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 2023-24 onwards)

BACHELOR OF ZOOLOGY
2023 – 2026 BATCH

College of Excellence, nirf 2023-4th Rank
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PROGRAMME LEARNING OUTCOMES (PLO's)

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 practicals.

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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BACHELOR OF ZOOLOGY – 2023-2026 BATCH
(I Semester)

(For the students admitted during the academic year 2023-24 onwards)

Sem	Part	Subject code	Title of the Paper		Instruction Hours/Week	Contact Hours	Tutorial	Duration of Examination	Examination Marks			Credits
									CA	ESE	Total	
I	I	TAM2301/ HIN2301/ FRE2301	**Language** Tamil Paper I / Hindi Paper I / French Paper I	Lang	6	88	2	3	25	75	100	3
	II	ENG2301	English Paper I	Englis h	6	88	2	3	25	75	100	3
	III A	AS23C01	Core Paper I – Invertebrata	CC	6	88	2	3	25	75	100	5
	III A	AS23CP1	Core Practical I	CC	3	45	-	-	-	-	-	-
	III A	CE23A01	Allied - Chemistry for Biologists - Paper I	GE	4	58	2	3	20	55	75	4
	III A	CE23AP1	Allied - Chemistry Practical for Biologists Paper I	GE	3	45	-	-	-	-	-	-
	IV	**Non Tamil Students**		AECC	2	28	2		100	-	100	2
		NME23B1/ NME23A1	Basic Tamil I/ Advanced Tamil I									
	IV	**Students with Tamil as Language**		AECC	2	30	-		100	-	100	2
		NME23ES/ NME23WS	Foundation Course I - Introduction to Entrepreneurship / Women Studies									

*Not considered for Grand Total and CGPA
**outside regular class hours

CC – Core Courses
GE – Generic Elective
AEC – Ability Enhancing 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:

23-24 BATCH ONWARDS

CA Question Paper Pattern and distribution of marks UG

Core and Allied - (First 3 Units)

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
Total	**: 45 Marks**

End Semester Examination – Question Paper Pattern and Distribution of 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.

WEIGHTAGE ASSIGNED TO VARIOUS COMPONENTS OF CONTINUOUS INTERNAL ASSESSMENT

Theory

	CIA I	Model Exam	Seminar/Assignment/ Quiz	Class Participation	Attendance	Max Marks
Core / Allied	5	7	5	5	3	25

Practical

	Model Exam	Lab Performance	Regularity in Record Submission	Attendance	Maximum Marks
Core / Allied	10	7	5	3	25

RUBRICS

Assessment/Seminar

Maximum - 20 Marks (converted to 4 marks)

Criteria	4 Marks	3 Marks	2 Marks	1 Mark
Focus Purpose	Clear	Shows awareness	Shows little awareness	No awareness
Main idea	Clearly presents a main idea.	Main idea supported throughout	Vague sense	No main idea

Organisation: Overall	Well planned	Good overall organization	There is a sense of organization	No sense of organization
Content	Exceptionally well presented	Well presented	Content is sound	Not good
Style: Details and Examples	Large amounts of specific examples and detailed description	Some use of examples and detailed descriptions	Little use of specific examples and details	No use of examples

CLASS PARTICIPATION

Maximum - 20 Marks (converted to 5 marks)

Criteria	5 Marks	4 Marks	3 Marks	2 Marks	1 Mark	Points scored
Level of Engagement in Class	Student proactively contributes to class by offering ideas and asks questions more than once per class.	Student proactively contributes to class by offering ideas and asks questions once per class	Student contributes to class and asks questions occasionally	Student rarely contributes to class by offering ideas and asking no questions	Student never contributes to class by offering ideas	
Listening Skills	Student listens when others talk, both in groups and in class. Student incorporates or builds off of the ideas of others.	Student listens when others talk, both in groups and in class.	Student listens when others talk in groups and in class occasionally	Student does not listen when others talk, both in groups and in class.	Student does not listen when others talk, both in groups and in class. Student often interrupts when others speak.	
Behavior	Student almost never displays disruptive	Student rarely displays disruptive behavior	Student occasionally displays disruptive behavior	Student often displays disruptive behavior	Student almost always displays disruptive	

	behavior during class	during class	during class	during class	behavior during class	
Preparation	Student is almost always prepared for class with required class materials	Student is usually prepared for class with required class materials	Student is occasionally prepared for class with required class materials	Student is rarely prepared for class with required class materials	Student is almost never prepared for class.	
					Total	

