DEPARTMENT OF ZOOLOGY				*CLASS: II B.Sc. Botany*				
Sem	**Course Type**	**Course Code**	**Course Title**	**Credits**	**Contact Hours/week**	**CIA**	**Ext**	**Total**
III	Allied	20U3ZAC1	Essentials of Invertebrates & Chordates	4	4	25	75	100

Nature of Course				
Knowledge and skill	✓		Employability oriented	
Skill oriented			Entrepreneurship oriented	

Course Objectives

By the end of the course, students will be able:

1. To describe the general characters and outline classification of Invertebrate and Chordate.
2. To identify the animals and recognize their distinguishing features.
3. To appraise the specific features of animal and their life cycle.
4. To understand the morphology and adaptations of animals in the context of evolution.
5. To learn how different body designs solve biological problems related to physiological and environmental challenges.

Unit	Description	Hours	K-level	CLO
I	**Classification, Protista & Porifera** Systems of classification and nomenclature, Levels of organization, Types of symmetry. General characters and outline classification of invertebrates (up to phylum) with examples. Life cycle of *Plasmodium*, Canal system in sponges, Corals and coral reefs.	**12**	Up to K-2	**1**
II	**Platyhelminthes, Annelida & Arthropoda** Parasitic adaptation in helminthic worms, Metamerism in Annelida, Metamorphosis in insects, Mouth parts in insects, Affinities of Peripatus.	**12**	Up to K-3	**2**
III	**Mollusca, Echinodermata & Chordata** Torsion in Mollusca, Economic importance of Mollusca, Water vascular system in starfish. General characters and outline classification of Chordates (up to class) with examples.	**12**	Up to K-3	**3**
IV	**Prochordates & Fishes** General characters and classification of Urochordates, Cephalochordates and Hemichordates (up to class) with examples, Parental care in fishes, Migration of fishes.	**12**	Up to K-4	**4**
V	**Amphibia, Reptilia, Birds & Mammals** Neoteny in Amphibians, Poisonous snakes of south India (Cobra and krait), Identification of poisonous and non poisonous snakes, Flight adaptations in birds, Egg laying and pouched mammals, Adaptive radiation in mammals.	**12**	Up to K-4	**5**

Books for Study

1. Nair NC, Leelavathy S, Soundara Pandian N, Murugan T and Arumugam N, 2017. *A Text Book of Invertebrates*, Saras Publication, Nagercoil.
2. Thangamani A, Prasannakumar, S, Narayanan L.M and Arumugam N, 2017. *A Text Book of Chordates*, Saras Publication, Nagercoil.
3. Nair N.C, Thangamani A, Leelavathy S, Prasanakumar S, Soundrapandian N, Murugan T, Narayanan L.M and Arumugam N, 2017. *Animal diversity (Invertebrata & Chordata)*, Saras Publication, Nagarcoil.
4. Kotpal R.L, 2017. *Modern Text Book of Zoology*: *Invertebrate*, Rastogi Publications, Meerut.
5. Kotpal R.L, 2017. *Modern text book of Zoology*: *Vertebrates*, Rastogi Publications, Meerut.

Books for References

1. Barnes R.D. 2006. *Invertebrate Zoology* (1982) VIIth Edition, Holt Saunders International Edition.
2. Ekambaranatha Ayyar and Ananthakrishnan T.N, 1992. *Manual of Zoology Vol – I, Part I & II*, S.Viswanathan Pvt. Ltd. Chennai.
3. Kotpal R.L, Agarwal S.K and Khetarpal R.P, 1990. *Invertebrates*, Rastogi Publications, Meerut.
4. Anderson D.T, 2001. *Invertebrate Zoology*, Oxford University Press, New Delhi.
5. Verma P.S, 2010. *Chordate Zoology*, S Chand Publishers, New Delhi.

Web resources

https://www.nwf.org/Educational-Resources/Wildlife-Guide/Invertebrates
https://biologydictionary.net/invertebrate/
https://basicbiology.net/animal/invertebrates
https://www.khanacademy.org/science/biology/crash-course-bio-ecology/crash-course-biology-science/v/crash-course-biology-121
https://www.khanacademy.org/science/biology/crash-course-bio-ecology/crash-course-biology-science/v/crash-course-biology-122
https://www.khanacademy.org/science/biology/crash-course-bio-ecology/crash-course-biology-science/v/crash-course-biology-123

Pedagogy

Chalk and Talk, PPT, group discussion, seminar, interaction, quiz, tutorial and virtual labs.

Rationale for Nature of the course

This course will enable the students to comprehend the general characters and outline classification of Invertebrates and Chordates. It augments the students' knowledge on morphology and adaptations of animals to meet challenges in their living environment.

