PSGR
Krishnammal College for Women

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 CURRICULUM FRAMEWORK (LOCF)

BACHELOR OF SCIENCE - ZOOLOGY
2025 – 2028 BATCH
I SEMESTER

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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

BACHELOR OF SCIENCE - ZOOLOGY
CHOICE BASED CREDIT SYSTEM (CBCS)
LEARNING OUTCOME BASED CURRICULAR FRAMEWORK (LOCF)
SYLLABUS & SCHEME OF EXAMINATION
2025-2028 BATCH
SEMESTER I

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	TAM2501/ HIN2501/ FRE2501	Tamil Paper I/ Hindi Paper I/ French Paper I	L	6	88	2	3	25	75	100	3
	II	ENG2501	English Paper I	E	6	88	2	3	25	75	100	3
	III	AS25C01	Invertebrata	CC	6	88	2	3	25	75	100	5
	III	AS25CP1	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	-	-	-	-	-	-
	IV	NME25B1/ NME25A1	Basic Tamil I/ Advanced Tamil I	AEC	2	28	2	-	100	-	100	2
	IV	NME23ES	Introduction to Entrepreneurship	AEC	2	30	-	-	100	-	100	
I-II	VI	NM25GAW	General Awareness	AECC	SS	-	-	-	100	-	100	Gr
I-II	VI	COM25SER	Community Services 30 Hours	GC	-	-	-	-	-	-	-	-
I-V	VI	24BONL1 24BONL2 24BONL3	Online Course I Online Course II Online Course III	ACC	-	-	-	-	-	-	-	-

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

MAPPING OF PLOS WITH CLOS

COURSE	PROGRAMME LEARNING OUTCOMES				
	PLO1	PLO2	PLO3	PLO4	PLO5
COURSE – AS25CO1					
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 – AS25CP1					
CLO1	S	S	S	S	S
CLO2	S	S	S	S	S
CLO3	S	S	S	S	S
CLO4	S	S	S	S	S

Examination System

Pattern:

Semester system will be followed. A semester consists of a minimum of 90 working days excluding the days of conduct of ESE. There will be Continuous Internal Assessment (CA) to evaluate the performance of students in each course and the End Semester Examination will be held at the end of every semester. Marks for the ESE and CA with reference to the maximum marks for the courses will be as follows:

Weightage assigned to various components of Continuous Internal Assessment

Theory

CIA Test	: 5 marks **(conducted for 45 marks after 50 days)**
Model Exam	: 7 marks **(Conducted for 75 marks after 85 days)**
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**

CA - Question Paper Pattern and Distribution of Marks

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 Paper Pattern: 3 × 15 = 45 Marks

CA Question from each unit comprising of

One question with a weightage of 2 Marks :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

Advanced Tamil / Basic Tamil

CIA Test	: 25 marks **(conducted for 50 marks after 50 days)**
Model Exam	: 50 marks **(Conducted for 75 marks after 85 days)**
Quiz	: 15 marks
Assignment	: 10 marks
Total	**: 100 Marks**

Introduction to Entrepreneurship

Quiz	: 50 marks
Assignment	: 25 marks
Project / Case Study	: 25 marks
Total	**: 100 Marks**

End Semester Examination – Question Paper Pattern and Distribution of Marks

Language and English

Section A 10 x 1 (10 out of 12)	: 10 Marks
Section B 5 x 5 (5 out of 7)	: 25 Marks (250 words)
Section A 4 x 10 (4 out of 6)	: 40 Marks (600 - 700 words)
Total	**: 75 Marks**

Core and Allied

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

Criteria for Attendance:

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

COURSE CODE	COURSE TITLE	Category	L	T	P	Credit
AS25CO1	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
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 – AS25CO1 **88 Hrs**

Unit 1 **19 Hrs**

Phylum Protozoa

General characteristics and Classification up to classes.

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

General Essays

- ***Life cycle and pathogenicity *Entamoeba histolytica***

Phylum Porifera

General characteristics and Classification up to classes.

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

General Essays:

- ***Economic importance of sponges**

Unit 2 **19 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, Polymorphism in Coelenterates.

General Essays

- ***Corals, coral reefs and coral bleaching**

Phylum Helminthes

General characteristics and Classification up to classes.

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

Unit 3 **20 Hrs**

Phylum Annelida

General characteristics and Classification up to classes.

Type Study: *Lampito mauritii* - External features, Body wall, Coelom, Locomotion, Digestive system, Respiratory system, Excretory system, Nervous system, Reproductive system.

General Essays

- ***Metamerism in annelids**

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.**

Unit 4 **20 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, Circulatory system, Nervous system, Sense organs, Excretory system, Reproductive system.

General Essays

- ***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 & Edition
1	Jordan E.L and Verma P.S	Invertebrate Zoology	S. Chand and Co	2022, 1 Edn.
2	Nair N. C.	A Text Book of Invertebrates	Saras Publications	2015, 5 Edn.
3	Kaliraj, P. and Devi, T.	Artificial Intelligence Theory, models and Applications	CRC Press, Taylor & Francis Group	2022, 1 Edn.
4	Kaliraj, P. and Devi, T.	Innovating with Augmented Reality : Applications in Education and Industry	CRC Press, Taylor & Francis Group	2022, 1 Edn.
5	Kaliraj, P. and Devi, T.	Big Data Applications in Industry 4.0	CRC Press, Taylor & Francis Group	2022, 1 Edn.

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 Edn.
2	Ekambaranatha Ayyar, M. & Ananthakrishnan, T.N.	Manual of Zoology Vol-I (Invertebrata) Part I & II	Vishwanathan (P) Ltd. Chennai	1995, 1 Edn.
3	Mandal Eatik Baran	Biology of Non chordates	PHI Learning Private Limited	2018, 2 Edn.
4	Kotpal R.L., Agarwal S.K and Ketarpal R.P.R	Modern Text Book of Zoology Invertebrates	Rastogi Publications	2011, 3 Edn.
5	Robert	Invertebrate Zoology	W. B. Saunders International	1974, 1 Edn.
6	Pechenik Jan A	Biology of the Invertebrates	McGraw-Hill International	2016, 7 Edn.

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 Links:

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 AS25CP1	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

CORE PRACTICAL - I AS25CPI **90 Hrs**

Dissections **34 Hrs**

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

2. **Fish**
   - a. Fish Anatomy 3 Hrs
   - b. Digestive system, 3 Hrs
   - c. Reproductive system, 3 Hrs
   - d. Fish Brain - demonstration 4 Hrs

3. **Earthworm**
   - a. Nervous system 4 Hrs
   - b. Reproductive system 3 Hrs

4. **Prawn** – Nervous system 4 Hrs

Mounting **16 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 4 Hrs

Spotters:

Classify giving reasons:- Paramecium, Leucosolenia, Obelia colony, Prawn, Octopus, Star fish, Ascidian, Shark, Salamander, 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, Heteronereis, Honey bee-Queen, Drone, Worker; Quill feather, Tortoise. 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 **10 Hrs**

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

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	2010, 1st Edn.
2	Lal S. S.	Textbook of Practical Zoology Vertebrate	Rastogi Publication	2009, 7th Edn.
3	Lal S. S.	Textbook of Practical Zoology Invertebrate	Rastogi Publication	2015, 12th Edn.

Pedagogy:

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

Course Designer: Dr. S. Gandhimathy