

**Course Structure & Syllabus for B.Sc. / M.Sc. / M. Phil.  
Zoology  
CBCS Pattern  
2022-2023 Academic Year onwards**

# **Z**oology



**RAJAH SERFOJI GOVERNMENT COLLEGE (Autonomous)  
THANJAVUR 613005**

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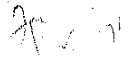
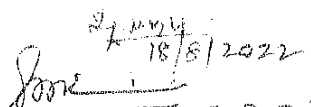
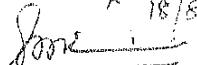

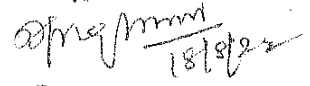
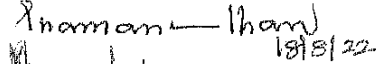
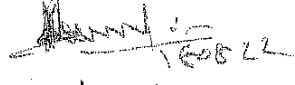
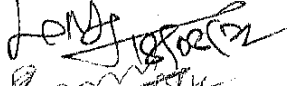

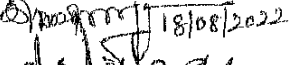
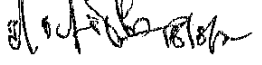

PG AND RESEARCH DEPARTMENT OF ZOOLOGY  
RAJAH SERFOJI GOVERNMENT COLLEGE (Autonomous)  
THANJAVUR 613005

BOARD OF STUDIES MEETING-MINUTES

18.08.2022

The meeting of Board of Studies (BoS) in Zoology was held on 02.00 pm on 18.08.2022 (Thursday) at the department of Zoology under the chairmanship of Dr.P.Mariappan, Head, Department of Zoology. The following members are present in the meeting

Internal Members

1. Dr.K.M.Subbu Rathinam - CL
2. Dr.K.Rameshkumar -  18/8/22
3. Dr. M.Sukumaran - 
4. Dr.S.Babu -  18/8/2022
5. Dr.S.Sivasuriyan -  18-08-2022
6. Dr.M.Thangadurai -  18.8.2022.
7. Dr.P.Murugaian -  18/8/22
8. Mr.S.Ramanathan -  18/8/22
9. Dr. P.Raja -  18/8/22
10. Dr.M.Sundaramoorthy -  18/8/22
11. Dr. S.Ravikumar - 
12. Dr. R.Ravichelvan -  18/08/2022
13. Dr.R.Ravichandran - 
14. Dr.Merlin Emerald - EL
15. Dr. M.Soundararajan -  18/8/22

## External Members

1. Dr. K. Anbarasu  
Associate Professor and Head  
Department of Marine Biotechnology  
Bharathidasan University, Thiruchirapalli 620 024
2. Dr. T. Ravimanickam  
Associate Professor of Zoology  
School of Biological Science  
Tamil Nadu Open University  
Chennai 600 015
3. Dr. K. Venkatramalingam  
Assistant Professor of Zoology  
Government Arts College (Autonomous)  
Salem-7
4. Mr. M. Murugaesan  
Sri Nee Vee Organic Foods  
Elupatti, Thanjavur
5. Dr. V. Thamilazhagan  
Assistant Professor of Zoology  
Syed Ammal Arts and Science College  
Ramanathapuram  
Ramanathapuram 623 513

The syllabi for B.Sc. Zoology (Major and Allied) and M.Sc. Zoology for the academic year 2022-23 Onwards under CBCS system was revised, discussed and correction/changes were carried out.

The syllabi for General Courses Environmental Studies was also revised and approved.

The students can opt extra credit course from skill based elective courses that have been left out under CBCS system apart from the ECC marked.

The finalized syllabus is approved in the meeting which is appended herewith along with course-wise correction details.

(P.MARIAPPAN)  
CHAIRMAN-BoS-ZOOLOGY

Dr. P. Mariappan  
Asst Prof & Head Zoology  
Rajah Serfoji Govt College  
Thanjavur 613001

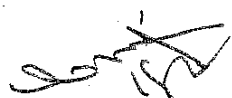
**B.Sc. Zoology**

Programme Specific Outcomes-B. Sc. Zoology	
On completion of the student will able to	
PSO-1	Demonstrate in-depth knowledge and understanding about the fundamental concepts, principles and processes underlying the academic field of Zoology and its different subfields
PSO-2	Apply the knowledge the acquired in Zoology domain in producing animal products
PSO-3	Address the problems in the field of animal breeding and environmental management by understanding of the societal, legal and cultural values
PSO-4	Upgrade the techniques he/she learned in various aspects of applied area
PSO-5	take part as member in the team with right attitudes

