CENTRE FOR DISTANCE AND ONLINE EDUCATION

BHARATHIDASAN UNIVERSITY, TIRUCHIRAPPALLI - 620 024.

B.Sc. ZOOLOGY: CHOICE BASED CREDIT SYSTEM -

LEARNING OUTCOMES BASED CURRICULUM FRAMEWORK (CBCS - LOCF)

(Applicable to the candidates admitted from the academic year 2026-27 onwards)

Sem.	Part	Course	Title of the Course	Credit	Exam Hours	Marks		Total
						Int.	Ext.	
I	I	Language Course – I Tamil $ / Other Languages + #		3	3	25	75	100
	II	English Course - I		3	3	25	75	100
	III	Core Course – I (CC)	Invertebrata	5	3	25	75	100
		Core Practical – I (CP)	Invertebrata	4	3	40	60	100
		First Allied Course – I (AC)	Allied Botany I	4	3	25	75	100
		First Allied Practical (AP)	Allied Botany Practical	-	-	-	-	-
	IV	Value Education		2	3	25	75	100
	TOTAL			**21**	**-**	**-**	**-**	**600**
II	I	Language Course - II Tamil $ / Other Languages + #		3	3	25	75	100
	II	English Course - II		3	3	25	75	100
	III	Core Course – II (CC)	Chordata	5	3	25	75	100
		Core Practical – II (CP)	Chordata	4	3	40	60	100
		First Allied Course – II (AC)	Allied Botany II	4	3	40	60	100
		First Allied Practical – I (AP)	Allied Botany Practical	2	3	25	75	100
	IV	Environmental Studies		2	3	25	75	100
	TOTAL			**23**	**-**	**-**	**-**	**700**

List of Allied Courses

First Allied Course	**Second Allied Course**
Botany	Chemistry

SUMMARY OF CURRICULUM STRUCTURE OF UG PROGRAMMES

Sl. No.	**Part**	**Types of the Courses**	**No. of Courses**	**No. of Credits**	**Marks**
1.	I	Language Courses	4	12	400
2.	II	English Courses	4	12	400
3.	III	Core Courses	9	45	900
4.		Core Practical	6	24	600
5.		Allied Courses I & II	4	16	400
6.		Allied Practical	2	4	200
7.		Major Based Elective Courses	2	8	200
8.		Project	1	7	100
9.	IV	Non-Major Elective Courses	2	4	200
10.		Soft Skills Development	1	2	100
11.		Value Education	1	2	100
12.		Environmental Studies	1	2	100
13.	V	Gender Studies	1	2	100
	Total		**38**	**140**	**3800**

First Year **CORE COURSE I** **Semester I**

INVERTEBRATA

(Theory)

COURSE OBJECTIVES:

- To perceive the taxonomic relationship and evolution of species.
- To identify each phylum of invertebrates and discuss their key characters.
- To appraise the diversity of invertebrate species in a phylogenetic context.
- To understand how body organization solves biological problems related to physiological and environmental challenges.
- To develop an appreciation for the role of invertebrates in biological and ecological interactions and its conservation strategies.

UNIT – I PHYLUM – PROTOZOA AND PORIFERA:

Introduction to principles of taxonomy and outline classification of Kingdom Animalia.

General characters and classification of Phylum- Protozoa and Porifera (uptoclass) with examples.

Detailed study – Protozoa – Amoeba (*Amoeba proteus*)Porifera – Ascon Sponge (Leucosolenia)

General Topic: 1. Parasites of Protozoa
2. Canal system in Sponges

UNIT – II PHYLUM - COELENTERATA AND PLATYHELMINTHES:

General characters and classification of Phylum Coelenterata and Platyhelminthes (upto class) with examples.

Detailed study – Coelenterata - Aurelia (*Aurelia aurita*), Platyhelminthes – Tapeworm (*Taeniasolium*),

General Topic:
1. Corals and corals reefs and their importance
2. Parasitic adaptations of helminth parasites

UNIT – III PHYLUM - ASCHELMINTHES AND ANNELIDA:

General characters and classification of Phylum Aschelminthes and Annelida (upto class) with examples.

Detailed study – Ascaris (*Ascarislumbricoides*) -Earthworm (*Pheretimaposthuma*)

General Topic: 1. Vermiculture technology and its economic importance
2. Adaptive radiation in Annelids

UNIT – IV PHYLUM - ARTHROPODA AND MOLLUSCA:

General characters and classifications of Phylum Arthropoda and Mollusca (upto class) with examples.