MAPPING OF PLOS WITH CLOS

COURSE	**PROGRAMME 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 – AS23CP1					
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 NO	COURSE NAME	Category	L	T	P	Credit
AS23CO1	INVERTEBRATA	Theory	86	4	-	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 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	K_1
CLO2	Understand the importance of multicellularity significant to anatomical and physiological up gradation of the invertebrates	K_2
CLO3	Identify the evolution of organ systems and differences in functional morphology of higher invertebrates	K_3
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	K_4

Mapping with Programme 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 (86 Hrs)

Unit 1 **(19 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 **(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.

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

- *Life cycle and pathogenicity of: a) *Wuchereria bancrofti*, b) *Drancunculus medinensis*, c) *Ancylostoma duodenale*
- *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 of Publication
1	Jordan E.L and Verma P.S	Invertebrate Zoology	S. Chand and Co	2014
2	N. C. Nair, N. Soundara Pandian, S. Leelavathy, T. Murugan	A Text Book of Invertebrates	Saras Publications	2013
3	P. Kaliraj, T. Devi, Higher Education for Industry 4.0 and Transformation to Education 5.0			

Reference Books:

S. No.	Authors	Title of the Book	Publishers	Year of Publication
1.	Dhami P.S. and Dhami J.K	Invertebrate Zoology	S. Chand & Co	2012, 5th edition
2.	EkambaranathaAyyar, M. & Ananthakrishnan,T.N	Manual of Zoology Vol-I (Invertebrata) Part I & II	Vishwanathan (p) Ltd. Chennai	2010
3.	FatikBaran Mandal	Invertebrate Zoology	Eastern Economy Edition	2012, 1st Edition
4.	Kotpal R.L., Agarwal S.K and Ketarpal R.P.R	Modern Text Book of Zoology Invertebrates	Rastogi Publications	12th Edition 2019
5.	Barrington EJW	Invertebrate Structure and Function	ELBS and Nelson	1979, 2nd edition
6.	Ruppert and Barnes, R.D.	Invertebrate Zoology	Holt Saunders International	2006
7.	Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. an d Spicer, J.I.	The Invertebrates: A New Synthesis	Blackwell Science	2002, 3rd Edn.
8.	Jan A. Pechenik	Biology of the Invertebrates	McGraw-Hill Companies	2014, 7th Revised Edition
9	Fatik, Mandal, Baran,	Biology of non-chordates	Publisher: PHI learning Private Limited , Delhi	2018
10.	Fatma El-Bawab	Invertebrate Embryology and Reproduction	Academic Press	2020
11.	John H. Byrne	The Oxford Handbook of Invertebrate Neurobiology	Oxford University Press	2019

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

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
   https://www.hyperhyve.com/post/beekeeping-using-machine-learning
6. https://www.researchgate.net/publication/322958397_Detection_of_stored-grain_insects_using_deep_learning
7. https://www.ijrte.org/wp-content/uploads/papers/v8i2/B1801078219.pdf

COURSE NO AS23CP1	COURSE NAME CORE 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 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	K_1
CLO2	To distinguish the diversity and relationships between major groups of invertebrates and Chordates.	K_2
CLO3	To examine the morphology and anatomy of invertebrates and Chordates	K_3
CLO4	To relate the diversity and culture/rearing of invertebrates and chordates and infer their economic utility.	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	S	S
CLO4	S	S	S	S	S

