E.M.G. YADAVA WOMEN'S COLLEGE, MADURAI – 625 014.

(*An Autonomous Institution – Affiliated to Madurai Kamaraj University*)

Re-accredited (**3rd Cycle**) with Grade **A+** & **CGPA 3.51** by NAAC

DEPARTMENT OF ZOOLOGY

TANSCHE - **CBC**S With OBE

BACHELOR OF SCIENCE

PROGRAMME CODE - Z

COURSE STRUCTURE

(w.e.f. 2023 – 2024 Batch onwards)

Annexure -6

E.M.G. YADAVA WOMEN'S COLLEGE, MADURAI -14.

(An Autonomous Institution – Affiliated to Madurai Kamaraj University)
(Re –accredited (3rd cycle) with Grade A+ and CGPA 3.51 by NAAC)

TANSCHE - CBCS with OBE

DEPARTMENT OF ZOOLOGY – UG

(w.e.f. 2023– 2024 Batch onwards)

Vision

To achieve academic excellence through teaching, impart quality Life Science education and promote discovery and learning at all levels of biological organization.

Mission

- To bring an awareness on nature and biodiversity
- To set up a sound and peaceful environment and life to community and society
- To develop Research aptitude among students
- To develop the attitude of the students to concentrate on applied science

Programme Educational Objectives(PEOs): B.Sc. Zoology

Sl.No.	Programme Educational Objective
PEO1	To make the students understand the needs of Zoology in shaping our planet
PEO2	To acquire knowledge from diverse fields of Zoology
PEO3	To inculcate biodiversity conservation and love for nature.
PEO4	To conduct field studies and different projects of local and global interest
PEO5	To provide opportunities for professional and self-development through Curricular and Co-curricular activities
PEO6	In order to develop students, become entrepreneurs in subjects like Sericulture, Apiculture, and Aquaculture have been introduced. In addition Consultancy and Extension activities are also included.

Programme Outcomes for Science Graduates:

On completion of B.Sc., Programmes students will be able to

SL.No.	Programme Outcomes
PO1	Develop necessary foundation in fundamentals, aptitude, applications of sciences and other related subjects. Able to clear competitive examinations, appear with confidence and possess basic skills on the related subjects. Secure jobs in employment in Government / Private / Industry and entrepreneurship.
PO2	Receive basic experimental skills in the observation and study of nature, biological techniques, and scientific research and demonstrate proficiency in critical analysis or creativity and provide scientific solutions to the problems of the society.
PO3	Enhance the digital knowledge of statistics and to understand its application in interpreting the obtained data.
PO4	Obtain knowledge with emerging trends in their disciplinary and inter-disciplinary areas. Usage of modern tools and software can also be put to use.
PO5	Lead lifelong learning & contribute sustainability to environment, equip students enough to take up higher studies upto research in various disciplines to become professionals.
PO6	Imbibe democratic, ethical, moral, social & spiritual values in the minds of the learners to become responsible citizens and build a healthy nation.

Programme Specific Outcomes (PSOs)

PSOs	After completion of B.Sc Zoology the students will be able to	PO Addressed
PSO1	**Placement:** To prepare the students who will demonstrate respectful engagement with others' ideas, behaviours, beliefs and apply diverse frames of reference to decisions and actions.	**PO1**
PSO 2	**Entrepreneur:** To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate startups and high potential organizations.	**PO2**
PSO3	**Research and Development:** Design and implement HR systems and practices grounded in research that comply with employment laws, leading the organization towards growth and development.	**PO3 & PO4**
PSO4	**Contribution to Business World:** To produce employable, ethical and innovative professionals to sustain in the dynamic business world.	**PO5 & PO6**
PSO 5	**Contribution to the Society:** To contribute to the development of the society by collaborating with stakeholders for mutual benefit.	**PO2 & PO6**

Qualification for Admission

Candidates should have passed the Higher Secondary Examination, Zoology/ Biology as one of the subject, conducted by the Board of Higher Education, Government of Tamil Nadu, CBSC & ICSE or any other examination approved by Madurai Kamaraj University as equivalent.

Duration of the Course

The students shall undergo prescribed course of study for the period of three academic years under TANSCHE - CBCS semester pattern with outcome based education.

Medium of Instruction: English.

System: Choice Based Credit System with Outcome Based Model.

Nature of the Course

Courses are classified according to the following nature

1. Knowledge and skill oriented 2. Employability oriented 3. Entrepreneurship oriented

Outcome Based Education (OBE) & Assessment: Students understanding must be built on and assessed for wide range of learning activities, which includes different approaches and are classified along several basis, such as

1. **Based on purpose:**
   - Continuous Assessment (internal tests, Assignment, seminar, quiz, Documentation, Caselets, ICT based Assignment, Mini projects administered during the learning process)
   - External Assessment (Evaluation of students' learning at the end of instructional unit)
2. **Based on Domain Knowledge: (for UG Upto K4 levels)**
   Assessment through K1, K2, K3 & K4

Annexure -6

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TANSCHE – CBCS with OBE

(w.e.f. 2023-2024 batch onwards)

(PART I / PART II / PART III)

Internal (Formative) : 25 marks
External (Summative) : 75 marks
Total :100 marks

Formative Test (CIA-Continuous Internal Assessment) : 25 Marks

Components	Marks
Test (Average of two tests) (Conducted for 100 marks and converted into 10 marks)	**10**
Assignment	**5**
Seminar	**5**
Quiz/ Documentation/ Case lets/ ICT based Assignment/ Mini Projects	**5**
Total	**25**

- ✓ **Centralized system** of Internal Assessment Tests
- ✓ There will be **Two Internal Assessment** Tests
- ✓ Duration of Internal assessment test will be **2 hours for Test I & II**
- ✓ Students shall write **retest** with the approval of HOD on genuine grounds if they are absent.

Question Paper Pattern for Continuous Internal Assessment –Test I and II

Section	Marks
A- Multiple Choice Question (7x1mark)	7
B- Short Answer (4x2marks)	8
C- Either Or Type (3/6x5marks)	15
D- Open Choice Type (2/3x 10marks)	20
Total	50

Conducted for 100 marks and converted into 10 marks.

Question Paper Pattern for Summative Examination

Section	Marks
A-Multiple choice Questions without Choice (10x1 mark)	10
B-Short Answer without choice (5x2marks)	10
C-Either Or type (5/10x5marks)	25
D-Open Choice type (3/5x10 marks)	30
Total	75

- In respect of Summative Examinations passing minimum is **36% for UG.**
- Latest amendments and revision as per **UGC** and **TANSCHE** norms is taken into consideration in curriculum preparation.

Annexure -6

BLUE PRINT FOR INTERNAL ASSESSMENT – I

Articulation Mapping – K Levels with Course Learning Outcomes (CLOs)

Sl. No	CLOs	K- Level	Section A		Section B		Section C	Section D	Total
			MCQs (No Choice)		Short Answers (No Choice)		(Either or Type)	(Open choice)	
			No. of Questions	K-Level	No. of Questions	K-Level			
1	CLO 1	Upto K3	3	(K1/ K2)	3	(K1/ K2)	2 (K2) / 2 (K3) / 2 (K4) (Each set of questions must be in same level)	2 (K3) & 1 (K4)	
2	CLO 2	Upto K3	2	(K1/ K2)					
3	CLO 3	Upto K4	2	(K1/ K2)	1	(K1/ K2)			
No. of Questions to be asked			7		4		6	3	20
No. of Questions to be answered			7		4		3	2	16
Marks for each question			1		2		5	10	-
Total Marks for each section			7		8		15	20	50

BLUE PRINT FOR INTERNAL ASSESSMENT – II

Articulation Mapping – K Levels with Course Learning Outcomes (CLOs)

Sl. No	CLOs	K- Level	Section A		Section B		Section C	Section D	Total
			MCQs (No Choice)		Short Answers (No Choice)		(Either or Type)	(Open choice)	
			No. of Questions	K-Level	No. of Questions	K-Level			
1	CLO 3	Upto K4	2	(K1/ K2)	1	(K1/ K2)	2 (K2) / 2 (K3) / 2 (K4) (Each set of questions must be in same level)	2 (K3) & 1 (K4)	
2	CLO 4	Upto K3	2	(K1/ K2)	3	(K1/ K2)			
3	CLO 5	Upto K4	3	(K1/ K2)					
No. of Questions to be asked			7		4		6	3	20
No. of Questions to be answered			7		4		3	2	16
Marks for each question			1		2		5	10	-
Total Marks for each section			7		8		15	20	50

