allied fields

Course Learning Outcome

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CLO1	To recall the general taxonomic rules on animal classification and general characteristics of animals	K_1
CLO2	To understand the basic concepts of Zoology, categorize the diversity found in the animal groups and their evolutionary significance	K_2
CLO3	To apply the practical skills towards the handling different organisms, use of various tools, technologies and fieldwork modalities	K_3
CLO4	To analyse and interpret the diversity of organisms, functioning of organ system, and observation and study of nature and develop experimental skills for scientific investigation	K_4

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	S	S
CLO2	S	S	S	S	S
CLO3	S	S	S	M	M
CLO4	S	S	S	M	M

S- Strong; M-Medium; L-Low

ZOOLOGY PRACTICAL – AS23AP1 **60 Hrs**

1. Dissections: **30 Hrs**

1. Cockroach Digestive system, Nervous system, Male & Female Reproductive systems
2. Fish (*Tilapia*) - Digestive system
3. Prawn- Nervous system

Mounting:

1. Mounting of scales of a marketable fish.
2. Mounting of gill arch.
3. Mounting of earthworm setae
4. Mounting of mouth parts of cockroach
5. Mounting of Prawn appendages

2. Spotters **12 Hrs**

Paramecium – Entire, binary fission, conjugation

- *Leucosolenia*
- *Hydra vulgaris* – Entire
- *Taenia solium* – Entire, T.S
- Ascaris -male, female
- Earth worm
- Pila
- Star fish
- Amphioxus
- Shark
- Frog
- Skeleton of frog- Skull, Vertebrae-Typical, VIII, IX, X, Girdles& Limbs
- Calotes
- Pigeon
- Quill feather
- Rabbit
- Mitosis stages

Frog embryology

- Egg
- Sperm
- Blastula
- Gastrula

3. Field observations combined with photography and/or videography **4 Hrs**

- Study of insect fauna in the college campus

4. Culture methods **2 Hrs**

- Culture of unicellular organisms.

5. Models **12 Hrs**

- Animal Cell
- Mitochondria
- DNA
- RNA
- Chromosomes
- Alimentary Canal of Man
- Male Reproductive Tract
- Female Reproductive Tract
- Human Placenta
- Protein Structure

REFERENCE BOOKS:

S. No.	Authors	Title of the Book	Publishers	Year & Edition
1	Sinha J, Chatterjee A K, Chattopadhyay P	Advanced Zoology Practical	Arunabha Sen Books and Allied (P) Ltd	2011, 1st Edn.
2	Lal S S	Textbook of practical Zoology Invertebrate	Rastogi Publication	2004, 3rd Edn.
3	Lal S S	Textbook of practical Zoology Vertebrate	Rastogi Publication	2004, 3rd Edn.

Pedagogy: Observation of slides, specimens and models; field visit, dissection

COURSE CODE	COURSE TITLE	Category	L	T	P	Credit
AS24SB01	MEDICAL CODING	Theory	41	4	-	3

Preamble

Medical coding is a vital component of the modern healthcare ecosystem, ensuring accurate documentation, efficient billing, and effective communication across providers and insurers. This course introduces the foundational concepts and practical skills necessary for aspiring medical coders.

Course Learning Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Recall the basic concepts, purpose, and types of medical coding systems including ICD, CPT, and HCPCS.	K1
CLO2	Interpret medical terminology, including common morphemes and terms related to different body systems, the anatomy, functions, and frequently encountered diseases of major organ systems	K2
CLO3	Apply correct ICD-10-CM codes for various diagnoses, signs, symptoms, and external causes based on clinical documentation.	K3
CLO4	Apply billing procedures and identify common issues such as denials, and rejections, and evaluate different career options in medical coding and prepare appropriate resumes and responses for interviews	K4

Mapping with Programme Learning Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	**M**	**M**	**M**	**S**	S
CLO2	**M**	**M**	**M**	S	S
CLO3	**M**	**M**	**S**	**S**	**S**
CLO4	**M**	**M**	**S**	**S**	**S**

S- Strong, M-Medium

MEDICAL CODING - AS24SB01 Hrs

UNIT I: Introduction to Medical Coding & Basic Systems 9 Hrs

Definition and purpose of medical coding, Roles and responsibilities of a medical coder, Types of medical codes: ICD, CPT, HCPCS, Overview of coding process from patient visit to billing, Medical Terminology- Morphemes, Common terminology in various systems, Tips for deciphering medical terms, Digestive System- Anatomy and Functions: digestion, absorption, excretion, Common diseases Diagnostic and procedural terminology, Respiratory System- Anatomy and Functions: gas exchange, respiration regulation, Common conditions and Procedures, Terminology and sample codes.

UNIT II: Major Organ Systems 9 Hrs

Cardiovascular System- Anatomy of the heart and blood vessels, Common diseases, Diagnostic terms and procedures, Common codes used, Musculoskeletal System, Bones, muscles, joints overview, Common conditions, Orthopedic terms and procedures, Coding for injuries and surgeries, Genitourinary System-Male and female reproductive systems, Urinary system components and functions, Common diseases, Diagnostic/procedural terms, Related coding examples, Nervous System-CNS and PNS structure and function, Common conditions, Diagnostic tools, Neurological coding and terminology.