**B. Sc. ZOOLOGY COURSE STRUCTURE**  
(For the Candidates admitted from the academic year 2022 -2023 onwards)

Semester	Part	Course	Subject Code	Title of the Paper	Inst. Hrs.	Credit	Exam (Hrs)	Marks		Total
								Int.	Ext.	
I	I	LT	A1T1	Tamil	6	3	3	25	75	100
	II	LE	A1E1	English	6	3	3	25	75	100
	III	CC1	A1ZO1	Invertebrata	6	4	3	25	75	100
	III	CC2	A1ZOP1	Major Practical-1	3	4	3	40	60	100
	III	Allied 1	A1ACH1	Chemistry 1	4	4	3	25	75	100
	III	Allied 1	A2AHP	Practical-Allied	3	-	-	-	-	-
	IV	VE	A1VE	Value Education	2	2	3	25	75	100
	<b>Total</b>					<b>30</b>	<b>20</b>			
II	I	LT	A2T2	Tamil	6	3	3	25	75	100
	II	LE	A2E2	English	6	3	3	25	75	100
	III	CC3	A2ZO2	Chordata	6	5	3	25	75	100
	III	CC4	A2ZOP2	Major Practical-2	3	3	3	40	60	100
	III	Allied 2	A2AHP	Practical-Allied 1	3	3	3	40	60	100
	III	Allied 3	A2ACH2	Chemistry 2	4	3	3	25	75	100
	IV	ES	A2ES	Environmental Studies	2	2	3	25	75	100
	<b>Total</b>					<b>30</b>	<b>24</b>			
III	I	LT	A3T3	Tamil	6	3	3	25	75	100
	II	LE	A3E3	English	6	3	3	25	75	100
	III	CC5	A3ZO3	Cell Biology	6	4	3	25	75	100
	III	CC6	A3ZOP3	Major Practical-3	3	4	3	40	60	100
	III	Allied 4	A3ABO1	Botany 1	4	4	3	25	75	100
	III	Allied 5	A4ABOP	Practical-Allied	3	-	-	-	-	-
	IV	SEC1	A3SB1	Aquaculture	2	2	3	25	75	100
	<b>Total</b>					<b>30</b>	<b>20</b>			
IV	I	LT	A4T4	Tamil	6	3	3	25	75	100
	II	LE	A4E4	English	6	3	3	25	75	100
	III	CC7	A4ZO4	Environmental Biology and Evolution	6	4	3	25	75	100
	III	CC8	A4ZOP4	Major Practical-4	3	4	3	40	60	100

	III	Allied 2	A4ABOP	Practical-Allied	3	4	3	40	60	100
	III	Allied 2	A4ABO2	Botany 2	4	4	3	25	75	100
	IV	SEC2	A4SB2	Sericulture	2	2	3	25	75	100
	<b>Total</b>				<b>30</b>	<b>24</b>				<b>700</b>
V	III	CC9	A5ZO5	Animal Physiology	6	5	3	25	75	100
	III	CC10	A5ZOP5	Major Practical-5	6	5	3	40	60	100
	III	DSE1	A5ZOEL1A	Genetics	6	5	3	25	75	100
			A5ZOEL1B	Medical Laboratory Techniques						
			A5ZOEL1C	Animal Behaviour						
	III	DSE2	A5ZOEL2A	Microbiology and Immunology	6	5	3	25	75	100
			A5ZOEL2B	Wildlife Biology						
			A5ZOEL2C	Toxicology						
	III	GEC1	A5CHGEC1	Soil Science	4	2	3	25	75	100
	IV	SSD	A5SSD	Soft Skill Development	1	2	3	25	75	100
IV	SEC3	A5SB3	Poultry Farming	1	2	3	25	75	100	
IV	ECC1	A5ZECC1	Biology of Insects	-	4	-	-	100	100	
<b>Total</b>				<b>30</b>	<b>26</b>					<b>700</b>
VI	III	CC11	A6ZO6	Developmental Biology	6	5	3	25	75	100
	III	CC12	A6ZO7	Biostatistics & Computer Applications	6	5	3	25	75	100
	III	CC13	A6ZOP6	Major Practical-6	6	5	3	40	60	100
	III	DSE3	A6ZOEL3A	Biotechnology	6	5	3	25	75	100
			A6ZOEL3B	Economic Entomology						
			A6ZOEL3C	Ornamental Fish Culture						
	III	GEC2	A5PHGEC2	Biophysics	4	2	3	25	75	100
	IV	GS	A6GS	Gender Studies	2	2	3	25	75	100
	IV	ECC2	A6ZECC2	Apiculture	-	4	3	-	100	100
	V	Extra Activities		NCC/NSS/SPORTS/RCC/YRC/CCC	-	2	-	-	-	-
<b>Total</b>				<b>30</b>	<b>26</b>					<b>600</b>
<b>Grand Total</b>						<b>140</b>				<b>3900</b>



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**CONTROLLER OF EXAMINATIONS**  
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THANJAVUR - 613 005.

Core Course 1: INVERTEBRATA							
(for students admitted from the academic year 2022-2023)							
Credit	4	Hours/Week	6	Sub Code	A1ZO1	Semester	I
Medium of Instruction: English/Tamil						CC1	

**Objective:**

To learn the classification, general characters, structure, functions and evolutionary significance of invertebrates belong to major phyla.

**Course Outcomes:**

CO No	CO-Statement	Cognitive Level (K)
On successful completion of this course student will be able to:		
CO-1	learn diverse forms of invertebrate animals belong to nine major phyla	K2
CO-2	gain knowledge about the type's study of each phylum, external features, nutrition, locomotion and life cycle.	K1
CO-3	demonstrate basic knowledge on life cycles of various parasites and their ecological significance	K2
CO-4	Appreciate economic importance and evolutionary significance	K3
CO-5	Understand their special adaptation for their efficient survival	K3

<b>Unit-I</b>	Principles and classification of Invertebrates. Nomenclature –types <b>Protozoa:</b> Salient features and classification up to class level with examples. Type Study – <i>Paramecium</i> - external features, nutrition and reproduction. General Topics (GT): Protozoan diseases-Amebiasis, <i>Trypanosomiasis</i> and Malaria. Life cycle of Plasmodium.
<b>Unit-II</b>	<b>Porifera:</b> Salient features and classification up to class level with examples. Type Study: Sycon sponge ( <i>Scypha</i> ). GT: Canal system in sponges, spicules of sponges. <b>Coelenterata:</b> Salient features and classification up to class level with examples. Type Study: <i>Obelia</i> - Structure of polyp, medusa and life history of Obelia. GT: Corals - Coral reefs and its importance.
<b>Unit-III</b>	<b>Platyhelminthes:</b> Salient features and classification up to class level with examples. Type Study: <i>Taeniasolium</i> – External features, Body wall, Feeding, excretion, reproduction and life cycle. GT: Parasitic adaptations in Platyhelminthes. <b>Nematoda:</b> Salient features and classification up to class level with examples. Type Study: <i>Ascarislumbricoides</i> : External features, Digestive system, excretion, Reproductive and Life cycle. GT:Parasitic adaptations of helminth parasites
<b>Unit-IV</b>	<b>Annelida:</b> Salient features and classification up to class level with examples. Type Study: <i>Megascolexmauriti</i> (Earthworm), external features, locomotion digestive system, excretory and reproductive system. GT: Adaptive radiation in Annelida . <b>Arthropoda:</b> Salient features and classification up to class level with examples. Type Study: <i>Panaeus monodor</i> : external features, respiratory system, digestive system, excretory system, reproductive system, GT: Crustacean larval forms and their significances