Distribution of Marks with K-Levels CIA I and CIA II

CIA	K Levels	Section -A MCQ (No choice)	Section -B Short Answer (No choice)	Section -C (Either or Type)	Section –D (Open choice)	Total Marks	% of Marks
I & II	K1	4	4	-	-	8	10
	K2	3	4	10	-	17	23
	K3	-	-	10	20	30	40
	K4	-		10	10	20	27
	Marks	**7**	**8**	**30**	**30**	**75**	**100**

Articulation Mapping - K Levels with Course Learning Outcomes (CLOs) for External Assessment

Sl. No	CLOs	K-Level	Section A		Section B		Section C (Either/or Type)	Section D (open choice)	Total
			MCQs (No choice)		Short Answers (No choice)				
			No. of Questions	K-Level	No. of Questions	K-Level			
1	CLO 1	Upto K3	2	K1/K2	1	K1/K2	2 (K3& K3)	1(K2)	
2	CLO 2	Upto K3	2	K1/K2	1	K1/K2	2(K2& K2)	1(K3)	
3	CLO 3	Upto K4	2	K1/K2	1	K1/K2	2 (K4&K4)	1(K4)	
4	CLO 4	Upto K 3	2	K1/K2	1	K1/K2	2 (K3& K3)	1(K3)	
5	CLO 5	Upto K 4	2	K1/K2	1	K1/K2	2 (K4& K4)	1(K4)	
No. of Questions to be asked			10		5		10	5	30
No. of Questions to be answered			10		5		5	3	23
Marks for each question			1		2		5	10	
Total Marks for each section			10		10		25	30	75

Annexure -6

Distribution of Section-wise Marks with K Levels for External Assessment

K Levels	Section A (MCQ'S) (No choice)	Section B (Short Answer) (No choice)	Section C (Either or Type)	Section D (Open Choice)	Total Marks	% of Marks
K1	9	6	-	--	**15**	13
K2	1	4	10	10	**25**	21
K3	-	-	20	20	**40**	33
K4	-	-	20	20	**40**	33
Total Marks	10	10	50	50	**120**	100

K1- Remembering and recalling facts with specific answers
K2- Basic understanding of facts and stating main ideas with general answers
K3- Application oriented- Solving Problems, Justifying the statement and deriving inferences
K4- Examining, analyzing, presentation and make inferences with evidences

Annexure -6

EVALUATION (THEORY)

(PART IV - SEC / DSEC)

Internal (Formative) : 25 marks

External (Summative) : 75 marks

Total : 100 marks

Formative Test (CIA-Continuous Internal Assessment) : 25 Marks

Components	Marks
Test (Average of two tests) (Conducted for 60 marks and converted into 20 marks)	**20**
Assignment / Seminar/ Quiz/ Documentation (from Unit 5)	**5**
Total	**25**

- ✓ There will be two Internal Assessment Test
- ✓ Duration of Internal assessment test will be 1 hour for Test

Students shall write retest with the approval of HOD on genuine grounds if they are absent.

Question Paper Pattern for Continuous Internal Assessment Test I & II

Section	Marks
A- Multiple Choice Question (4x1mark)	4
B- Short Answer (3x2marks)	6
C- Either Or type (2/4 x5marks)	10
D- Open choice type (1/2 x10marks)	10
Total	30

Conducted for 60 marks and converted into 20 marks

Question Paper Pattern for External Examination

Section	Marks
A- Multiple Choice Question (10x1mark)	10
B- Short Answer (5x2marks)	10
C- Either Or type (5/5 x5marks)	25
E- Open choice type (3/5 x10marks)	30
Total	75

Annexure -6

BLUE PRINT FOR INTERNAL ASSESSMENT –I
Articulation Mapping - K Levels with Course Learning Outcomes (CLOs)

Sl. No	CLOs	K- Level	Section A		Section B		Section C	Section D	Total
			MCQs (No Choice)		Short Answers (No Choice)		(Either or Type)	(Open choice)	
			No. of Questions	K-Level	No. of Questions	K-Level			
1	CLO 1	Upto K3	2	K1	3	K1	1 (K2) / 1 (K3) (Each set of questions must be in same level)	1 (K2) & 1 (K3)	
2	CLO 2	Upto K3	2						
No. of Questions to be asked			4		3		4	2	13
No. of Questions to be answered			4		3		2	1	10
Marks for each question			1		2		5	10	-
Total Marks for each section			4		6		10	10	30

BLUE PRINT FOR INTERNAL ASSESSMENT –II
Articulation Mapping - K Levels with Course Learning Outcomes (CLOs)

Sl. No	CLOs	K- Level	Section A		Section B		Section C	Section D	Total
			MCQs (No Choice)		Short Answers (No Choice)		(Either or Type)	(Open choice)	
			No. of Questions	K-Level	No. of Questions	K-Level			
1	CLO 3	Upto K3	2	K1	3	K1	1 (K2) / 1 (K3) (Each set of questions must be in same level)	1 (K2) & 1 (K3)	
2	CLO 4	Upto K3	2						
No. of Questions to be asked			4		3		4	2	13
No. of Questions to be answered			4		3		2	1	10
Marks for each question			1		2		5	10	-
Total Marks for each section			4		6		10	10	30

Distribution of Marks with K Levels – CIA I & II

CIA	K Levels	Section A MCQ	Section B (Short Answers)	Section C (Either Or Type)	Section D (Open Choice)	Total Marks	% of Marks
I & II	K1	4	6	-	-	10	20
	K2	-	-	10	10	20	40
	K3	-	-	10	10	20	40
	Marks	**4**	**6**	**20**	**20**	**50**	**100**

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Articulation Mapping - K Levels with Course Learning Outcomes (CLOs) for External Assessment

Sl. No	CLOs	K-Level	Section A		Section B		Section C (Either or Type)	Section D (Open Choice)	Total
			MCQs		Short Answers				
			No. of Questions	K-Level	No. of Questions	K-Level			
1	CLO 1	Upto K3	2	K1	1	K1	6(K2) & 4(K3) (Each set of questions must be in same level)	2(K2) & 3(K3)	
2	CLO 2	Upto K3	2		1				
3	CLO 3	Upto K3	2		1				
4	CLO 4	Upto K 3	2		1				
5	CLO 5	Upto K 3	2		1				
No. of Questions to be asked			10		5		10	5	30
No. of Questions to be answered			10		5		5	3	23
Marks for each question			1		2		5	10	
Total Marks for each section			10		10		25	30	75

Distribution of Section-wise Marks with K Levels for External Assessment

K Levels	Section A (MCQ's)	Section B (Short Answer)	Section C (Either or Type)	Section D (Open Choice)	Total Marks	% of Marks
K1	10	10	-	--	**20**	16
K2	-	-	30	20	**50**	42
K3	-	-	20	30	**50**	42
Total Marks	10	10	50	50	**120**	100

Annexure -6

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TANSCHE – CBCS with OBE

DEPARTMENT OF ZOOLOGY – UG

(with Allied Chemistry and Allied Botany)
(w.e.f. 2023-2024 batch onwards)