S- Strong; M-Medium; L-Low

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:-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, 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 of Publication
1	Sinha. J, Chatterjee. A. K, Chattopadhyay. P	Advanced Zoology Practical	Arunabha Sen Books and Allied (P) Ltd	2011
2	Lal S. S.	Textbook of Practical Zoology Vertebrate	Rastogi Publication	2004
3	Lal S. S.	Textbook of Practical Zoology Invertebrate	Rastogi Publication	2004

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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

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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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BACHELOR OF ZOOLOGY – 2023-2026 BATCH
(II Semester)

(For the students admitted during the academic year 2023-24 onwards)

Sem	Part	Subject code	Title of the Paper		Instruction Hours/Week	Contact Hours	Tutorial	Duration of Examination	Examination Marks			Credits
									CA	ESE	Total	
II	II	TAM2302/ HIN2302/ FRE2302	Language T/H/F Paper – II	Language	6	88	2	3	25	75	100	3
	II	ENG2302	English Paper II	English	5	73	2	3	25	75	100	3
	III A	AS23C02	Chordata Paper II	CC	6	88	2	3	25	75	100	5
	III A	AS23CP1	Core Practical I	CC	3	45	-	3	25	75	100	5
	III A	CE23A02	Allied-Chemistry for Biologists-II	GE	5	73	2	3	20	55#	75#	4
	III A	CE23AP1	Allied -Chemistry Practical for Biologists	GE	3	45	-	3	15	25#	50#	2
	IV		Online Self Study Courses	-	-	-	-	-	-	-	-	-
		NME23B2/ NME23A2	Basic Tamil/Advanced Tamil**	AEC	2	-	-	-	100	-	100	Grade*
	III B	NM23GAW	Foundation Course –1 (General Awareness)	-	Self study (Online)				100	-	100	Grade*
	V	23PELS1	Professional English (Science /Management/ Humanities/Commerce)	AEC	2	25	5	-	100	-	100	2

*Not considered for Grand Total and CGPA

**outside regular class hours

CA conducted for 25 converted to 20, ESE conducted for 100 converted to 55

CC – Core Courses
GE – Generic Elective
AEC – Ability Enhancing 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:

2023-2024 BATCH ONWARDS

CA Question Paper Pattern and distribution of marks UG
Language and English

Section A 5 x 1 (No choice) : 5 Marks
Section B 4 x 5 (4 out of 6) : 20 Marks (250 words)
Section C 2 x 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 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 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 / Women Studies / Value education / Environmental Studies / Design Thinking
Quiz : 50 marks
Assignment : 25marks
Project / Case study : 25 marks
Total : 100 Marks

Professional English
The course offered in alignment with TANSCHE norms with 2 credits.
Quiz (5 x 20 Marks) : 100 Marks

WEIGHTAGE ASSIGNED TO VARIOUS COMPONENTS OF CONTINUOUS INTERNAL ASSESSMENT

Theory

	CIA I	Model Exam	Seminar/Assignment/ Quiz	Class Participation	Attendance	Max Marks
Core / Allied	5	7	5	5	3	25

Practical

	Model Exam	Lab Performance	Regularity in Record Submission	Attendance	Maximum Marks
Core / Allied	10	7	5	3	25

RUBRICS FOR CLASS PARTICIPATION

Level of Engagement in Class : 2 Marks
Listening Skills : 2 Marks
Behavior : 1 Marks
Preparation : 2 Marks
Total : 7 Marks