UNIT III: Additional Body Systems 9 Hrs

Integumentary System- Skin, hair, nails, and glands, Common disorders, Biopsy, excision, and dermatological procedures, Related coding examples, Blood & Lymphatic Systems- Blood components and functions Lymph nodes and immune system overview, Related Diseases, Hematology/oncology codes, Endocrine System- Major glands, Hormonal imbalances, Lab tests and common endocrine-related procedures, Coding and medical terminology EENT- Overview of EENT organs, common conditions, Related tests and treatments, Basic coding practices in EENT.

UNIT IV: ICD-10-CM Diagnosis Coding 9 Hrs

ICD-10-CM (International Classification of Diseases, 10th Revision – Clinical Modification) Structure and format of ICD-10-CM, Guidelines for proper use of codes, Coding for: Diseases,

Signs and symptoms, Abnormal findings, External causes, Injuries, Overview of all 22 chapters: Infectious diseases to External causes of morbidity, Examples of correct and incorrect coding.

UNIT V: CPT, HCPCS & Career Prep **9 Hrs**

CPT (Current Procedural Terminology), Introduction to CPT codes, CPT manual organization (Sections and Subsections), Types of codes, Evaluation & Management (E/M) coding, Surgical procedures and diagnostics, Modifiers, Use of CPT modifiers, Importance in refining code accuracy, Impact on reimbursement, HCPCS (Healthcare Common Procedure Coding System), Levels I and II codes, Durable Medical Equipment (DME) and supplies, Drugs and non-physician services, Billing Guidelines-Insurance claim process, Payers and reimbursement systems, Role of clearinghouses and denials, Job Opportunities & Career Preparation, Career paths: outpatient coder, inpatient coder, auditing, compliance, Common interview questions for coders, Resume tips for coders, Mock interview preparation, Certifications.

Reference Books

S. No.	Authors	Title of the Book	Publishers	Year & Edition
1,	Carol J. Buck	Step-by-Step Medical Coding	Elsevier	2023
2	American Medical Association (AMA)	CPT 2024 Professional Edition	American Medical Association Press	2024
3	American Academy of Professional Coders	ICD-10-CM Expert for Physicians 2024	American Academy of Professional Coders	2024
4	Joanne Valerius, Nenna Bayes, Cynthia Newby	Medical Insurance: An Integrated Claims Process Approach	McGraw-Hill Education	2020
5	American Medical Association	Principles of CPT Coding	American Medical Association	2012, 9th Edn.
6	American Academy of Professional Coders	CPC® Certification Study Guide 2024	AAPC Publishing	2024

Semester : III & IV

Paper : Job Oriented Course

Title : Celebrate Life with Photography - A Mobile Phone Photography Course

Subject Code : JOB2598

Lecture Hours: 60

Preamble

- Impart a good understanding of the Art and Science of Mobile Phone Photography
- Help develop a sense of aesthetics and cultivate creativity
- To help students connect with themselves and the world around them
- Observation skills will make a person more sensitive to whatever is happening in their immediate surroundings and the world at large
- Motivate peer interaction and help students discover the pleasure of working with others

Module 1: Introduction to Mobile Photography

This module will introduce students to the essentials of photography, focusing specifically on the capabilities of mobile devices. Topics will include understanding the camera in a smartphone, working with available light, composition, and colour theory.

Module 2: Advanced Techniques in Mobile Photography

Students will learn about advanced concepts like HDR, panoramas, time-lapses, portraits, and macro photography. They will also be introduced to post-processing apps for mobile devices.

Module 3: Exploring Nature
Description: This module will focus on using mobile phone photography to observe Nature in the context of shapes, forms, colours, and textures.
Assignment: The assignment will be based on the topic for the week
Assessment Criteria: Content, Technique and Aesthetics.

Module 4: Capturing Culture and Heritage
Description: Students will learn how to use mobile photography to document and appreciate diverse cultures, traditions, and architecture in their cities.
Assignment: The assignment will be based on the topic for the week
Assessment Criteria: Content, Interpretation and Aesthetics.

Module 5: Mindful Photography
Description: This module will teach students how photography can be used as a mindfulness tool to appreciate the surroundings and foster a positive mindset.
Assignment: The assignment will be based on the topic for the week
Assessment Criteria: Content, Interpretation and Presentation.

Module 6: Urban Explorations
Description: Students will learn how to use mobile photography to appreciate and capture the aesthetics of urban life, including street art, architecture, urban landscapes, and cityscapes.
Assignment: The assignment will be based on the topic for the week
Assessment Criteria: Content, Technique and Aesthetics.

7. Final Project: Your Mobile Photo Story (Team Project)

In this team Photo Story project, students will be required to capture captivating narratives through the lens of their cameras. Each team will identify an underlying theme that resonates with them, for example - "Reflections", "Journey", "Contrast", "Connections". Through this collaborative endeavour, students will explore the art of storytelling through photography, using visual imagery to convey compelling narratives that reflect their unique perspectives and experiences.