COURSE STRUCTURE

Semester	Part	Course Code	Course Title	Teaching hrs (per week)	Duration of Exam (hrs.)	Marks Allotted			Credits
						CIA	SE	Total	
I	I	23OU1TA1	Tamil / Hindi	6	3	25	75	100	3
	II	23OU2EN1	General English -I	6	3	25	75	100	3
	III	23OUZO11	**Core Course 1**: Invertebrata	5	3	25	75	100	5
		23OUZO1P	**Core Course 2:** Lab in Invertebrata	3	3	40	60	100	3
		23OUZOGECH1	**GEC 1:** Chemistry for Biological Sciences -I	4	3	25	75	100	3
		23OUZOGECH1P	**GEC 2:** Chemistry Practical for Biological Sciences -I	2	3	40	60	100	2
	IV	23OUZOSECN1	**SEC 1 (NME) :** Ornamental Fish Farming and Management	2	3	25	75	100	2
		23OUZOFC1	**FC** :Foundation Course in Zoology	2	3	25	75	100	2
II	I	23OU1TA2	Tamil / Hindi	6	3	25	75	100	3
	II	23OU2EN2	General English - II	6	3	25	75	100	3
	III	23OUZO21	**Core Course 3**: Chordata	5	3	25	75	100	5
		23OUZO2P	**Core Course 4**: Lab in Chordata	3	3	40	60	100	3
		23OUZOGECH2	**GEC 3:** Chemistry for Biological Sciences -II	4	3	25	75	100	3
		23OUZOGECH2P	**GEC 4:** Chemistry Practical for Biological Sciences -II	2	3	40	60	100	2
	IV	23OUZOSECN2	**SEC 2 (NME) :** Basic Course in Ornithology	2	3	25	75	100	2
		23OUZOSEC3	**DSEC:** Basics of Marine Biology	2	3	25	75	100	2
			Total						46

Department of Zoology						Class: I B.Sc		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
I	Core Course 1	23OUZO11	Invertebrata	5	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✔		

Course Objectives:

- To understand the basic concepts of lower animals and observe the structure and functions.
- To illustrate and examine the systemic and functional morphology of various group of invertebrates.
- To differentiate and classify the various groups of animal modes of life and to estimate the biodiversity.
- To compare and distinguish the general and specific characteristics of reproduction in lower animals.
- To infer and integrate the parasitic and economic importance of invertebrate animals.

Course Content:

Unit – I Taxonomy: Units of Classification, Criteria of classification –Principles of Classification - types of Coelom, types of Symmetry, Binomial nomenclature. Classification up to class level with example (Flow Chart only) - General characters of the phyla with examples: i) Protozoa ii) Porifera iii) Coelenterata iv) Platyhelminthes v) Nematoda *vi)* Annelida, vii) Arthropoda viii) Mollusca, ix) Echinodermata .

Unit – II Phylum: **Protozoa** - Type study -Paramecium- General organization, cyclosis, contractile vacuole and conjugation only. Structure, Life history, pathology, prevention and control measures of i) *Plasmodium vivax* and ii) *Entamoeba histolytica.*

Phylum: Porifera: Type study-*Leucosolenia* - general organization, histology, Spicules, reproduction and development only. Canal system in Sponges.

Unit –III Phylum: Coelenterata: Type study- Obelia; structure of obelia colony, Medusa, Nematocyst, reproduction and development (metagenesis) - Polymorphism in Coelenterata. Types of Corals- Ecological and Economic importance.

Phylum: Helminthes: Type study- *Fasciola hepatica* - external characters, digestive system, excretion, reproduction and development (life cycle). Structure, pathology and control measures of *Ascaris* and *Wuchereria.*

Unit - IV Phylum: Annelida: Type study -Earth worm, External morphology, setae, nephridia, nerves system and reproductive system - Metamerism in Annelids.

Phylum: Arthropoda: Type study-*Penaeus indicus*- Marine Prawn - external morphology, appendages, digestive and excretory systems, reproductive system and development - Affinities of Peripatus.

Unit -V Phylum: Mollusca: Type study – *Pila globosa*- external morphology, digestive system, respiratory system, Osphridium only. -Cephalopods as an advanced Mollusca.

Phylum: Echinodermata: Type study Star fish *(Asterias)*, external morphology, pedicellaria, --Water vascular system - Larval forms of Echinodermata

Books for Study:

1. Nair N.C, Leelavathy.S, Soundara Pandian.N Murugan.T and Arumugam.N.(2010) *A text book of Invertebrata*, Saras publication.
2. Kotpal. R.L. *Modern.*,(2005) *Text Book of Zoology Invertebrates*, 9thEdition.Rastogi publication, Meerut.

Books for Reference:

1. Barrington, E. J. W.,(1979) *Invertebrate Structure and functions*, II Edition,E.L.B.S, East-West Press Pvt. Ltd, New Delhi.
2. Hyman L.H.,(1982)*The Invertebrates*, Vol. I-VI, McGraw-Hill Companies Inc, New York.
3. M.Ekambaranatha Ayyar& T. N. Ananthakrishnan.,(2012)*A Manual of Zoology*, S. Viswanathan Pvt. Limited.
4. Jordon E.L. and Verma P.S.,(2014)*Invertebrate Zoology*, S. Chand & Company Ltd.,New Delhi, India.

Web Resources / E.Books:

https://basicbiology.net/animal/mammals

https://www.nwf.org/Educational-Resources/Wildlife-Guide/invertebrates

https://study.com/academy/lesson/animal-behavior-innate-vs-learned.html

https://fliphtml5.com/zrrga/rxxh/basic

Pedagogy:

Chalk and Talk, PPT, Group discussion, OHP presentations, Quiz, On the spot test, You tube Links, Open book test and Virtual Labs.

Rationale for nature of Course:

Knowledge and Skill: To make students aware of the role of Invertebrates in biological communities and understand their significance and ecological interactions.

Activities to be given: Students shall be asked to collect invertebrate specimens and make documentation as a group activity.

Course learning Outcomes (CLOs):

CLO	Course Outcomes Statement	Knowledge according to Bloom's Taxonomy (Upto K level)
CLO1	Understand the basic level of organization and taxonomy of animal kingdom. Identify the general characters and describe the outline classification from protozoa to Echinodermata.	K1 to K3
CLO2	Impart, gain knowledge of Life history and pathology of the protozoan parasites and its importance in human health.	K1 to K3
CLO3	Understand the significance of Ecological and Economic importance of Coelenterates and helminthes.	K1 to K4
CLO4	Analyze the significance of animal existence and adaptation in their habitat.	K1 to K3
CLO5	Examine the role of invertebrates in the ecosystem and their interactions.	K1 to K4

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	1	1	2	3	2
CLO2	3	1	1	1	3	2
CLO3	3	1	1	1	3	2
CLO4	3	1	2	3	3	2
CLO5	3	2	1	2	2	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

LESSON PLAN: TOTAL HOURS (75 Hrs)

UNIT	DESCRIPTION	Hrs	MODE
I	**Taxonomy:** Units of Classification, Criteria of classification – Principles of Classification - types of Coelom, types of Symmetry, Binomial nomenclature. Classification up to class level with example (Flow Chart only) - General characters of the phyla with examples: i) Protozoa ii) Porifera iii) Coelenterata iv) Platyhelminthes v) Nematoda *vi)* Annelida, vii) Arthropoda viii) Mollusca, ix) Echinodermata .	12	Chalk and Talk, PPT, quiz, on the spot test
II	**Phylum**: **Protozoa** - Type study -Paramecium- General organization, cyclosis, contractile vacuole and conjugation only. Structure, Life history, pathology, prevention and control measures of i) *Plasmodium vivax* and ii) *Entamoeba histolytica*. **Phylum: Porifera**: Type study-*Leucosolenia* - general organization, histology, Spicules, reproduction and development only. Canal system in Sponges.	18	Chalk and Talk, OHP quiz, on the spot test
III	**Phylum:** Coelenterata: Type study- Obelia; structure of obelia colony, Medusa, Nematocyst, reproduction and development (metagenesis) - Polymorphism in Coelenterata. Types of Corals- Ecological and Economic importance. **Helminthes**: Type study- *Fasciola hepatica* - external characters, digestive system, excretion, reproduction and development (life cycle). Structure, pathology and control measures of *Ascaris* and *Wuchereria.*	15	Chalk and Talk, PPT, group discussion , OHP andYou tube Links
IV	**Phylum: Annelida**: Type study-Earth worm, External morphology, setae, nephridia, nerves system and reproductive system - Metamerism in Annelids. **Phylum: Arthropoda**: Type study-*Penaeus indicus*- Marine Prawn - external morphology, appendages, digestive and excretory systems, reproductive system and development-Affinities of Peripatus.	15	Chalk and Talk, OHP,PPT presentations, quiz,
V	**Phylum: Mollusca**: Type study – *Pila globosa*- external morphology, digestive system, respiratory system, osphridium only. - Cephalopods as an advanced Mollusca. **Phylum: Echinodermata;** Type study Star fish *(Asterias)*, external morphology, pedicellaria, --Water vascular system - Larval forms of Echinodermata	15	Chalk and Talk, PPT, group discussion , OHP presentations, quiz, open book test

Course Designer: Dr.G. Indira Rani

Ms.R.S.Rajalakshmi

Annexure -6

Department of Zoology						Class :IB.Sc		
Semester	**Course Type**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
I	Core Course 2	23OUZO1P	Lab in Invertebrata	3	3	40	60	100

Nature of the Course		
Knowledge and Skill Oriented	**Employability Oriented**	Entrepreneurship oriented
✓	✓	

Course Objectives:

- To identify the different groups of invertebrate animals by observing their external characteristics.
- To understand the organs, organ system and their functions in lower animals.
- To get knowledge about the different modes of life and their adaptation based on the environment
- Able to dissect and display the internal organs and mount the mouthparts and scales of invertebrates.