Level of Engagement in Class	Student proactively contributes to class by offering ideas and asks questions more than once per class.	Student proactively contributes to class by offering ideas and asks questions once per class	Student contributes to class and asks questions occasionally	Student rarely contributes to class by offering ideas and asking no questions	Student never contributes to class by offering ideas
Criteria	**7 MARKS**	**6 MARKS**	**5 MARKS**	**4 MARKS**	**3 MARKS**
Level of engagement in class	Student proactively contributes to class by offering ideas and asks questions more than once per class.	Student proactively contributes to class by offering ideas and asks questions once per class.	Student contributes to class by offering ideas and asks questions occasionally.	Student contributes to class by offering ideas and asking no questions.	Student never contributes to class by offering ideas.
Listening Skills	Student listens when others talk, both in groups and in class. Student incorporates or builds off of the ideas of others.	Student listens when others talk, both in groups and in class.	Student listens when others talk in groups and in class occasionally	Student does not listen when others talk, both in groups and in class.	Student does not listen when others talk, both in groups and in class. Student often interrupts when others speak.
Behavior	Student almost never displays disruptive behavior during class	Student rarely displays disruptive behavior during class	Student occasionally displays disruptive behavior during class	Student often displays disruptive behavior during class	Student almost always displays disruptive behavior during class
Preparation	Student is almost always prepared for class with required class materials	Student is usually prepared for class with required class materials	Student is occasionally prepared for class with required class materials	Student is rarely prepared for class with required class materials	Student is almost never prepared for

MAPPING OF PLOS WITH CLOS

COURSE	PROGRAMME OUTCOMES				
	PLO1	PLO2	PLO3	PLO4	PLO5
COURSE – AS23CO2					
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 – AS23CP1					
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 NO AS23CO2	COURSE NAME CHORDATA	Category	L	T	P	Credit
		Theory	88	2	-	5

Preamble

To understand basic classification, structural and functional details of chordates and to interpret the evolutionary relationships among the major taxa

Course Outcomes

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

CLO Number	CLO Statement	Knowledge Level
CLO1	Identify the general and specific characteristics of the different classes and the organization of the representative types.	K_1
CLO2	Recognize and describe the major groups of chordates	K_2
CLO3	Interpret the unique features, taxonomy and functional morphology of different classes of chordates	K_3
CLO4	To examine chordate diversity, systematics, their affinities, adaptations to different modes of life, evolutionary relationships of the major taxa and their economic importance.	K_4

Mapping with Programme Outcomes

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

S- Strong; M-Medium; L-Low

CHORDATA-AS23CO2 (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 Balanoglosuss and Herdmania

Type study: 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
- Retrogressive metamorphosis in Urochordata
- General characters of Agnatha and its affinities
- Overview of Phylogenetic analysis using Machine learning

PISCES- General Characters

General characteristics of Chondrichthyes and Osteichthyes, classification up to order

Type study: Shark - Systematic Position, Habits and Habitat, External features, Exoskeleton- Placoid Scales, Digestive System**,** Respiratory system & Mechanism of respiration, Circulatory system -Blood, Heart and pericardium, Arterial system, Venous system, Nervous system-Brain, Spinal cord, cranial nerves and spinal nerves. Sense organs-Olfactory organs, Eyes, Internal ears, Neuromast or lateral line system, Ampullae of Lorenzini. Urinogenital system.

General Essays

- Types of Fins and Scales of fishes
- *Accessory respiratory organs in fishes
- Migration, Osmoregulation and Parental care in fishes
- General account of a) *Oreochromis mossambicus* b) *Labeo rohita* c) *Catla catla*
- *Virtual E-museum to identify and learn different species of Pisces

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

General characteristics and classification up to 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 mechanism-inspiration and expiration. Circulatory system-Blood, Heart-Internal structure, Arterial system, Venous system. Nervous system-Brain, Spinal cord, cranial nerves and spinal nerves. Sense organs- Tango receptors, Taste buds, Olfactory organs, Internal structure and functions of Eye and Ear, Urinogenital system

General Essays

- Regeneration in amphibians (Axolotls)
- Origin of Tetrapoda (Evolution of terrestrial ectotherms)
- *Parental care in Amphibia
- Neoteny and Paedogenesis in Amphibia
- Outline on Image processing for taxonomic classification

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

General characteristics and classification up to order

Type study: Calotes - 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

General Essays

- Affinities of *Sphenodon*
- *Poison apparatus and Biting mechanism in snakes, First aid treatment for snake bite.
- Common poisonous and non – poisonous snakes in India.
- Extinct Reptiles
- Conservation of reptiles (Turtles and Crocodiles)
- Overview of artificial intelligence for modelling to study Reptile behaviour

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

General characteristics and classification up to order

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-Blood, Heart-Internal structure, Arterial system, Venous system. Nervous system-Brain, Spinal cord, cranial nerves and spinal nerves, Structure and function of Eye and Ear, Urinogenital system.