<b>Unit-V</b>	<p><b>Mollusca:</b> Salient features and classification up to class level with examples. Type Study: <i>Lamellidens marginalis</i> (Freshwater mussel): External features digestive, respiratory and reproductive system. GT: Economic importance of Mollusca.</p> <p><b>Echinodermata:</b> Salient features and classification up to class level with examples. Type Study: <i>Asterias rubens</i> (Star fish). External features, digestive system, water vascular system, life cycle. GT:: Larval forms of Echinodermata</p>
<b>Text Books</b>	
<ol style="list-style-type: none"> <li>1. Ekambaranatha Ayyar. M and Ananthakrishnan, T.N. 2000. Manual of Zoology, Volume I – Invertebrate Zoology, Kitab Mahal, Allahabad., S.Viswanathan Pvt. Ltd.</li> <li>2. Jordan, E.L. &amp; Verma, P.S. 2009. Invertebrate Zoology, S.Chand &amp; Co. New Delhi</li> <li>3. Ruppert E.E., Fox, R.S., and Barnes, R.D., 2006. Invertebrate Zoology. 7<sup>th</sup> Ed, Cenage Learning Singapore.</li> </ol>	
<b>Reference Books</b>	
<ol style="list-style-type: none"> <li>1. R.C.Brusca et al. 2016. Invertebrates. Sinauer Associates, an imprint of Oxford University Press.</li> <li>2. Barrington E.J.W., 1979. Invertebrate structure and Functions, 2<sup>nd</sup> Ed., Thomas Nelson &amp; Sons Ltd., Middlesex, United Kingdom.</li> <li>3. Arthur E Shipley. 2021. Zoology of the Invertebrata, MJP Publisher, First edition, p468.</li> <li>4. Hymen, L.H. 1940-1959. The Invertebrates, Volume I – V., Mc Graw Hill, UK.</li> </ol>	
<b>Web resources</b>	
<a href="http://en.wikipedia.org/wiki/Invertebrate">http://en.wikipedia.org/wiki/Invertebrate</a> <a href="http://animalkingdom.net/category/invertebrates/">http://animalkingdom.net/category/invertebrates/</a>	


**Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes**

Course Outcomes	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	2	2	3	3	2	3	3	3	1	2	2.4
CO2	3	2	3	3	1	2	3	1	2	3	2.3
CO3	3	2	3	2	3	3	2	1	3	3	2.5
CO4	2	2	2	2	3	1	2	3	2	2	2.1
CO5	1	2	3	2	3	3	2	1	3	3	2.3
Mean Overall Score (High Level Relationship between COs and POs)											2.32

**Semester Question paper Pattern:**

Section: A	10 x 2 = 20
Section: B (either or choice)	5 X 5 = 25
Section: C (3 out of 5)	3 X 10 = 30

  
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Core Course 2: Major Practical-I: INVERTEBRATA (for students admitted from the academic year 2022-2023)							
Credit	4	Hours/Week	3	Sub Code	A1ZOP1	Semester	I
Medium of Instruction: English/Tamil						CC2	

CO NO	CO-STATEMENT	Cognitive Level (K)
On successful completion of this course student will be able to:		
CO-1	Learn practical knowledge of certain selected functional systems on invertebrates	K3
CO-2	Gain experience on standard mounting procedures of harmful and economically important invertebrates	K4
CO-3	Familiarize and acquire basic knowledge on entire morphology of various invertebrate animals of the given (syllabus) phyla.	K2

### Major Practical: Dissections

Earthworm: digestive system-Nervous system

Cockroach: Digestive –nervous-reproductive systems

Prawn: Digestive system-Nervous system

### Minor Practical: Mounting

Earthworm:Penial and Body setae

Prawn: appendages

### Mouth Parts:

Cockroach

Honey bee

Housefly

Mosquito

### Spotters

**Protozoa:** *Entamoebahistolitica*, *Euglena*, *Paramecium* (entire, binary fission and conjugation)

**Porifera :** *Sycon*, *Spicules* and *Gemmules*.

**Coelenterata:** *Obelia*(entire, medusa), *Aurelia*, *Metridium*(Sea anemone).

**Corals:** *Astraea*, *Madrepora*, *Tubipora*, *Fungia*, *Favia*, *Corallium*(Red coral).

**Platyhelminthes:** *Dugesia*(Planaria)(W.M. & T.S), *Fasciola hepatica* (Liver fluke) W.M. & T.S), Redia larva, Cercaria larva, *Taeniasolium* (Tape worm ) (W.M. & T.S), Tape worm Scolex.

**Nematoda:** *Ascarislumbricoides*(Entire – Male and Female), T.S. of *Ascaris*.

**Annelida:** Earth worm(*Megascolex*), *Nereis* (Entire), T.S. of *nereis*,

Parapodium, Heteronereis, *Hirudinaria granulosa* (Leech) (Entire & T.S), Aphrodite, Arenicola.

**Arthropoda:** Cockroach, Scorpion, *Daphnia*, *Cyclops*, *Lepas*, *Balanus*, *Sacculina*, *Hippa*, *Limulus*, Prawn (*Penaeus*).