Course Content:

Virtual dissection / Dissection Charts:

1. Earthworm: Nervous System (Dissection)
2. Cockroach: Digestive System and Nervous System
3. Pila: Digestive system

Mountings:

1. Earthworm: Body Setae
2. Cockroach: Trachea
3. Honey bee: Mouth Parts
4. Pila: Radula (Virtual dissection only)

Observation of Larval forms of the following animals:

1. Liver fluke: Miracidium, Redia and Cercaria.
2. Prawn: Nauplius, Zoea and Mysis.
3. Any Two Echinoderm Larvae.

Spotters:

- Protozoa: Paramecium-conjugation, Entamoeba,
- Porifera: Sponge- Gemmule and Spicules.

- Coelenterata: Obelia medusa, Sea anemone.
- Helminthes: Liver fluke, Ascaris (Male and Female)
- Annelida: Nereis, Chaetopterus.
- Arthropoda: Prawn, Peripatus.
- Mollusca: Chiton, Sepia.
- Echinodermata: Starfish, Sea-urchin.
- Field trip compulsory- A Report

Books for References:

1. Jayasurya, NairN.C, Soundarapandian N, Arumugam N,Leelavathy S and Murugan T, (2013)," Practical Zoology Vol 1 Invertebrata, Saras publication, Nagercoil.
2. Jayasurya, ThangamaniA,Arumugam N, Prasanakumar S Andnarayanan Lm, (2013), Practical Zoology Vol. 2 Chordata ,Saras Publication , Nagercoil.
3. Sinha J, Chatterjee A.K, And Chattopadhyay P, (2011), Advanced Practical Zoology , Books and Allied (P) Ltd., Kolkata.

Web Resources:

https://www.youtube.com/watch?v=wF7ew2w24as

https://www.youtube.com/watch?v=mjn4QUdYADg

Pedagogy

PPT, Group Discussion , Interaction, Quiz, Tutorial And Virtual Labs.

LESSON PLAN FOR PRACTICAL (TOTAL HOURS : 45)

Cycle	Description	Hrs	Mode
Virtual dissection / Dissection Charts:			
1	Earthworm: Nervous System	5	Charts
2	Cockroach: Digestive System, Nervous System		
3	Cockroach: Nervous System		
4	Pila: Digestive system		
Mountings			
5	Earthworm: Body Setae	16	Mounting
6	Cockroach: Trachea		Mounting (Virtual lab)
7	Honey bee: Mouth Parts		Mounting
8	Pila: Radula		Mounting (Virtual lab)
Observation of Larval forms of the following animals:			
9	Liver fluke: Miracidium, Redia and Cercaria.	8	Live specimen identification
10	Prawn: Nauplius, Zoea and Mysis		
11	Any Two Echinoderm Larvae.		
SPOTTERS			
12	**Protozoa:** Paramecium-conjugation, Entamoeba,	16	**Observation** Slides / Specimen / Images
13	**Porifera:** Sponge-Gemmule and Spicules.		
14	**Coelenterata:** Obelia medusa, Sea anemone.		
15	**Helminthes:** **Liver fluke,** Ascaris (Male and Female)		
16	**Annelida:** Neris, Chaetopterus,		
17	**Arthropoda:** Prawn, Peripatus,		
18	**Mollusca:** Chiton, Sepia,		
19	**Echinodermata:** Starfish, Sea-urchin,		
20	Field trip compulsory- A Report		

Course Designer: Ms.R.S.Rajalakshmi
Dr.M.A.Soniya
Mrs.S.Sharmila

Annexure -6

Department of Zoology						Class: I B.Sc		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
I	Skill Enhancement Course 1 (NME)	23OUZOSECN1	Ornamental Fish Farming And Management	2	2	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	**Entrepreneurship oriented**
✔		✔

Course Objectives:

- To highlight the importance of ornamental fish culture in relation to entrepreneurship development.
- To enable the identification, culture and maintenance of commercially important ornamental fishes.
- To provide the knowledge on the techniques of ornamental fish breeding, rearing, disease control and economics of ornamental fish farming.

Course Content:

Unit I - Introduction - ornamental fish keeping as hobby and cottage industry. Scope and self-employment of ornamental fish culture. Domestic and global scenario of ornamental fish trade and export potential.

Unit II - Identification of popular Ornamental fishes: Siamese fighting fish, Gold fish, Rosy barb, Black molly, Guppy, Koi carp, Arowana and Angel fish.

Unit III - Construction of fish tank: Size and shape of fish tank, bottom settings, stocking of fish, planting with aquarium plants, Accessories of fish Tank - aerators, types of filters, nets, lights and hood.

Unit IV - Transport of fishes: Oxygen packing, Food and feeding: Culture of live food organisms- Micro worms, vinegar eel, tubifex. Artificial feed - Pellet feed formulation.

Unit V - Breeding, hatchery and nursery management of Butterfly fish, Sword tails, Blue morph and Anemone fish- Common diseases and treatment of ornamental fishes : Nutritional diseases, White spot diseases, fungal diseases, Bacterial diseases, Dropsy diseases and ecto-parasites.

Books for Study:

1.Tharadevi, C.S. and K.V. Jayashree. (2009). "*Home Aquarium*", Saras Publications, Nagercoil.

2. Arumugam, N. (2010). "*Aquaculture*". Saras Publications, Nagercoil.

Books for Reference:

1. Swain SK., Sarangi N. and Ayyappan S. 2010. Ornamental fish farming. ICAR, New Delhi.
2. Living Jewels – A handbook on freshwater ornamental fish, MPEDA, Kochi.
3. Dey V.K.A. 1997. A handbook on aquafarming ornamental fishes. MPEDA, Kochi.
4. Ahilan, B., Felix N. and Santhanam R. 2008. Text book of aquariculture. Daya Publishing House, New Delhi.

Web Resources/ E.Books:

1. **http://ecoursesonline.iasri.res.in/course/view.php?id=297**
2. **https://www.ofish.org/**
3. **https://krishijagran.com/agripedia/income-generation-by-ornamental-fish culture/**
4. https://99businessideas.com/ornamental-fish-farming/

Pedagogy:

Chalk and Talk, PPT, group discussion , OHP presentations, quiz, on the spot test and Virtual Labs.

Rationale for nature of Course:

Entrepreneurship Oriented:

Knowledge on ornamental fishes attracts students to become entreprenurs.