General Essays

- *Archaeopteryx*—a connecting link
- Beaks and wing adaptation in birds
- *Flightless birds, Migration in birds.
- GPS Tracking systems to study bird behaviour and predict their migration

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

General characteristics and classification up to order

Type study: Rabbit- Systematic Position, Habits and Habitat, External features, Digestive System, Respiratory system, Circulatory system-Blood, Heart-Internal structure, Arterial system, Venous system. Nervous system-Brain, Spinal cord, cranial nerves and spinal nerves. Structure and function of Eye and Ear, Excretory system, Reproductive system.

General Essays

- Affinities of Prototheria; Adaptive radiation with reference to locomotory appendages
- Dentition in mammalss
- Egg laying and flying mammals
- *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
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	Pearson International	9thEdn.
6	Darlington P.J.	The Geographical Distribution of Animals	R.E. Krieger Pub Co.,	3rdEdn.
7	Hall B.K. and Hallgrimsson B.	Strick berger's Evolution	Jones and Bartlett Publishers Inc.	4thEdn.
8.	Malcolm Jollie	Chordate Morphology	Franklin Classics Trade Press	2017
9.	Marshall and Williams Edited by Veer Baala Rastogi	Parker and Haswell Textbook of ZOOLOGY - Vertebrates -	Medtech Science Press	Volume I 2021
10.	Neil Shubin, Kenneth P. Dial, Elizabeth L. Brainerd	Great Transformations in Vertebrate Evolution	University of Chicago Press	2015
11.	Kevin Padian, Vivian de Buffrénil, Armand J. de Ricqlès, Louise Zylberberg	Vertebrate Skeletal Histology and Paleohistology	CRC Press	2021
12.	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. 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 NO 23PELS1	COURSENAME SEMESTER– II PROFESSIONAL ENGLISH FOR LIFE SCIENCES	Category	L	T	P	Credit
		-	25	5	--	2

Objectives

1. To develop the language skills of students by offering adequate practice in professional contexts.
2. To enhance the lexical, grammatical and socio-linguistic and communicative competence of first year physical sciences students
3. To focus on developing students' knowledge of domain specific registers and the required language skills.
4. To develop strategic competence that will help in efficient communication
5. To sharpen students' critical thinking skills and make students culturally aware of the target situation.

Course outcome

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

CLO Number	CO Statement	Knowledge Level
CLO1	Recognize their own ability to improve their own competence in using the language	K1
CLO2	Use language for speaking with confidence in an intelligible and acceptable manner	K2
CLO3	Read independently unfamiliar texts with comprehension and understand the importance of reading for life	K3
CLO4	Understand the importance of writing in academic life	K3
CLO5	Write simple sentences without committing error of spelling or grammar	K3

(Outcomes based on guidelines in UGC LOCF – Generic Elective)

Mapping with Programme Outcomes

CLOs	PLO1	PLO2	PLO3	PLO4	PLO5
CLO1	S	S	S	M	M
CLO2	S	S	S	M	M
CLO3	S	S	M	M	S
CLO4	S	S	M	M	M
CLO5	S	S	S	S	S

S- Strong; M-Medium

Syllabus

UNIT 1: Communication **(5 hrs)**

Listening: Listening to audio text and answering question Listening toInstructions
Speaking: Pair work and small group work.
Reading: Comprehension passages –Differentiate between facts and opinion
Writing: Developing a story with pictures**.**
Vocabulary: Register specific - Incorporated into the LSRW tasks

UNIT 2: Description **(5 hrs)**

Listening: Listening to process description.-Drawing a flow chart.
Speaking: Role play (formal context)
Reading: Skimming/Scanning- Reading passages on products, equipment and gadgets.
Writing: Process Description –Compare and Contrast Paragraph-Sentence Definition and Extended definition- Free Writing.
Vocabulary: Register specific -Incorporated into the LSRW tasks.