Detailed study – Cockroach (*Periplanataamericana*) – Apple snail (*Pilaglobosa*)

General Topic: 1. Mouth parts of insects
2. Economic importance of Mollusca

UNIT – V PHYLUM - ECHINODERMATA AND MINOR PHYLA:

General characters and classification of Phylum Echinodermata (upto class) with examples and minor phyla (Mesozoa, Ctenophora, Nemertinea, Acanthocephala, Entoprocta, Rotifera, Gastrotricha and Kinorhyncha)

Detailed study – Starfish (*Asteriasrubens*), CrinoidsBrief about Branchionus

General Topic: 1. Larval forms of Echinodermata
2. Water vascular system in Echinodermata

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Recent research/discoveries in Zoology - Identification of new species – evolutionary significance between species - mitogenomics study – invertebrate model organisms -*Drosophila melanogaster* as an animal model in biomedical research -automatic invertebrate detection and identification methods -acoustic and vibration sensing - extinct species – protective measures - applications of biotechnology in conservation of invertebrate species.

REFERENCES:

1. Ayyar. E.M. (1966). A Manual of Zoology Part I, Invertebrata, S. ViswanathanPvt. Ltd., Chennai.
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5. Sandhu, G.S. (2005). Textbook of Invertebrate Zoology. India: Campus Books International.
6. Ruppert, E.E., Fox, R.S. and Barnes, R.D. (2004). Invertebrate Zoology: A Functional Evolutionary Approach. United Kingdom: Thomson-Brooks/Cole.
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8. Pechenik, J.A. (2014). Biology of the Invertebrates. India: McGraw-Hill Education, VII edition.

9. Shuster, S.M., Moore, W. and Brusca, R.C. (2016). Invertebrates. United States: Sinauer.
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11. https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/porifera
12. https://www.differencebetween.com/difference-between-coelenterates-and-vs-platyhelminthes/
13. https://www.researchgate.net/profile/Anuradha-Sharma-11/publication/311971514_Vermiculture_Technology_A_Novel_Approach_in_Organic_Farming/links/59fae02d458515d20c7d9706/Vermiculture-Technology-A-Novel-Approach-in-Organic-Farming.pdf?origin=publication_detail
14. https://www.biologydiscussion.com/invertebrate-zoology/phylum-mollusca/economic-importance-of-phylum-molluscs/33025
15. https://www.researchgate.net/profile/Huajian-Liu-3/publication/307529800_A_review_of_recent_sensing_technologies_to_detect_invertebrates_on_crops/links/5c0faab1299bf139c7509a61/A-review-of-recent-sensing-technologies-to-detect-invertebrates-on-crops.pdf
16. https://academic.oup.com/ilarjournal/article-pdf/52/2/126/6763915/ilar-52-126.pdf

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

- Understand the principles of taxonomy and classification of invertebrates.
- Acquire knowledge on the characteristic features of invertebrates.
- Identify the any species at basic level of morphology.
- Aware of the multiparasitism of helminthes and their dynamics in a changing world.
- Understand the economic and ecological importance of Porifera, Coelenterata and Mollusca.
- Realize the significance of larval forms of Echinoderms in understanding as model organisms.

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First Year **CORE PRACTICAL I** **Semester I**

INVERTEBRATA

(Practical)

COURSE OBJECTIVES:

- To introduce the structure, functions and behavior of specified invertebrate organisms by the observation of both living and preserved specimens.
- To reinforce the student's basic laboratory skills including microscopy, virtual dissection and careful observation.
- To enrich knowledge about the lower invertebrates - used as the model organisms in the scientific research.
- To find the ability to recognize the major species and subspecies of invertebrates.
- To emphasize the investigating methods of evolution of species as well the current state of scientific knowledge.