Activities to be given:

Visit to Fish Farm, setting up of aquarium at homes

Course learning Outcomes (CLOs):

CLO	Course Outcomes Statement	Knowledge According to Bloom's Taxonomy(upto K level)
CLO1	The students will be able to identify, culture, maintain and market the commercially important ornamental fishes.	K1 to K3
CLO2	Possess the skills in culturing various kinds of fishes. Become an entrepreneur in ornamental fish culture.	K1 to K3
CLO3	Possess knowledge on principles, designing and maintenance of an aquarium.	K1 to K3
CLO4	Make students aware fish food production and on trade regulations.	K1 to K3
CLO5	Able to market the product and health related problems with ornamental fishes.	K1 to K3

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs) (SCIENCE)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	2	1	2	2	3	3
CLO2	2	3	2	2	3	3
CLO3	3	3	1	2	3	2
CLO4	3	2	3	2	3	2
CLO5	2	3	2	3	3	2

1-Basic Level 2- Intermediate Level 3- Advanced Level

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs) (ARTS)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	2	1	2	2	3	3
CLO2	2	3	2	2	3	3
CLO3	3	3	1	2	3	2
CLO4	3	2	3	2	3	2
CLO5	2	3	2	3	3	2

1-Basic Level 2- Intermediate Level 3- Advanced Level

Annexure -6

LESSON PLAN: TOTAL HOURS (30 Hrs)

UNIT	DESCRIPTION	Hrs	MODE
I	**Unit I** - Introduction - ornamental fish keeping as hobby and cottage industry. Scope and self-employment of ornamental fish culture. Domestic and global scenario of ornamental fish trade and export potential.	4	Chalk and Talk, PPT, quiz, on the spot test
II	**Unit II** - Identification of popular Ornamental fishes: Siamese fighting fish, Gold fish, Rosy barb, Black molly, Guppy, Koi carp, Arowana and Angel fish.	6	Chalk and Talk, PPT, group discussion , OHP andYou tube Links
III	**Unit III -** Construction of fish tank: Size and shape of fish tank, bottom settings, stocking of fish, planting with aquarium plants, Accessories of fish Tank - aerators, types of filters, nets, lights and hood.	6	Chalk and Talk, OHP,PPT presentations, quiz,
IV	**Unit IV** - Transport of fishes: Oxygen packing, Food and feeding: Culture of live food organisms- Micro worms, vinegar eel, tubifex. Artificial feed - Pellet feed formulation.	6	Chalk and Talk, PPT, group discussion , OHP presentations, quiz, open book test
V	**Unit V** - Breeding, hatchery and nursery management of Butterfly fish, Sword tails, Blue morph and Anemone fish- Common diseases and treatment of ornamental fishes : Nutritional diseases, White spot diseases, fungal diseases, Bacterial diseases, Dropsy diseases and ecto-parasites.	8	Chalk and Talk, PPT, group discussion , OHP presentations, quiz, open book test

Course Designer: Mrs.S.Sharmila

Annexure -6

Department of Zoology						Class: I B.Sc		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
I	Foundation Course	23OUZOFC1	Foundation Course in Zoology	2	2	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	**Entrepreneurship oriented**
✔		

Course Objectives:

- The objective of this document is to facilitate institutions and faculty in implementing a Foundation Course of three-months duration at the beginning of the B.Sc., course that will sensitise the fresh graduate student with the required knowledge and skills that will assist her in acclimatising to the new college environment which would be her basement for a life-long career.
- The Foundation Course will also provide a sound foundation for learning in the B.Sc., Zoology course and later in their professional career. While the institutions are expected to abide by the general guidelines, local changes can be made depending on the context and requirements.

Course content:

Unit I - Introduction to Zoology- Father of Zoology - Scope of zoology – Explain in brief account on Structural Zoology (Morphology, Anatomy, Histology, Cytology) - Developmental Zoology- Functional Zoology(Animal Physiology, Ethology)- Systemic Zoology (Protozoology, Entomology, Conchology, Malacology, Ichthyology, Herpetology, Ornithology, Mammalogy, Helminthology, Apiculture, Anthropology, Carcinology)- Distributional Zoology- Historical Zoology(Palaeontology, Phylogeny, Evolution) Medical Zoology, Economic Zoology. Molecular Biology and Genomics.

Unit II - Laboratory and Safety Rules - Animal Care in lab, safety protocols for Microbes study in the laboratory - safety preparations for Field Activities - safety precautions for demonstration of animal dissections

Unit III - Animal preservation-Steps for the preservation of specimens for scientific study- both microscopic and macroscopic in formalin, study skins, mounted specimens, skeletal

material, casts, pinned insects, dried material, animals preserved in liquid preservatives, models and microscope slides.

Unit IV - Scientific methods steps- observation, prediction, experiment, hypothesis, consistency, theory – scientific theory, scientific law – impact of science in human life: positive and negative aspects-- Ethical Principles and Guidelines for the use of Animals.

Unit V - Institutes of Zoological and Scientific importance in India - Location, major achievements and present activities of following academic and scientific organizations: Zoological Survey of India, Central Marine Fisheries Research Institute, Central Institute of Fisheries Technology, Rajiv Gandhi Centre for Biotechnology, Bioinformatics Centre and Library, Indian Institute of Science, Stem Cell Institute, National Institute of Immunology, Centre for Cellular & Molecular Biology, Centre for DNA Fingerprinting and Diagnostics, Central Drug Research Institute.

Books for Study:

1. Ernst Myer. (1997). This is Biology: The Science of the living World. 1st Edition, Harvard University Press, London

Books for Reference:

1. Bowler Peter J. and Iwan Rhys Morus. (2005) Making Modern Science: A Historical Survey. 2nd Edition, University of Chicago Press, Chicago, IL

2.Agarwal, S.K. (2010) Foundation course in Biology. 3rd Edition, Ane Books India, New Delhi

3. Collins H. and Pinch, T. (1993) The Golem: What everyone should know about Science. Cambridge university press.

Web Resources/ E.Books:

https://en.wikipedia.org/wiki/Institutes_of_National_Importance

http://www.historyworld.net/wrldhis/plaintexthistories.asp?historyid=ac22

https://courses.lumenlearning.com/wm-nmbiology2/

Pedagogy:

Chalk and Talk, PPT, group discussion , OHP presentations, quiz, on the spot test and Virtual Labs.

Rationale for nature of Course:

Knowledge and skill Oriented:

Gaining knowledge of fundamentals in Zoology

Activities to be given:

Taxidermy work, Knowhow of the Zoology research centers – documentation work.

LESSON PLAN: TOTAL HOURS (30 Hrs)

UNIT	DESCRIPTION	Hrs	MODE
I	**Unit I -** Introduction to Zoology- Father of Zoology - Scope of zoology – Explain in brief account on Structural Zoology (Morphology, Anatomy, Histology, Cytology) - Developmental Zoology- Functional Zoology(Animal Physiology, Ethology)- Systemic Zoology (Protozoology, Entomology, Conchology, Malacology, Ichthyology, Herpetology, Ornithology, Mammalogy, Helminthology, Apiculture, Anthropology, Carcinology)- Distributional Zoology- Historical Zoology(Palaeontology, Phylogeny, Evolution) Medical Zoology, Economic Zoology. Molecular Biology and Genomics.	4	Chalk and Talk, PPT, quiz, on the spot test
II	**Unit II -** Laboratory and Safety Rules - Animal Care in lab, safety protocols for Microbes study in the laboratory - safety preparations for Field Activities - safety precautions for demonstration of animal dissections	6	Chalk and Talk, PPT, group discussion , OHP andYou tube Links
III	**Unit III** - Animal preservation-Steps for the preservation of specimens for scientific study- both micro-scopic and macroscopic in formalin, study skins, mounted specimens, skeletal material, casts, pinned insects, dried material, animals preserved in liquid preservatives, models and microscope slides.	6	Chalk and Talk, OHP,PPT presentations, quiz,
IV	**Unit IV -** Scientific methods steps- observation, prediction, experiment, hypothesis, consistency, theory – scientific theory, scientific law – impact of science in human life: positive and negative aspects-- Ethical Principles and Guidelines for the use of Animals.	6	Chalk and Talk, PPT, group discussion , OHP presentations, quiz, open book test

V	**Unit V -** Institutes of Zoological and Scientific importance in India - Location, major achievements and present activities of following academic and scientific organizations: Zoological Survey of India, Central Marine Fisheries Research Institute, Central Institute of Fisheries Technology, Rajiv Gandhi Centre for Biotechnology, Bioinformatics Centre and Library, Indian Institute of Science, Stem Cell Institute, National Institute of Immunology, Centre for Cellular & Molecular Biology, Centre for DNA Fingerprinting and Diagnostics, Central Drug Research Institute.	8	Chalk and Talk, PPT, group discussion , OHP presentations, quiz, open book test

Course Designer: Ms.R.S.Rajalakshmi

Department of Zoology						Class: I B.Sc		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
II	Core Course 3	23OUZO21	Chordata	5	5	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	Entrepreneurship oriented
✔		

Course Objectives:

- To understand the structures and distinct features of Phylum Chordata.
- To understand and able to distinguish the characteristic features of each subphylum and class.
- To understand the economic importance of vertebrate.
- To know about the adaptations of vertebrates.
- To understand the evolutionary position of different groups of vertebrates.