Activities having direct bearing on Skill development/Employability/Entrepreneurship

The acquiring of knowledge on body designs of Invertebrates & Chordates, their role to solve physiological and environmental challenges, could enrich the students' knowledge on biology in an evolutionary perspective. It could pave the way for their holistic understanding on biology.

Course designers:

Dr. R. Eswaran
Dr. L. D. Devasree

LESSON PLAN (Total hours: 60)

Unit	Description	Staff Name	Hrs	Mode
I	Systems of classification & nomenclature		1	Lecture, Chalk and Talk, Interaction, PPT & Group Discussion
	Levels of organization		1	
	Types of symmetry		1	
	General characters of Invertebrates		1	
	Classification of Invertebrates (up to phylum) with examples		2	
	Life cycle of *Plasmodium*		2	
	Canal system in sponges		2	
	Corals and coral reefs		2	
			12	
II	Parasitic adaptation in helminthic worms		3	Lecture, Chalk and Talk, Interaction, PPT & Group Discussion
	Metamerism in Annelida		2	
	Metamorphosis in insects		2	
	Mouth parts in insects		3	
	Affinities of Peripatus		2	
			12	
III	Torsion in Mollusca		3	Lecture, Chalk and Talk, Interaction, PPT & Group Discussion
	Economic importance of Mollusca		3	
	Water vascular system in starfish		2	
	General characters of Chordates		2	
	Classification of Chordates (up to class) with examples		2	
			12	
IV	General characters and classification of Urochordates (up to class) with examples		2	Lecture, Chalk and Talk, Interaction, PPT & Group Discussion
	General characters of and classification Cephalochordates (up to class) with examples		2	
	General characters and classification of Hemichordates (up to class) with examples		2	
	Parental care in fishes		3	
	Migration of fishes		3	
			12	
V	Neoteny in Amphibians		2	Lecture, Chalk and Talk, Interaction, PPT & Group Discussion
	Poisonous snakes of south India (Cobra and krait)		2	
	Identification of poisonous and non poisonous snakes		2	
	Flight adaptations in birds		2	
	Egg laying and pouched mammals		2	
	Adaptive radiation in mammals		2	
			12	

Course Learning Outcomes:

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

CLOs	CLO Statements	Knowledge level
CLO-1	Understand the systems of classification and nomenclature for animals.	K2
CLO-2	Predict the adaptations of animals with their mode of life.	K3
CLO-3	Apply the knowledge to identify evolutionary relationship among Invertebrates and Chordates.	K3
CLO-4	Investigate the relations between unique behaviours of animals with their habitat.	K4
CLO-5	Examine the role of Invertebrate and Chordates in biological communities and ecological interactions.	K4

Mapping with Programme Specific Outcomes of Botany

	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6	PSO-7	PSO-8
CO-1	2	2	1	1				
CO-2	2	2	3	1				2
CO-3	1	2	1	2				
CO-4	2	1	3	3				1
CO-5	2	2	2	1	2		3	2

3- Advance application; 2- Intermediate level; 1- Basic level

Mapping with Programme Outcomes

	PO-1	PO-2	PO-3	PO-4	PO-5
CO-1	2	2	1	2	2
CO-2	2	2	2	3	
CO-3	3	3	2	2	2
CO-4	1	3	2	3	3
CO-5	2	2	3	3	2

3- Advance application; 2- Intermediate level; 1- Basic level

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 (Either/or Choice)	Section D (Open Choice)	Total
			MCQs		Short Answers				
			No. of Questions	K- Level	No. of Questions	K- Level			
1	CLO 1	Up to K 2	2	K1& K2	1	K1	2 (K2&K2)	1(K2)	
2	CLO 2	Up to K 3	2	K1& K2	2	K2	2 (K3&K3)	2(K2/K3)	
No. of Questions to be asked			4		3		4	3	14
No. of Questions to be answered			4		3		2	2	10
Marks for each question			1		2		5	10	
Total Marks for each section			4		6		10	20	40

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

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 (Either/or Choice)	Section D (Open Choice)	Total
			MCQs		Short Answers				
			No. of Questions	K- Level	No. of Questions	K- Level			
1	CLO 3	Up to K3	2	K1& K2	1	K1	2 (K2&K2)	2(K2/K3)	
2	CLO 4	Up to K4	2	K1& K2	2	K2	2 (K3&K3)	1(K4)	
No. of Questions to be asked			4		3		4	3	14
No. of Questions to be answered			4		3		2	2	10
Marks for each question			1		2		5	10	
Total Marks for each section			4		6		10	20	40

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

BLUE PRINT FOR EXTERNAL

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

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

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

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	**Total Marks**	% of Marks without choice	Consolidated
K1	5	2	10	--	**17**	14.16	**42%**
K2	5	8	10	10	**33**	27.5	
K3	-	-	20	30	**50**	41.67	**42%**
K4	-	-	10	10	**20**	16.67	**16%**
Total Marks	10	10	50	50	**120**	100.00	**100%**