Major Dissections (Virtual dissection)

Earthworm – Digestive and Nervous system
Cockroach – Digestive and Nervous system
Prawn – Nervous system

Minor Dissection

Earthworm – Mounting of body setae and penial setae
Cockroach – Mounting of mouth parts
Honeybee – Mounting of mouth parts
Prawn – Mounting of Appendages

Invertebrata - List of spotters

Protozoa: *Amoeba*, *Paramecium, Plasmodium vivax* and*Euglena*.
Porifera: Sycon sponge, Sponge gemmules and spicules.
Coelenterata: Obeliacolony, Physalia, Hydra, Aurelia, Sea anemone and Corals.
Platyhelminthes: Planaria, Liver fluke. Miracidium larva, Redia larva, Cercaria larva, Tapeworm and Scolex of Tape worm.
Aschelminthes: Ascaris (male and female), Filarial worm, Trichuris and Pinworm.
Annelida: Nereis,Parapodium of Nereis, Earthworm, Leech, Trochophore larva.
Arthropoda: Honeybee: Queen bee, Worker bee, Drone bee - Housefly, Wasp,Rhinosaur beetle, Mosquito -Peripatus, Limulus, Scorpion, Spider, Daphnia, Cyclops, Nauplius, Zoea, Mysis, Sacculina, *Penaeusmonodon*andSilkworm.
Mollusca: Sepia, Nautilus, Pila, Lamellidens, Octopus and Glochidium larva.
Echinodermata: Starfish, Sea urchin, Sea cucumber, Bipinnaria larva, Auricularia larva andDoliolaria larva.
Minor phyla: Rotifera

REFERENCES:

1. Wallis, C. J. (2013). Practical Biology: For Advanced Level, Medical and Intermediate Students. Netherlands: Elsevier Science.
2. Ayyar. E.M. (1966). A Manual of Zoology Part I, Invertebrata, S. ViswanathanPvt. Ltd., Chennai.

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9. Verma. P.S (2010). A Manual of Practical Zoology: Invertebrates. S Chand Publishers.
10. Osborn. H.L (2015), Invertebrate Dissections. Sagwan press.
11. Sandhu G. S, (2000), Advanced Practical Invertebrate Zoology. Campus Books International Publisher.
12. Cockroach dissection- www.ento.vt.edu
13. Anatomy of earthworm: The dissection works (CD); Source –
14. www.scienclass.com; www.neosci.com

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

- Gain first-hand knowledge to identify and group non-chordate (species of fresh and preserved) along with larval forms.
- Analyze the relationship between organisms and their environment.
- Recognize the diversity from Protozoa to Echinodermata using their morphological structures.
- Virtually visualize and understand the anatomy and functional features of invertebrates.
- Fortify the ecological and economic importance of invertebrate diversity in their habitat.

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First Year **CORE COURSE II** **Semester II**

CHORDATA

(Theory)

COURSE OBJECTIVES:

- To enlighten the students about the diverse forms of vertebrate organisms under five major classes.
- To help the students to distinguish various vertebrate species with key characters.
- To understand the classification of chordate animals up to order with suitable examples.
- To acquire the knowledge on adaptations of vertebrates and their evolution.
- To study the detailed knowledge of protochordates like Amphioxus and Chordates like Shark, Frog, Calotes, Pigeon and Rabbit.

UNIT – I Chordata:

General characters of Chordata and its outline classification (upto order)- Origin of chordates.

Prochordata: General characters of Prochordata and its classification (upto order) - affinities with invertebrates and chordates.

Detailed Study on Cephalochordata - Amphioxus (*Branchiostomalanceolatum*).

General Topic: Retrogressive metamorphosis in Ascidian.

UNIT – II Vertebrata:

General characters of vertebrata and its classification uptoclass with examples.

Class Pisces: General characters and classification upto order with examples.

Detailed study*Scoliodonsorrakowah* (Shark).

General Topics1. Migration of fishes

Class Amphibia Generalcharacters and classification upto order with examples.

Detailed study*Ranahexatactyla* [Frog].

General Topic Parental care in Amphibia.

UNIT – III Class Reptilia:

General characters and classification (upto order) with examples.

Detailed study*Calotesversicolor* (Garden lizard).

General Topics 1. Identification and general characters of poisonous and non-poisonous snakes of South India.

UNIT – IV Class Aves:

General characters and classification upto order with examples.

Detailed Study *Columba livia* [Pigeon].

General Topics 1. Flightless birds - distribution and adaptations.
2. Migration of birds.

UNIT – V Class Mammalia:

General characters and classification upto order with examples.

Detailed Study *Oryctolaguscuniculus*(Rabbit).

General Topics 1. Prototheria, Metatheria and Eutheria (Salient features with examples).
2. Dentition in Mammals.