Course Content:

Unit 1 : Taxonomy And Phylum Chordata - Chordates characteristics, Outline classification up to class level with examples. Cephalochordate -Amphioxus: External morphology, Digestive System and Excretory System only. Uro-chordata – Tadpole larva and Retrogressive metamorphosis in Ascidian, Hemichordate – Balanoglossus external morphology and Affinities of Hemichordate

Unit 2 : Pisces And Amphibians - General Characters and Classification of Fishes and Amphibians up to order level with examples -Pisces -Shark: External Morphology and Digestive System only, Migration of Fishes- Agnatha- Petromyzon -External morphology,

Amphibia: General characters and classification - Rana hexadactyla - External Morphology and Respiratory system only, Parental Care in Amphibians.

Unit 3 : Reptiles - General Characters and Classification of Reptiles up to orders with examples. Calotes: External Morphology, Heart, Arterial and Venous system only.

Snakes of India - Poisonous and non-poisonous snakes – Identification and biting mechanism. Origin, Dominance and Decline of Mesozoic reptiles.

Unit 4 : Aves - General Characters and Classification of Aves up to orders with examples. Columba livia -Pigeon: External Morphology, Respiratory System, Synsacrum, Pectoral and Pelvic girdles only- Flightless Birds.

Unit 5 : Mammals - General Characters and Classification of Mammals up to orders with examples- General Characters of Prototherians, Metatherians and Eutherians with examples. Rabbit: External Morphology, Excretory system and Reproductive System only - Dentition in mammals - Adaptation of aquatic mammals.

Books for Study:

1. EkambaranathaAyyar and T.N.Ananthakrishnan, (1995). "*A Manual of Zoology"*.Vol 2 (Part 1 & 2), S. Viswanathan, Chennai
2. Jordan E.L and P.S. Verma, (2000). *"Chordate Zoology"* S. Chand, New Delhi.

Books for Reference:

1. De Beer G, (1966), "*Vertebrate Zoology*", Sedgwick & Jackson, London.
2. Young J.Z, (1950), *"The Life of Vertebrates"*, Oxford University Press, London.

3 Alexander R.M.C.N., (1981)"*The Chordata"*Cambridge University Press., New York.

3. Kotpal. R.L.,(2009). *"Modern Text Book of Zoology Vertebrates"*3rd Edition, Rastogi Publications.

5. Romer A.S. & Parson, T.S (1986). "*A Vertebrate body*", W.B Saunders, Philadelphia.
6. Newman. H.H, (1939). "*The Phylum Chordata*", Mc Millan, New York.
7. Nigam. H.C.,(2021).Ist edition, "*Comparative Anatomy of Vertebrates*" Ist edition, Vishal Publishing Co., Jalandhar - 144008, 942.
8. Nair N.C.*et.al*., (2012)."*A text book of Chordata"* Saras Publications.

Web Resources/ E.Books:

https://books.google.co.in/books?id=IgA3fKgx-NYC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

http://chromeextension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.uou.ac.in/sites/default/files/slm/BSCZO-201.pdf

https://archive.org/details/in.ernet.dli.2015.262640/page/n1/mode/2up

Pedagogy:

Chalk and Talk, PPT, group discussion , OHP presentations, quiz, on the spot test and Virtual Labs. Charts, e-journals, Different channels of TV – Animal planet, Discovery, National Geographic.

Rationale for nature of Course:

Knowledge and Skill : Students will be able to obtain knowledge and habitat of the various kinds of domestic and wild animals.

Activities to be given:

- Collection of chordate specimens , information's gathered through news papers Journals and media .
- Counting and identification of birds within the campus.
- Celebrating wild life week among students focusing endangered species

Course learning Outcomes (CLOs):

CLO	Course Outcome Statements	Knowledge According to Bloom's Taxonomy (Upto K level)
CLO1	Classify, Identify and recall the name and distinct features of different subphylum belonging to phylum Chordata.	K1 to K3
CLO2	Explain, and relate the origin, structural organization and evolutionary aspects of vertebrates	K1 to K3
CLO3	Analyze, compare and distinguish the developmental stages and describe the important biological process	K1 to K4
CLO4	Correlate the different modes of life and parental care among different vertebrates.	K1 to K3
CLO5	Summarise the morphology and ecological adaptations in vertebrates and list out the economic importance.	K1 to K4

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	1	1	2	3	2
CLO2	3	1	1	1	3	2
CLO3	3	1	1	1	3	2
CLO4	3	1	2	3	3	2
CLO5	3	2	1	2	2	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

Annexure -6

LESSON PLAN: TOTAL HOURS (75 Hrs)

UNIT	DESCRIPTION	Hrs	MODE
I	**Taxonomy And Phylum Chordata** - Chordates characteristics, Outline classification up to class level with examples. Cephalochordate -Amphioxus: External morphology, Digestive System and Excretory System only. Uro-chordata – Tadpole larva and Retrogressive metamorphosis in Ascidian, Hemichordate – Balanoglossus external morphology and Affinities of Hemichordate.	12	Chalk and Talk, PPT, quiz, on the spot test
II	**Unit 2 : Pisces And Amphibians** - General Characters and Classification of Fishes and Amphibians up to order level with examples -Pisces -Shark: External Morphology and Digestive System only, Migration of Fishes- Agnatha- Petromyzon -External morphology, Amphibia: General characters and classification - Rana hexadactyla - External Morphology and Respiratory system only, Parental Care in Amphibians.	18	Chalk and Talk, PPT, quiz, on the spot test
III	**Unit 3 : Reptiles** - General Characters and Classification of Reptiles up to orders with examples. Calotes: External Morphology, Heart, Arterial and Venous system only. Snakes of India - Poisonous and non-poisonous snakes – Identification and biting mechanism. Origin, Dominance and Decline of Mesozoic reptiles.	15	Chalk and Talk, PPT, quiz, on the spot test
IV	**Unit 4 : Aves** - General Characters and Classification of Aves up to orders with examples. Columba livia -Pigeon: External Morphology, Respiratory System, Synsacrum, Pectoral and Pelvic girdles only- Flightless Birds.	15	Chalk and Talk, PPT, quiz, on the spot test
V	**Unit 5 : Mammals** - General Characters and Classification of Mammals up to orders with examples- General Characters of Prototherians, Metatherians and Eutherians with examples. Rabbit: External Morphology, Excretory system and Reproductive System only - Dentition in mammals - Adaptation of aquatic mammals.	15	Chalk and Talk, PPT, quiz, on the spot test

Course Designer: Ms.R.S.Rajalakshmi

Dr.M.A.Soniya

Annexure -6

Department of Zoology						Class :IB.Sc		
Semester	**Course Type**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
II	Core Course 4	23OUZO2P	Lab in Chordata	3	3	40	60	100

Nature of the Course		
Knowledge and Skill Oriented	**Employability Oriented**	Entrepreneurship oriented
✓	✓	

Course Objectives:

- To understand the structures and distinct features of phylum chordata.
- To understand and able to distinguish the characteristic features of each subphylum and class.
- To understand and compare the structure of various internal organs in different classes of vertebrates.
- To know about the classification, adaptations and affinities of chordate animals.

Course Content:

Virtual dissection / Dissection Charts:

1. Calotes: Arterial System and Venous System
2. Shark: Cranial nerves

Mountings:

1. Shark: Placoid Scales
2. Frog: Brain

Observation of Larval forms of the following animals:

1. Frog: Tadpole
2. Salamander: Axolotyl.

Spotters:

1. Prochordata: Amphioxus, Balanoglossus.
2. Agnatha: Petromyzon.
3. Pisces: Narcine, Echeneis, Hippocampus, Eel
4. Amphibian: Bufo, Ichthiophis, Salamander.
5. Reptilia: Poisonous Snakes: Cobra, Krait, and Viper.
6. Non-Poisonous Snakes: Dryophis and Ptyas.