UNIT 3: Negotiation Strategies **(5 hrs)**

Listening: Listening to interviews of specialists / Inventors in fields (Subject specific)
Speaking: Brainstorming. (Mind mapping).Small group discussions (Subject- Specific)
Reading: Longer Reading text.
Writing: Essay Writing (250 words)
Vocabulary: Register specific - Incorporated into the LSRW tasks

UNIT 4: Presentation Skills **(5 hrs)**

Listening: Listening to lectures.
Speaking: Short talks.
Reading: Reading Comprehension passages
Writing: Writing Recommendations Interpreting Visuals inputs
Vocabulary: Register specific - Incorporated into the LSRW tasks

UNIT 5: Critical Thinking Skills **(5 hrs)**

Listening: Listening comprehension- Listening for information.
Speaking: Making presentations (with PPT- practice).
Reading : Comprehension passages –Note making.Comprehension: Motivational article on Professional Competence, Professional Ethics and Life Skills)
Writing: Problem and Solution essay– Creative writing –Summary writing
Vocabulary: Register specific - Incorporated into the LSRW tasks

Textbooks

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	TamilNadu State Council for Higher Education (TANSCHE)	English for Life Sciences Semester 1	--	--

Reference Books

S.No.	Authors	Title of the Book	Publishers	Year of Publication
1	Sreedharan, Josh	The Four Skills for Communication	Foundation books	2016
2	Pillai, G Radhakrishna, K Rajeevan, P Bhaskaran Nair	Spoken English for you	Emerald	1998
3	Pillai, G radhakrishna, K Rajeevan, P Bhaskaran Nair	Written English for you	Emerald	1998

COURSE NO AS23CP1	COURSE NAME CORE 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 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	K_1
CLO2	To distinguish the diversity and relationships between major groups of invertebrates and Chordates.	K_2
CLO3	To examine the morphology and anatomy of invertebrates and Chordates	K_3
CLO4	To relate the diversity and culture/rearing of invertebrates and chordates and infer their economic utility.	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	S	S
CLO4	S	S	S	S	S

S- Strong; M-Medium; L-Low

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:-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, 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 of Publication
1	Sinha. J, Chatterjee. A. K, Chattopadhyay. P	Advanced Zoology Practical	Arunabha Sen Books and Allied (P) Ltd	2011
2	Lal S. S.	Textbook of Practical Zoology Vertebrate	Rastogi Publication	2004
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.

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)
(III Semesters)

BACHELOR OF ZOOLOGY
2023 – 2026 BATCH

PROGRAMME LEARNING OUTCOMES (PLO's)

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 practicals.

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.

DEPARTMENT OF ZOOLOGY
CHOICE BASED CREDIT SYSTEM (CBCS) & LEARNING OUTCOME BASED CURRICULAR FRAMEWORK (LOCF)
BACHELOR OF ZOOLOGY – 2023-2026 BATCH

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/ HIN 2303/ FRE2303	**LANGUAGE III** T/H/F Paper III	L	6	88	2	3	25	75	100	3
	II	ENG2303	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
		AS23CP2	Zoology Practical II	CC	3	45	-	-	-	-	-	-
		AS23A01/ PL23A01	Invertebrata and Chordata/ Fundamentals of Botany I	GE	5	73	2	3	20	55	75	4
		AS23AP1/ PL23AP1	Zoology Practical/ Botany Practical I	GE	2	30		-	-	-	-	-
III	III	AS23CE1/ CS23SBGP	Coursera – Insect human Interaction/ GEN-AI	DSE /SEC	3	45/44	-/1	-	100	-	100	3
IV	IV	NM23DTG	Design Thinking	AEC	2	30	-	-	100	-	100	2
	IV	NM22UHR	Universal Human Values and Human Rights #		-	-	-	-	100	-	100	Gr.
I - V	VI	16BONL1 16BONL2	Online Course Online Course		-	-	-	-	-	-	-	-
	VI	JOB1993	Job OrientedCourse			After the class hours						