**Larvae:** Nauplius larva, Zoea larva, Mysis larva.

**Beneficial Insects:** Honey bee and Silkworm, Lac insect.

**Mollusca:** *Pila*, *Chiton*, *Lamellidens* (Fresh water mussel), *Murex*, *Sepia*, *Octopus*, *Nautilus*, *Aplysia*, *Mytilus*, *Pinctada* (Pearl oyster), *Croassostrea*(Edible oyster)

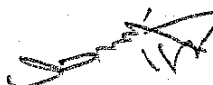
**Echinodermata:** Star fish, Sea urchin, Sea cucumber, Sea lilly, *Bipinnaria* larva, *Brachiolaria* larva, *Ophiopluteus* larva, *Auricularia* larva.


Field Visit: specimen collection

Relationship matrix for Course Outcomes, Programme Outcomes /Programme Specific Outcomes											
Course Outcomes ↓	Programme Outcomes(PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	2	3	2	2	3	3	2	2	3	2.5
CO-2	2	2	2	2	3	3	2	2	1	2	2.1
CO-3	2	2	3	2	2	2	2	3	2	3	2.3
Mean Overall Score											2.30
Result											Medium

Semester Question paper Pattern:

Section: A	10 x 2 = 20
Section: B (either or choice)	5 X 5 = 25
Section: C (3 out of 5)	3 X 10 = 30

  
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Core Course 3: CHORDATA							
(for students admitted from the academic year 2022-2023)							
Credit	4	Hours/Week	6	Sub Code	A2ZO2	Semester	II
Medium of Instruction: English/Tamil						CC3	

**Objective:**

To introduce the students about the diverse forms of vertebrate animals of major classes, their identifications, evolutionary significance, ecological and economic importance.

**Course Outcomes:**

CO No	CO-Statement	Cognitive Level (K)
On completion of this course the student will		
CO-1	Get knowledge on classification and characteristic features of chordates	K1
CO-2	Know the structure and its function of various organs of chordates	K3
CO-3	Acquire knowledge about the birds and mammals	K2
CO-4	Gain more information on comparative study in Chordates	K2
CO-5	Be familiar with the migration of animals	K1, K2

<b>Unit-I</b>	General characters of chordate - Classification of Chordates up-to class level Prochordata-General characters Cephalochordata. Type Study: Amphioxus Hemichordata Type Study: Balanoglossus. Urochordata Type Study: Ascidian.
<b>Unit-II</b>	Pisces-General characters and classification up to order with examples. <b>Detailed study:</b> Shark external features, digestive, respiration and reproduction General Topics: Migration of Fishes.
<b>Unit-III</b>	Amphibia: General characters and Classification of up to order with examples. <b>Detailed study:</b> Frog –external features, digestive, respiration and metamorphosis. General Topics: Parental care in amphibians Reptilia: General characters and Classification up to orders with examples <b>Detailed study:</b> Calotes- external features, digestive, respiration and reproduction General Topics: Identification of poisonous and nonpoisonous snakes.
<b>Unit-IV</b>	Aves- General characters and Classification up to orders with examples <b>Detailed study:</b> - <i>Columba livia</i> - external features, digestive, respiration and reproduction General Topics: Migration of birds. Flight adaptation in birds.
<b>Unit-V</b>	Mammalia- General Characters and Classification up to orders with examples <b>Detailed study:</b> Rabbit external features, digestive, respiration and reproduction General Topics: Dentition in mammals
<b>Text Books</b>	
1. EkambaranathaAyyar, M, and Ananthakrishnan, T.N. 2000. Manual of Zoology, (Volume II – Chordate Zoology.) S.Viswanathan Pvt. Ltd.	
2. Jordan, E.L. and Verma,P.S. (2008). Chordate Zoology S. Latest Edition Chand & Co. New Delhi.	
3. Kotpal , R.L. (2001)Modern Textbook of Zoology Chordates. Rastogi publications, Meerut.	
<b>Reference Books</b>	
1. Pough, F.H., J.B. Heiser& W.N. McFarland, 1996. Vertebrate Life. Prentice Hall Pvt. Ltd. Pp 798.	

2. Sinha, Adhikari, Ganguly, BharatiGoswami., 2004. Biology of animals Vol. II, New Central BookAgency (p) Ltd.
3. Pough, F.H., Janis, C.M. &Heiser, J.B. 2002. Vertebrate Life. Pearson Education, Inc. Pp699.
4. Miller, A.S. and John P. Harvley, (1996). Zoology. Latest Edition. Wm. C.Brown Publishers.

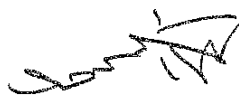
**Web resources**


<https://library.si.edu/research/vertebrate-zoology>  
<https://www.earthlife.net/inverts/hemichordata.html>  
<http://www.askitians.com/biology/animal-kingdom/phylum-chordata-and-hemichordata.html#difference-between-lower-and-higher-chordates>  
<http://www.biozoo.com/2011/11/pisces-classification-super-class.html>

Course outcomes ↓	Programme outcomes (po)					Programme specific outcomes (pso)					Mean scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	3	2	3	3	2	3	3	2	2.7
CO-2	3	3	3	2	2	3	3	3	2	2	2.6
CO-3	3	3	3	3	2	3	3	2	3	3	2.8
CO-4	3	3	2	3	2	3	3	2	2	2	2.5
CO-5	3	3	3	2	2	3	3	3	2	3	2.7
<b>Mean Overall Score</b>											<b>2.66</b>
<b>Result</b>											<b>High</b>

**Semester Question paper Pattern:**

Section: A	10 x 2 = 20
Section: B (either or choice)	5 X 5 = 25
Section: C (3 out of 5)	3 X 10 = 30

  
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 THANJAVUR - 613 005.