7. Lizards - Chaemeleon and Draco.
8. Aves: Pectoral and Pelvic girdle of Pigeon, Archaeopteryx.
9. Mammals: Bat, Loris.

Field trip compulsory- A Report

- Animal collection / Field trip to visit places of biological importance and recorded

Books for References:

1. Jayasurya, ThangamaniA, Arumugam N, Prasanakumar S Andnarayanan Lm, (2013), Practical Zoology Vol. 2 Chordata ,Saras Publication , Nagercoil.
2. Sinha J, Chatterjee A.K, And Chattopadhyay P, (2011), Advanced Practical Zoology, Books and Allied (P) Ltd., Kolkata.
3. Lal S S, 2009. Practical Zoology Vertebrate, Rajpal and Sons Publishing, 484pp.
4. VermaP.S,2000. A Manual of Practical Zoology: Chordates, S. Chand Limited, 627pp.

Web Resources:

https://www.youtube.com/watch?v=b04hc_kOY10

https://bit.ly/3CzTEy8

http://tolweb.org/Chordata/2499

https://www.nhm.ac.uk/

https://bit.ly/3Av1Ejg

Pedagogy

PPT, Group Discussion , Interaction, Quiz, Tutorial And Virtual Labs.

Annexure -6

LESSON PLAN FOR PRACTICAL (TOTAL HOURS : 45)

Cycle	Description	Hrs	Mode
Virtual dissection / Dissection Charts:			
1	Calotes: Arterial System and Venous System	6	Charts
2	Calotes: Arterial System and Venous System		
3	Shark: Cranial nerves		
Mountings			
5	Shark: Placoid Scales	10	Mounting
6	Frog: Brain		Mounting (Virtual lab)
Observation of Larval forms of the following animals:			
9	Frog: Tadpole	8	Live specimen identification
10	Salamander: Axolotyl.		
SPOTTERS			
12	Prochordata: Amphioxus, Amphioxus - T.S. through pharynx, Balanoglossus, Ascidian.	16	**Observation** Slides / Specimen / Images
13	Agnatha: Petromyzon.		
14	Pisces: Narcine, Echeneis, Hippocampus, Eel, Catla. Tilapia.		
15	Amphibian: Bufo, Rhacophorus, Ichthiophis. Salamander.		
16	Reptilia: Poisonous Snakes: Cobra, Krait, and Viper.		
17	Non-Poisonous Snakes: Dryophis and Ptyas.		
18	Lizards - Chaemeleon and Draco.		
19	Aves: Pectoral and Pelvic girdle of Pigeon, Archaeopteryx.		
20	Mammals: Bat, Loris.		
21	Field trip compulsory- A Report Animal collection / Field trip to visit places of biological importance and recorded	5	

Course Designer: Ms.R.S.Rajalakshmi
Dr.M.A.Soniya
Mrs.S.Sharmila

Department of Zoology						Class: I B.Sc		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
II	Skill Enhancement Course 2 (NME)	23OUZOSECN2	Basic Course in Ornithology	2	2	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	**Entrepreneurship oriented**
✔		✔

Course Objectives:

- To equip students with the required knowledge to understand the taxonomic position and role played by birds in the ecosystem, their importance to humans and their evolution
- To enable students to comprehend the biological evolution of birds and their structural adaptations
- To enable students to understand and learn aspects of bird behaviour
- To enable students to learn about the breeding biology of birds
- To equip students with a knowledge of macro ecology of birds, bird populations and communities, bird diseases, bird conservation and on the role of citizen science in ornithology.

Course Content:

Unit I - Introduction to Ornithology; Birds and Humans; Classification of Birds, Bird Endemism, Books written by Salim Ali. Acts related to Bird conservation, -Bird Sanctuaries.

Unit II - External Morphology of the Bird; Bird Lore; Structure of bird feather, Internal Structure of the Bird - Beaks and feet in Birds.

Unit III - Bird Behaviour: Foraging, Roosting, Vocalization, Imprinting, Feather care, Bird Intelligence, Social Behaviour, Mixed Species Flocks, Migration of Birds.

Unit IV - Breeding Biology: Differential investment of sexes; territoriality, courtship and display behaviour, nesting, eggs, incubation and care of young. Identification of Birds by Calls and songs. Bird Watching: - Equipment for Bird Watching.

Unit V - Studying bird populations and communities, sampling methods; Macro ecology; Threats faced by birds; Bird Conservation with case studies.

Books for Study:

1. Sálim Ali, (2003) The Book Of Indian Birds, Oxford Publisher, BHNS, Bombay.
2. Lovette, I.J and Fitzpatrick, J.W. (2016). Handbook of Bird Biology, 3rd ed. Wiley.

Books for Reference:

1. Birkhead, T. (2013). Bird Sense: What it's like to be a bird? Bloomsbury, NY.
2. Birkhead, T., Wimpenny, J., and Montgomerie, B. (2014). Ten Thousand Birds: Ornithology since Darwin. Princeton University Press, Princeton, NJ.
3. Gill, F.B, and Prum, R.O. (2019). Ornithology, 4th ed. Macmillan.

Web Resources/ E.Books:

1. **https://archive.org/details/BookOfIndianBirds/page/n11/mode/2up**
2. **http://assets.press.princeton.edu/chapters/i10989.pdf**

Pedagogy:

Chalk and Talk, PPT, group discussion , OHP presentations, quiz, on the spot test and Virtual Labs. Charts, e-journals, Different channels of TV – Animal planet, Discovery, National Geographic.

Rationale for nature of Course:

Knowledge and Skill : Students will be able to obtain knowledge and habitat of the various kinds of domestic and wild Birds.

Activities to be given:

- Bird watching - Counting and identification of birds within the campus.
- Celebrating wild life week among students focusing endangered species of birds

Course learning Outcomes (CLOs):

CLO	Course Outcome Statements	Knowledge According to Bloom's Taxonomy (Upto K level)
CLO1	Recall the taxonomic position of birds, their external morphology and internal parts, types of bird behavior	K1 to K3
CLO2	Identify the external parts of the bird, internal structures of the bird and different types of bird behavior	K1 to K3
CLO3	Differentiate birds based on their morphology, foraging strategies and other behaviour	K1 to K3
CLO4	Explain and discuss how birds evolved, bird adaptations to flight, different aspects of bird behaviour, threats to birds and the role of citizen science in ornithology	K1 to K3
CLO5	Discuss and analyse case studies relating to bird conservation	K1 to K3

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs) (SCIENCE)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	3	1	1	2	3	2
CLO2	3	1	1	1	3	2
CLO3	3	1	1	1	3	2
CLO4	3	1	2	3	3	2
CLO5	3	2	1	2	2	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs) (ARTS)

	PO1	PO2	PO3	PO4	PO5	PO6
CLO1	2	1	2	2	3	3
CLO2	2	3	2	2	3	3
CLO3	3	3	1	2	3	2
CLO4	3	2	3	2	3	2
CLO5	2	3	2	3	3	2

1-Basic Level 2- Intermediate Level 3- Advanced Level

Annexure -6

LESSON PLAN: TOTAL HOURS (30 Hrs)

UNIT	DESCRIPTION	Hrs	MODE
I	Unit I - Introduction to Ornithology; Birds and Humans; Classification of Birds, Bird Endemism, Books written by Salim Ali. Acts related to Bird conservation, -Bird Sanctuaries.	5	Chalk and Talk, PPT, quiz, on the spot test
II	Unit II - External Morphology of the Bird; Bird Lore; Structure of bird feather, Internal Structure of the Bird - Beaks and feet in Birds.	6	Chalk and Talk, PPT, quiz, on the spot test
III	Unit III - Bird Behaviour: Foraging, Roosting, Vocalization, Imprinting, Feather care, Bird Intelligence, Social Behaviour, Mixed Species Flocks, Migration of Birds.	6	Chalk and Talk, PPT, quiz, on the spot test
IV	Unit IV - Breeding Biology: Differential investment of sexes; territoriality, courtship and display behaviour, nesting, eggs, incubation and care of young. Identification of Birds by Calls and songs. Bird Watching: - Equipment for Bird Watching.	7	Chalk and Talk, PPT, quiz, on the spot test
V	Unit V - Studying bird populations and communities, sampling methods; Macro ecology; Threats faced by birds; Bird Conservation with case studies.	6	Chalk and Talk, PPT, quiz, on the spot test

Course Designer: Mrs. S.Sharmila

Annexure -6

Department of Zoology						Class: I B.Sc		
Sem	**Category**	**Course Code**	**Course Title**	**Credits**	**Contact Hours / Week**	**CIA**	**SE**	**Total**
II	Discipline specific elective course (DSEC)	23OUZOSEC3	Basics of Marine Biology	2	2	25	75	100

Nature of the Course		
Knowledge and Skill Oriented	Employability Oriented	**Entrepreneurship oriented**
✔	✔	

Course Objectives:

- To understand and learn the physical, chemical and biological aspects of marine environment and to gain knowledge about the management of oceans.
- To introduce students to the marine environment and its indigenous organisms.
- To study the principles, concepts and facts through which the student can better understand and appreciate the nature of the sea and its inhabitants.
- To acquaint the student with the characteristics used to identify and classify marine plants and animals and to develop an awareness of the career possibilities available to students in this area.