UNIT – VI CURRENT CONTOURS (For continuous internal assessment only):

Zoological survey of India - Role of ZSI - Species conservation status and management - first aid advancement for the venomous snake bite - development of snake venom as antivenoms to treat snakebite envenomation and yielding new drugs.Metabolic fossils from the origin of life.

REFERENCES:

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2. Satoh, N. (2016). Chordate Origins and Evolution: The Molecular Evolutionary Road to Vertebrates. Netherlands: Elsevier Science.
3. Diogo, R., Siomava, N., Ziermann, J. M., Abdala, V. and Molnar, J. (2018). Muscles of Chordates: Development, Homologies, and Evolution. United States: CRC Press.
4. Wise, J., Roush, R. and Fowler, S. (2018). Concepts of Biology. Hong Kong: Samurai Media Limited.
5. Salazar, A. (2018). Advanced Chordate Zoology. United Kingdom: EDTECH.
6. Beer, G. R. D. (2017). Vertebrate Zoology: An Introduction to the Comparative Anatomy, Embryology, and Evolution of Chordate Animals. United States: FB&C Limited.
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9. Lydekker, R. (2016). Reptiles, Amphibia, Fishes and Lower Chordata. United States: FB&C Limited.
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15. https://www.notesonzoology.com/essay/flightless-birds/essay-on-flightless-birds-vertebrates-chordata-zoology/8284
16. http://faunaofindia.nic.in/PDFVolumes/hpg/022/index.pdf
17. https://www.cdc.gov/niosh/topics/snakes/symptoms.html
18. https://www.sciencedaily.com/releases/2020/03/200312101054.htm

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

- Understand about the vertebrates up to order level with suitable examples.
- Gain knowledge about the adaptation and migration of important tetrapods.
- Understand about the vertebrates in the food web and its diversity.
- Relate about the adaptations of flightless birds and migration of birds.
- Perceive information on the evolutionary relationships of tetrapods.

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First Year **CORE PRACTICAL II** **Semester II**

CHORDATA

(Practical)

COURSE OBJECTIVES:

- To impart training on the identification the vertebrate species by observing key characters.
- To make them understand the various systems of vertebrate animals.
- To demonstrate the technique of *in silico*dissection of vertebrate animals.
- To highlight on studying the importance of chordate animals as spotters.
- To emphasize the role and evolution of exo- and endo-skeleton in vertebrates.

VIRTUAL DISSECTIONS:

Fish / Frog / Rat – Digestive, arterial, venous and reproductive systems.

Mountings: Placoid / Cycloid / Ctenoid scales of fishes- Brain of fish.

Spotters:

1.**Protochordata:** Amphioxus, Balanoglossus and Ascidia.

2.**Pisces:** Shark, Ray, Echeneis, Hippocampus, Exocoetus, Catla, Rohu, Mrigal and Tilapia.

3.**Amphibia:** Frog, Tadpole larva, Axolotl larva, Hyla, Salamander and Ichthyophis.

4. **Reptilia:** Calotes, Hydrophis, Naja, Viper, Draco, Chamaeleon, PhrynosomaandSphenodon.

5.**Aves:** Pigeon, Parrot, Kingfisher, Owl,Eagle, Vulture and all types of feathers.

6.**Mammalia:** Bat, Loris, Rabbit, Rat, Echidna, Duck-billed Platypus andKangaroo.

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

8.**Osteology:** Pigeon – Synsacrum, Rabbit – Pectoral and Pelvic girdles, Forelimb and Hind limb bones.

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1. Ayyar. E.M. andAnantha Krishnan T.N. (1995). Manual of Zoology Vol.II, Part I & II. (Chordata), S. ViswanathanPvt. Ltd., Chennai.
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1. Hyman, L. H. (2018). A Laboratory Manual for Comparative Vertebrate Anatomy. United States: Creative Media Partners, LLC.
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10. Anatomy of Frog: Pro Dissector (CD)- www.prodissector.com
11. Physiology of Frog: Physio Ex 4.0 (CD)- www.physioex.com
12. Anatomy of shark: Shark dissection and anatomy (video)- www.neosci.com
13. Mammalian Physiology– www.biopac.com

COURSE OUTCOMES:

Upon successful completion of this course the students would be able to:

- Understand the classification of vertebrates.
- Identify and recognize the organisms by key characters.
- Integrate the ecological adaptation of the studied species.
- Relate the adaptive behaviour of vertebrates.
- Virtually clarify the functional structure in tetrapods.

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