Core Course 4: Major Practical – II: CHORDATA (for students admitted from the academic year 2022-2023)							
Credit	4	Hours/Week	3	Sub Code	A2ZOP2	Semester	II
Medium of Instruction: English/Tamil						CC4	

CO No	CO-Statement	Cognitive Level (K)
On completion of this course the student will		
CO-1	Gain hands on skill of various systems of popular vertebrate animals through virtual dissection	K3
CO-2	Learn the part of animal structure through mounting	K2
CO-3	Familiar with trendy examples from vertebrate phyla.	K5
CO-4	Understand the architecture of animals through their skeletal system	K2
CO-5	Identify the nature of food habit by learning dentition.	K1

#### Virtual Dissections:

**Shark / Frog / Calotes/ Aves/Rat** – Digestive system, respiratory system, arterial system, venous system, male and female reproductive systems and Nervous system.

#### Mounting:

**Shark:** Mounting of placoid scales

#### SPOTTERS:

**Prochordata:** Balanoglossus, *Amphioxus* and Ascidian.

**Pisces:** Shark (*Scoliodonsorrakowah*), Arius, Gambusia, Hippocampus, Catlacatia, Anabas, Anguilla, Exocoetus, Anabas, Synaptura.

**Amphibia:** Rhacophoruspleurosticus, Frog, Bufo, Hyla, Salamander

**Reptilia:** Calotes, Hemidactylus, Draco, Varanus, Najanaja, Viper, Chelone, chamaeleon, Lycodon

**Aves:** King fisher, Pigeon, Owl, Quill feather.

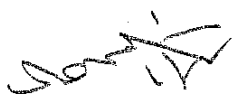
**Mammalia:** Rabbit, Rat, Loris and Bat


**Skeletal system:** Frog, skull, Pectoral and Pelvic girdle, forelimb and hindlimb.

**Dentition:** Rabbit, Man, Dog.

A Record of the work done is to be submitted at the time of examination

Relationship matrix for Course Outcomes, Programme Outcomes /Programme Specific Outcomes											
Course Outcomes ↓	Programme Outcomes(PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	2	3	2	2	3	3	2	2	3	2.5
CO-2	2	2	2	2	3	3	2	2	1	2	2.1
CO-3	2	2	3	2	2	2	2	3	2	3	2.3
CO-4	2	3	2	2	3	2	3	2	1	3	2.2
CO-5	3	2	2	1	2	2	3	2	1	3	2.1
Mean Overall Score											2.24
Result											Medium

  
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ENVIRONMENTAL STUDIES							
(for students admitted from the academic year 2022-2023)							
Credit	2	Hours/Week	2	Sub Code	A2ES	Semester	II
Medium of Instruction: English/Tamil						ES	

### Objective:

To sensitize students on environmental issues and sustainable development practices.

### Unit 1

The Multidisciplinary nature of environmental studies: Scope and importance; Need for public awareness. Natural Resources: Renewable and non-renewable resources; Natural resources and associated problems - a) Forest resources, b) Water resources, c) Mineral resources, d) Food resources, e) Energy resources, f) Land resources Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

சுற்றுச்சூழல் அறிவியல்-பல்துறை தன்மை: நோக்கம் மற்றும் முக்கியத்துவம்; மக்களிடம் விழிப்புணர்வு தேவை. இயற்கை வளங்கள்: புதுப்பிக்கத்தக்க மற்றும் புதுப்பிக்க இயலா வளங்கள்; இயற்கை வளங்கள் மற்றும் பயன்பாடு தொடர்புடைய பிரச்சனைகள் - அ) வன வளங்கள், ஆ) நீர் வளங்கள், இ) கனிம வளங்கள், ஈ) உணவு வளங்கள், உ) ஆற்றல் வளங்கள், ஊ) நில வளங்கள். இயற்கை வளங்களைப் பாதுகாப்பதில் தனிநபரின் பங்கு. நிலையான வாழ்க்கை முறைக்கு வளங்களை சமமாகப் பயன்படுத்துதல்.

### Unit II

Ecosystem: Concept, structure and function of an ecosystem; Energy flow in the ecosystem; Ecological succession; Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of - a) Forest ecosystem, b) Grassland ecosystem, c) Desert ecosystem, d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

சுற்றுச்சூழல் அமைப்பு: கட்டமைப்பு மற்றும் செயல்பாடு; சுற்றுச்சூழல் அமைப்பில் ஆற்றல் ஓட்டம்; சுற்றுச்சூழல் தொடர்வழி மாற்றம்; உணவு சங்கிலி, உணவு வலை மற்றும் சுற்றுச்சூழல் கூம்புகள்; அறிமுகம், வகைகள், சிறப்பியல்பு, கட்டமைப்பு மற்றும் செயல்பாடு - அ) வன சுற்றுச்சூழல், ஆ) புல்வெளி சுற்றுச்சூழல், இ) பாலைவன சுற்றுச்சூழல், ஈ) நீர்வாழ் சுற்றுச்சூழல் அமைப்புகள் (குளங்கள், நீரோடைகள், ஏரிகள், ஆறுகள், பெருங்கடல்கள், முகத்துவாரங்கள்).

### Unit III

Biodiversity and its conservation: Genetic, species and ecosystem diversity; Biogeographical classification of India; Value of biodiversity; Biodiversity at global, National and local levels; India as a mega-diversity nation; Hot-spots of biodiversity; Threats to biodiversity; Endangered and endemic species of India; In-situ and Ex-situ conservation of biodiversity. Environmental Pollution: Definition, causes, effects and control measures of a) Air Pollution, b) Water Pollution, c) Soil Pollution, d) Marine Pollution, e) Noise pollution, f) Thermal Pollution, g) Nuclear hazards, h) solid waste; Role of an individual in prevention of pollution; Pollution case studies; Disaster management - floods, earthquake, cyclone and landslides.