L – Language **E – English**
CC – Core Courses **CA – Continuous Assessment**
GE – Generic Elective **ESE - End Semester Examination**

AEC – Ability Enhancement Course **SEC- Skill Enhancement Course**
ACC-Additional Credit Course **AECC- Ability Enhancement Compulsory Course,**
 # - Self Study
€ - CA conducted for 25 and converted into 20, ESE conducted for 75 and converted into 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 x 1 (No choice) : 5 Marks
Section B 4 x 5 (4 out of 6) : 20 Marks (250 words)
Section C 2 x 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 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 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

Evaluation pattern for Gen-AI

Quiz : 50 Marks (5 quizzes with each 10 marks)
Case study : 25 Marks
Online Exam : 25 Marks (Departments to plan and conduct the exam)
Total **:100 Marks**

WEIGHTAGE ASSIGNED TO VARIOUS COMPONENTS OF CONTINUOUS INTERNAL ASSESSMENT

Theory

	CA	Model Exam	Seminar/Assignment/ Quiz	Class Participation	Attendance	Max. Marks
Core / Allied	5	7	5	5	3	25

Practical

	Model Exam	**Lab Performance**	**Regularity in Record Submission**	**Attendance**	**Maximum Marks**
Core / Allied	10	7	5	3	25

Part IV
Value education / Environmental Studies / Design Thinking

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

Course Number	Course Name	Category	L	T	P	Credit
AS23CO3	ECOLOGY AND EMBRYOLOGY	Theory	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.	K1
CLO2	Understand the concepts of ecological attributes and physiological processes in Embryology that are distinct and significant	K2
CLO3	Apply the systemic and functional morphology of various aspects of ecology and embryology	K3
CLO4	Analyze the general and specific characteristics within and other environments in relation to abiotic & biotic factors, stages and development of an embryo	K4

Mapping with Programme Learning 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 and Edition	Year of Publication and Edition
1	Arumugam, N	A Text Book of Embryology	Saras Publication	2014 and 15th edition
2	Verma P.S., Agarwal., V.K	Environmental Biology	S. Chand & Company	2000 and 10th edition

REFERENCE BOOKS

S. No.	Author	Title of the Book	Publisher	Year of Publication and Edition
1	Balinsky, B.I	Introduction to Embryology	Saunders College Publishing	1981 and 5th edition
2	Berrill, N.J	Developmental Biology	Tata Mc Graw Hill Publication Co.Ltd	1986 and 4th editioin
3	Clarke,G.L.	Elements of Ecology	John Wiley & Son Inc. New York & London	1954 and 1st edition
4	Kotpal,R.L. and Bali,N.P.	Concepts of Ecology	Vishal Publication, Delhi	1986 and 2nd edition
5	Odum, E.P.	Basic Ecology	Saunders College Publishing , New York	1983 and Revised, Subsequent edition
6	Scott F. Gilbert,	Developmental Biology	Sinauer Associates, Inc. Publishers, Sunderland, Massachusetts	1997 and 7th edition
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

Pedagogy

- Lecture by chalk and talk, power point presentation, e-content, group discussion, assignment, quiz, peer learning, seminar

Course Designers

Dr. M. Sheeba

Course Number	Course Name	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 Laerning 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.	K1
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.	K2
CLO3	Application of the acquired skills and adopting it for future research.	K3
CLO4	Analyze the practical knowledge on cell biology, environmental and developmental biology and develop practical biological skills.	K4

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 (**42Hrs**)

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 of Publication and Edition
1	Sinha. J, Chatterjee. A. K, Chattopadhyay. P	Advanced Zoology Practical	Arunabha Sen Books and Allied (P) Ltd	2014 and 3rd edition
2	Lal S. S., A	Textbook of Practical Zoology Vertebrate	Rastogi Publication	2004 and 12th edition
3	Lal S. S., A	Textbook of Practical Zoology Invertebrate	Rastogi Publication	2004 and 12th edition