Course content:

Unit I: Marine Ecology : Marine environment- ecological factors- light, temperature, salinity, pressure; Classification of marine environment; Pelagic environment – Planktonic and Nektonic adaptations; Benthic environment - intertidal, interstitial and deep sea adaptations; Distribution and ecological role of other coastal environments - estuaries, mangroves.

Unit II: Physical Oceanography : Physical Properties of Seawater- density, viscosity, surface tension, conductivity and their relationship; temperature distribution in the sea - heat budget, UV radiation; El Nino/La Nina – global impact; Dynamics of the ocean-general surface circulation, Waves, Currents and Tides, Tsunami.

Unit III: Chemical Oceanography: Chemical composition of seawater- major and minor elements, trace elements- their importance, distribution. Chemistry of seawater constituents- concept of chlorinity and salinity - methods of measurements, nutrients - biogeochemical cycles.

Unit IV: Biological Oceanography: Sea as a biological environment- Plankton- classification -Phytoplankton and Zooplankton - methods of collection, Oxidation as carbon (as organic matter). Primary productivity – estimation and factors affecting primary productivity.

Unit V: Marine Pollution and Ocean Management: Ocean pollution- kinds and quantities of pollutants, toxic effects and control measures – oil spills, plastics, nuclear waste disposal in marine environment, Eutrophication. Role of National and international agencies and organizations in ocean management-FAO, UNEP, DOD, WOCE, WHOI, IOI Malta, IMO INMARSAT- IUCN, SCAR, SCOR, Marpol, Traffic. Ocean policy (India) - research and management.

Books for Study:

1.Thurman, Harold.,2001 Introduction to Oceanography, Prentice Hall Inc. New Jersey.506pp.

2. Bertness, M.D, S. D. Gaines and M.K. Hay 2000. Marine Community Ecology Sinauer Associates.

3. Grant Gross, M., 1993 Oceanography: A view of the earth (sixth edition). Prentice Hall Inc. New Jersey.

4. Fincham A. A, 1984. Basic Marine Biology. Cambridge University Press, England. 157 pp.

5. John Resech Jr.1979, Marine Biology. Reston Publishing Company, Virginia. 257 pp.

Books for Reference:

1. Barbara E. Curry, 2016. Advances in Marine Biology, Volume 74, Ist Edition. Academic Press ISBN: 9780128036075.

2. Peter Castro, Michael E. Huber, 2015. Marine Biology; Series Botany, Zoology, Ecology and Evolution. McGraw-Hill Education.

3. Philip V. Mladenov, 2013 Marine Biology: A very short introduction, Ist Edition. Oxford University Press.

4. Venkataraman K, Raghunathan C, Raghuraman R, Sreeraj C. R, 2012. Marine diversity in India. Zoological Survey of India, Kolkata.178 pp.

5. Amy Hill. 2002. Marine Biology: An Introduction to Ocean Ecosystems (Marine Biology Ser) Walch publishing.

6. Pickard, G.L. and W.J. Emery 1995. Descriptive Physical Oceanography. Pergamon Press,London.

7. Gage. J.D. and P.A. Tyler, 1991. Deep Sea Biology, Cambridge University Press,Cambridge

8. Raymont J. E. G., 1980. Plankton and Productivity in the oceans: Volume 1: Phytoplankton, Pergamon Press.

Web Resources/ E.Books:

https://www.livescience.com

https://www.cbd.int

Pedagogy:

Chalk and Talk, PPT, group discussion , OHP presentations, quiz, on the spot test and Virtual Labs. Charts, e-journals, Different channels of TV – Animal planet, Discovery, National Geographic.

Rationale for nature of Course:

Knowledge and Skill : Students will be able to obtain knowledge and habitat of the various kinds of marine animals and their conservation.

Activities to be given:

- Visit to seashore for collection of marine species
- Field trip to CMFRI-Thoothukudi /Rameswaram

Course learning Outcomes (CLOs):

CLO	Course Outcome Statements	Knowledge According to Bloom's Taxonomy (Upto K level)
CLO1	Define marine ecosystem, recognize and describe the interrelationship between biology and ocean technology.	K1 to K3
CLO2	Articulate and classify the dynamics and the physical attributes of the ocean, interpret the factors which affect the global climate.	K1 to K3
CLO3	Identify and analyze the physical and biological factors of marine environments, and focus life in the open sea.	K1 to K3
CLO4	Evaluate the impact of variations in abiotic factors in marine productivity and justify the role of human activities in the degradation of marine ecosystems.	K1 to K3
CLO5	Categorize marine pollutants and develop controlling measures in collaboration with the institutions for ocean management.	K1 to K3

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Annexure -6

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6
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CLO2	3	1	1	1	3	2
CLO3	3	1	1	1	3	2
CLO4	3	1	2	3	3	2
CLO5	3	2	1	2	2	3

1-Basic Level 2- Intermediate Level 3- Advanced Level

LESSON PLAN: TOTAL HOURS (30 Hrs)

UNIT	DESCRIPTION	Hrs	MODE
I	**Marine Ecology** : Marine environment- ecological factors- light, temperature, salinity, pressure; Classification of marine environment; Pelagic environment – Planktonic and Nektonic adaptations; Benthic environment - intertidal, interstitial and deep sea adaptations; Distribution and ecological role of other coastal environments - estuaries, mangroves.	5	Chalk and Talk, PPT, quiz, on the spot test
II	**Physical Oceanography :** Physical Properties of Seawater- density, viscosity, surface tension, conductivity and their relationship; temperature distribution in the sea - heat budget, UV radiation; El Nino/La Nina – global impact; Dynamics of the ocean-general surface circulation, Waves, Currents and Tides, Tsunami.	6	Chalk and Talk, PPT, quiz, on the spot test
III	**Chemical Oceanography**: Chemical composition of seawater- major and minor elements, trace elements- their importance, distribution. Chemistry of seawater constituents- concept of chlorinity and salinity - methods of measurements, nutrients - biogeochemical cycles.	6	Chalk and Talk, PPT, quiz, on the spot test
IV	**Biological Oceanography:** Sea as a biological environment- Plankton- classification -Phytoplankton and Zooplankton - methods of collection, Oxidation as carbon (as organic matter). Primary productivity – estimation and factors affecting primary productivity.	7	Chalk and Talk, PPT, quiz, on the spot test
V	**Marine Pollution and Ocean Management**: Ocean pollution- kinds and quantities of pollutants, toxic effects and control measures – oil spills, plastics, nuclear waste disposal in marine environment, Eutrophication. Role of National and international agencies and organizations in ocean management-FAO, UNEP, DOD, WOCE, WHOI, IOI Malta, IMO INMARSAT- IUCN, SCAR, SCOR, Marpol, Traffic. Ocean policy (India) - research and management.	6	Chalk and Talk, PPT, quiz, on the spot test

Course Designer: Dr.M.A.Soniya

Annexure -6

EVALUATION (PRACTICAL)

Internal (Formative) : 40 marks
External (Summative) : 60 marks
Total :100 marks

Question Paper Pattern for Internal Practical Examination: 40 Marks

Components	Marks
I – Major question	15
II - Minor question	08
III-Spotter (4 x 3)	12
IV –Record book	05
Total	**40**

Question Paper Pattern for External Practical Examination (Major) :60 Marks

Components	Marks
I – Major question	20
II - Minor question	15
III-Spotter (4 x 5)	20
IV –Record book	5
Total	**60**

In respect of external examinations passing minimum is **35% for Under Graduate** Courses and in total, **aggregate of 40%.**

Latest amendments and revisions as per **UGC** and **TANSCHE** norm is taken into consideration to suit the changing trends in the curriculum.