பல்லுயிர் மற்றும் அதன் பாதுகாப்பு: மரபணு, இனங்கள் மற்றும் சுற்றுச்சூழல் பன்முகத்தன்மை; இந்தியாவின் உயிர் புவியியல் வகைப்பாடு; பல்லுயிர் மதிப்பு; உலகளாவிய, தேசிய மற்றும் உள்ளூர் மட்டங்களில் பல்லுயிர்; இந்தியா ஒரு பெரும்-பன்முகத்தன்மை கொண்ட நாடு; பல்லுயிர் பெருக்கத்தின் செழுமை இடங்கள்; பல்லுயிர் பெருக்கத்திற்கு அச்சுறுத்தல்கள்; இந்தியாவின் அழிந்துவரும் மற்றும் உள்ளூர் இனங்கள்; அக-புறச் சூழல் பல்லுயிர் பாதுகாப்பு. சுற்றுச்சூழல் மாசுபாடு: வரையறை, காரணங்கள், விளைவுகள் மற்றும் கட்டுப்பாட்டு நடவடிக்கைகள் அ) காற்று மாசுபாடு, ஆ) நீர் மாசுபாடு, இ) மண் மாசுபாடு, ஈ) கடல் மாசுபாடு, உ) ஒலி மாசுபாடு, ஊ) வெப்ப மாசுபாடு, ஏ) அணு அபாயங்கள், ஏ) திடமான கழிவுகள்; மாசுபாட்டைத் தடுப்பதில் தனிநபரின் பங்கு; மாசு கள ஆய்வுகள்; பேரிடர் மேலாண்மை - வெள்ளம், பூகம்பம், சூறாவளி மற்றும் நிலச்சரிவு.

#### Unit IV

Social Issues and the Environment: from Unsustainable to Sustainable development; Urban problems related to energy; Water conservation, rain water harvesting, watershed management; Resettlement and rehabilitation of people – problems, concerns, case studies; Environmental ethics; Climate change; Global warming; Acid rain; Ozone layer depletion; Nuclear accidents and holocaust; Wasteland reclamation; Consumerism and waste products; Environmental Legislations - Environment Protection Act; Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act.; Issues involved in enforcement of environmental legislation; Public awareness.

சுற்றுச்சூழல் சார்ந்த சமூகப் பிரச்சினைகள்: நீடித்த வளர்ச்சி, நிலையான வளர்ச்சி வரை; ஆற்றல் தொடர்பான நகர்ப்புற பிரச்சனைகள்; நீர் சேமிப்பு, மழை நீர் சேகரிப்பு, நீர்நிலை மேலாண்மை; மக்களின் மீள்குடியேற்றம் மற்றும் மறுவாழ்வு - பிரச்சினைகள், கவலைகள், வழக்கு ஆய்வுகள்; சுற்றுச்சூழல் நெறிமுறைகள்; பருவநிலை மாற்றம்; உலக வெப்பமயமாதல்; அமில மழை; ஓசோன் அடுக்கு சிதைவு; அணு விபத்துக்கள் மற்றும் மரணங்கள்; தரிசு நில மீட்பு; நுகர்வோர் மற்றும் கழிவு பொருட்கள்; சுற்றுச்சூழல் சட்டங்கள் - சுற்றுச்சூழல் பாதுகாப்பு சட்டம்; காற்று (மாசு தடுப்பு மற்றும் கட்டுப்பாடு) சட்டம், நீர் (தடுப்பு மற்றும் மாசு கட்டுப்பாடு) சட்டம், வனவிலங்கு பாதுகாப்பு சட்டம், வன பாதுகாப்பு சட்டம்.; சுற்றுச்சூழல் சட்டத்தை அமல்படுத்துவதில் உள்ள சிக்கல்கள்; பொது விழிப்புணர்வு.

#### Unit V

Human Population and the Environment: Population growth, Variation among nations, Population explosion, Family Welfare Programmes, Environment and human health, Human Rights, Value Education, HIV/ AIDS, Women and Child Welfare, Role of Information Technology in Environment and human health.

மக்கள்தொகை மற்றும் சுற்றுச்சூழல்: மக்கள்தொகை வளர்ச்சி, நாடுகளிடையே மாறுபாடு, மக்கள்தொகை பெருக்கம், குடும்ப நலத் திட்டங்கள், சுற்றுச்சூழல் மற்றும் மனித ஆரோக்கியம்,

மனித உரிமைகள், மதிப்புக் கல்வி, எச்ஐவி/எய்ட்ஸ், பெண்கள் மற்றும் குழந்தைகள் நலன், சுற்றுச்சூழல் மற்றும் மனித ஆரோக்கியத்தில் தகவல் தொழில்நுட்பத்தின் பங்கு.

### Text books

1. Erach Bharucha, 2004. Textbook for Environmental studies, UGC, New Delhi.
2. Townsend C.R., Harper, J.L., Begon, M., 2009. Essentials of Ecology, Wiley, 528p.
- N. Arumugam, V. Kumaresan. 2014. Environmental Studies. Saras Publication

### Reference books

1. Abbasi, S.A., 1998. Environmental Pollution and its Control, International Publications, Pondichery.
2. Agarwal, K.C. 2001 Environmental Biology, Nidi Public Ltd Bikaner.
3. Clark R.B., 2001. Marine Pollution, 5<sup>th</sup> edition, Oxford University Press. 248p.
4. Jadhav, H and Bhosale, V.M., 1995. Environmental Protection and Laws Himalaya Pub. House, Delhi 284 p.
5. McNeely, J.A., Miller, K., Mittermeier, R.A., Reid, W.V and Werner, T.B., 1990. Conserving the world's Biological diversity, IUCN.
6. Odum, E.P. 1971 Fundamentals of Ecology. W.B. Saunders Co. USA. 574 p.
7. Trivedi R.K., 2010. Handbook of Environmental Laws, Acts, Guidelines, Compliances and Standards, Vol. I and II, B.S. Publications.
8. Wagner K.D., 1998. Environmental Management. W.B. Saunders Co. Philadelphia USA 515p.