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 NO	COURSE NAME	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	K1
CLO2	To understand the need for taxonomic position of invertebrates and chordates based on their distribution	K2
CLO3	To apply the knowledge of systematics, morphology, functional, and structural modification in invertebrates & chordates during the course of evolution and their significance	K3
CLO4	To analyse the knowledge of anatomy of invertebrates and chordates comparatively to recognize their history, evolutionary trends and significance	K4

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)

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 of Publication and Edition
1	Jordon. E L & Verma PS	Invertebrate Zoology	1 st edition, S. Chand & Co., New Delhi	2015 and revised edition
2	Jordan E L and Verma PS	Chordate Zoology	S. Chand & Co, New Delhi	2013 and 14 revised editions

REFERENCE BOOKS:

S. No.	Authors	Title of the Book	Publishers	Year of Publication and Edition
1	Ekambaranatha Ayyar M	Outlines of Zoology	Viswanathan Publication	1992
2	Fatik Baran Mandal	Invertebrate Zoology	Eastern Economy Edition	2012 and 1st Edition.
3	Jan A Pechenik	Biology of the Invertebrates	McGraw-Hill Companies,	2014 and 7th Revised Edition
4	Barrington EJW	Invertebrate Structure and Function	ELBS and Nelson,	1979 and 2nd Edtion
5	Waterman, Allyn J	Chordate structure and Function	Mac Milan & Co., New York	2006 and 4 th edition

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 NO	COURSE NAME	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

CLO 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 – AS2AP1 (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 of Publication and edition
1	Sinha J, Chatterjee A K, Chattopadhyay P	Advanced Zoology Practical	Arunabha Sen Books and Allied (P) Ltd	2011 and 1 st edition
2	Lal S S	Textbook of practical Zoology Invertebrate	Rastogi Publication	2020 and 12th edition
3	Lal S S	Textbook of practical Zoology Vertebrate	Rastogi Publication	2020 and 12th edition

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

Semester : III & IV

Paper : Job Oriented Course

Title : Apiculture

Subject Code : JOB1993

Lecture Hours: 60

Unit I (8 Hrs)

Bee keeping down the ages - Present status of Apiculture in India - Classification and Biology of Honey Bees. Embryology and life history - Anatomy and Physiology of honeybee. Social Organization of Bee Colony

Unit II (8 Hrs)

Types of beehives - structure - location, care and management - Genetic studies - breeding of stocks - winter broods. Artificial Bee rearing (Apiary), Bee Pasturage. Selection of Bee Species for Apiculture. Bee Keeping Equipment.

Unit III (8 Hrs)

Bee foraging: Pollen and nectar yielding plants. Honey extraction, seasonal maintenance, swarming and supersedure - pheromone. Natural enemies and diseases of honey bees and control methods. Bee poisoning and utility of bees in toxicity studies. Apiculture Management

Unit IV (8 Hrs)

Uses of honey and beeswax in Indian medicine. Bee Products and Marketing of Bee products. Economics of bee keeping: Economics in small scale and large scale bee keeping. Economic Value of Commercial Beekeeping.

Unit V (8 Hrs)

Preparing bankable bee keeping project: Steps involved in starting a beekeeping project, Prospects of apiculture as self-employment venture. Funding sources for beekeeping projects. Funds mobilization from state and national banks. Grant Resource and utilization.

FIELD VISIT: To Apiary unit (**10 Hrs)**

INTERNSHIP (10 Hrs)

REFERENCE BOOKS

S. No	Authors	Title of the Book	Publishers	Year of Publication
1	Sardar Singh	Bee keeping in India	Indian council of Agricultural Research, New Delhi	1962
2	Sharma P.L. and Singh, S.H.,	Hand book of Bee keeping	Controller Printing and Stationery, Chandigarh	1987
3	Roger, A. Morse	The ABC and XYZ of Bee culture	A.I. Root & Co., Medina, Ohio	40th Edn, 1990