### Web Resources:

- <https://www.ugc.ac.in/oldpdf/modelcurriculum/env.pdf>
- <https://ta.vikaspedia.in/education/baabb2-bb5b95bc8bafbbeba9-baab9fbbfbaabcdbaabc1b95bb3bcd/%E0%AE%9A%E0%AF%81%E0%AE%B1%E0%AF%8D%E0%AE%B1%E0%AF%81%E0%AE%9A%E0%AF%8D%E0%AE%9A%E0%AF%82%E0%AE%B4%E0%AE%B2%E0%AF%8D-%E0%AE%95%E0%AE%B2%E0%AF%8D%E0%AE%B5%E0%AE%BF>

Course Outcomes		
At the end of the course, the students will be able to		
CO-1	rationalize social issues with environmental issues and realize the importance of the environment and aware of its protection	Understanding
CO-2	distinguish renewable resources from non-renewable resources	Analyzing
CO-3	gain knowledge on types of pollutions and their management strategies	Evaluating
CO-4	value the importance of biodiversity and its conservation.	Applying
CO-5	understand the concept, structure and functions of various ecosystems.	Understanding

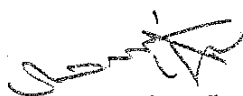
### Question Pattern:


Maximum Marks: 75

Duration of Exam: 3 hrs

Part A: 5 x 6 = 30 (5 out of 7 questions, atleast one question from each unit)

Part B: 3 x 15 = 45 (One question from each unit)

  
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ALLIED ZOOLOGY-I (Invertebrata and Vertebrata) (for students admitted from the academic year 2022-2023)							
Credit	2	Hours/Week	4	Sub Code	A1AZ1	Semester	II
Medium of Instruction: English/Tamil						AC1	

**Course Objective:**

To introduce the students about the diverse forms of Invertebrate and Vertebrate animals living around us and their structural organization.

**Course Outcomes:**

CO No	CO-Statement	Cognitive Level (K)
<i>On successful completion of this course, students will be able to:</i>		
CO-1	Identify and appreciate the animal diversity.	K1
CO-2	Understand basic taxonomy of invertebrates and chordates.	K2
CO-3	Appreciate the economic importance of animal diversity.	K3
CO-4	Recognize how different body designs solve biological problems related to physiological and environmental challenges.	K3
CO-5	Realize the role of vertebrates in biological communities, ecological interactions, and conservation problems.	K4

Unit I	ANIMAL TAXONOMY Principles of Animal Taxonomy–Kingdom Protozoa –Salient features. Type study: Paramecium - Habitat, Morphology and Conjugation. Life cycle of Plasmodium. Salient features of Phylum Porifera.
Unit II	COELENTERATA, PLATYHELMINTHES AND ANNELIDA Outlines of Kingdom Animalia. Salient features of Phylum Coelenterata, Platyhelminthes, Aschelminthes, Annelida with any two examples. Colonial organization of Obelia, Parasiticadaptations in Helminthes. External features of Earthworm
Unit III	ARTHROPODA, MOLLUSCA AND ECHINODERMATA Salient features of Phylum Arthropoda, Mollusca and Echinodermata with any two examples. Type study: Cockroach – External features, Mouthparts, Digestive, Nervous and Reproductivesystem. Economic importance of Mollusca.
Unit IV	FISHES AND AMPHIBIA Characters and classification up to Subphylum of Chordates. Salient features of Fishes and Amphibia. Type Study: Frog: External features, Digestive System, Circulatory System and Urinogenital System.
Unit V	REPTILES, AVES AND MAMMALS Salient features Reptiles, Aves and Mammals with two examples. Type study: Rabbit - Morphology, Digestive System, Circulatory System, and Urinogenital Systems.
<b>Text Books</b>	
1. Nair NC, Leelavathy S, SoundaraPandian N and Arumugam N. (2013). A Text Book of Invertebrates, Saras Publication Nagercoil, Tamilnadu.	
2. Thangamani A, Prasannakumar S, Narayanan LM, Arumugam N. (2013). A Text Book of	

Chordates, Saras Publication, Nagercoil, Tamilnadu.

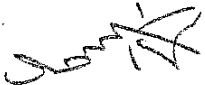
#### Reference Books


1. Jordon EL and Verma PS. (2009), Invertebrate Zoology, 15th edition, S Chand and Co, Zoology Delhi.
2. Kotpal RL. (2014). Invertebrates – Animal Diversity – I, 11th edition, Rastogi Publications, Meerut.
3. Verma PS. (2010). Chordate Zoology, Revised edition, S Chand Publishers, New Delhi.

#### Webresources

<https://www.acs.edu.au/courses/invertebrate-animals-730.aspx>  
<http://web2.uconn.edu/cyberinfra/module4/Taxonomy.pdf>  
<http://animalkingdom.net/category/invertebrates/>  
<http://www.askitiations.com/biology/animal-kingdom/phylum-chordata-and-hemichordata.html#difference-between-lower-and-higher-chordates>

Course Outcomes ↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Score s of COs
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	
CO-1	3	3	2	3	3	3	3	3	3	2	2.8
CO-2	3	3	2	3	3	3	2	3	2	3	2.7
CO-3	3	3	3	2	2	3	3	3	3	2	2.7
CO-4	3	3	2	3	2	3	2	3	3	2	2.6
CO-5	3	3	2	3	2	3	2	3	3	2	2.6
Mean Overall Score											2.68
Result											High

  
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Allied Zoology II: COMMERCIAL ZOOLOGY (for students admitted from the academic year 2022-							
Credit	2	Hours/Week	4	SubCode	A1AZ2	Semester	II
Medium of Instruction: English/Tamil						AC2	

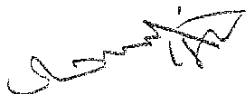
**Objective:**

To reveal the applications of zoology and thereby motivate for self employment.

**Course Outcomes:**

CO No	CO-Statement	Cognitive Level (K Level)
<i>On successful completion of this course, students will be able to</i>		
CO-1	Learn vermiculture technique.	K1
CO-2	Gain knowledge about beekeeping.	K2
CO-3	Understand sericulture technique.	K3
CO-4	Become skilled in some of the aquaculture practices.	K4
CO-5	Familiar with poultry farming and its management.	K5

<b>Unit-I</b>	Vermiculture: Types of earthworm. Rearing technology. Methods of vermicomposting and Advantages. Management of vermiculture –vermin cast–economic importance.
<b>Unit-II</b>	Apiculture: Species of honey bees–methods of bee keeping - bee colony–types of bee hives -honey extraction - care and management–nutritive and medicinal value–diseases of honey bees.–economic importance
<b>Unit-III</b>	Sericulture: History of sericulture–types of silk worm–food and feeding habits of larva–Life cycle of Mulberry silkworm (Bombyx mori)–silkgland–diseases of mulberry silkworm–economic importance.
<b>Unit-IV</b>	Aquaculture: construction and management of pond. Cultivable fishes (Catla, Rohu, Mrigal). Fish feed. Integrated fish farming. Induced breeding. Fish diseases. Marine Shrimp freshwater prawn culture.
<b>Unit-V</b>	Poultry Farming: types of poultry–management–poultry nutrition–feeding methods of poultry–poultry diseases and their control– economics importance of poultry production.
<b>Text Book</b>	
1. Ram Prabhu Jayasurya, R., Thangamani, L.M. Narayanan, N. Arumugam and Prasannakumar, 2013. Economic Zoology, Saras Publication, Tamil Nadu, India.	
<b>Reference Books</b>	
1. V.B. Upadhyay and S.S. Shukla, 2014. Applied and Economic Zoology, Rastogi Publications, Uttar Pradesh, India.	
2. Aminul Islam, 2016. A Text Book of Economic Zoology, I.K. International Publishing House Pvt. Ltd., New Delhi, India.	



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3. V.Jaiswal,2014.EconomicZoology,PrenticeHall IndiaLeatningPvt.Ltd.,NewDelhi,India.

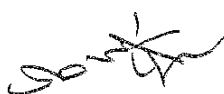
**Web resources**

<http://csb.gov.in/assets/Uploads/documents/note-on-sericulture-2016-17.pdf>

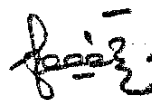
[https://aabees.org/ebooks/Honey\\_bee\\_e\\_book.pdf](https://aabees.org/ebooks/Honey_bee_e_book.pdf)

<https://www.slideshare.net/SameerChebbi1/freshwater-brackish-water-and-marinefish-culture-of-india-by-dr-s-g-chebbi>

Relationship matrix for Course Outcomes, Programme Outcomes / Programme Specific Outcomes											
Course Outcomes ↓	Programme Outcomes(PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	
CO-1	3	2	3	2	2	3	3	2	2	3	2.5
CO-2	2	2	2	2	3	3	2	2	1	2	2.1
CO-3	2	2	3	2	2	2	2	3	2	3	2.3
CO-4	2	3	2	2	3	2	3	2	1	3	2.2
CO-5	3	2	2	1	2	2	3	2	1	3	2.1
Mean Overall Score											2.24
Result											Medium



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ALLIED ZOOLOGY III- PRACTICAL							
(for students admitted from the academic year 2022-2023)							
Credit	4	Hours/Week	3	Sub Code	A1AZ3P	Semester	II
Medium of Instruction: English/Tamil					AC 3		

**Course Outcomes:**

CO No	CO-Statement	Cognitive Level (K)
<i>On successful completion of this course, students will be able to:</i>		
CO-1	Learn practical knowledge of certain selected functional systems on invertebrates	K1
CO-2	Gain experience on standard mounting procedures of harmful and economically important invertebrates	K2
CO-3	Familiarize and acquire basic knowledge on entire morphology of various invertebrate animals of the given (syllabus) families.	K3

**Major Practical: Dissections:**

Earthworm: Digestive system and Nervous system. Cockroach: Digestive system and Nervous system Frog: Pro-dissector software: Demonstration

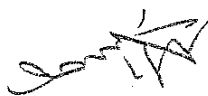
**Minor Practical:**

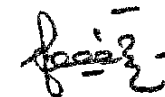
Earthworm: Body setae, Penial setae.  
Honey bee/ Cockroach/ Mosquito: : Mouth Parts  
Shark: Placoid scale.

**Spotters:**

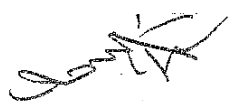
*Amoeba*, *Paramecium* (entire and conjugation), *Obelia* colony, Aurelia entire, Fasciola hepatica (W.M & T.S.), Redia, Cercaria, *Taenia solium*- entire and scolex, *Ascaris* - male and female, Earthworm, Leech, Freshwater mussel, Starfish, Frog, Calotes, Pigeon and Rabbit.  
Species of animals used in vermiculture, apiculture, lac culture, sericulture, aquaculture and poultry farming.  
Products: Honey, beeswax, lac, silk, cod liver oil, pearl, egg of different poultry birds

**Field visit:** Fish farm, Prawn farm, Pearl culture, Vermiculture Place, Sericulture centre, Apiculture Place, Poultry farm.

  
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Relationship matrix for Course Outcomes, Programme Outcomes /Programme Specific Outcomes											
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CO-2	2	2	2	2	3	3	2	2	1	2	2.1
CO-3	2	2	3	2	2	2	2	3	2	3	2.3
CO-4	2	3	2	2	3	2	3	2	1	3	2.3
CO-5	3	2	2	1	2	2	3	2	1	3	2.1
Mean Overall Score											2.2
Result											Medium



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