SEMESTER I			
Core I	**Invertebrata**		
Course Code: 21UZOC11	**Hrs/Week : 6**	**Hrs/Sem : 90**	**Credits : 6**

Objectives:

- To impart knowledge on invertebrate animals.
- To elaborate the organization, functional morphology, anatomy and taxonomic position of representative invertebrates.

Course Outcomes:

CO. No	Upon completion of this course, students will be able to	PSO addressed	CL
CO- 1	know the distinctive features of taxonomic classes within the phyla covered	1	Kn
CO -2	recognize the common members of each phylum and of selected classes	1	Kn
CO – 3	analyze the important concepts in invertebrate body structure and organization, including body symmetry, body cavity, gut formation, segmentation	2	An
CO – 4	examine the important biological processes in invertebrates, including locomotion, body support, reproduction, development, feeding, digestion, excretion, osmoregulation etc.	2	An
CO – 5	impart information on the ecological and economic importance of invertebrates.	2	Un
CO – 6	aware of the importance and diversity of invertebrates	2	Un
CO – 7	develop basic laboratory skills including microscopy, dissection and careful observation.	8	Cr
CO – 8	use knowledge in invertebrates as basic course for further subjects on higher level study.	8	Ap

Unit I Protozoa and Porifera

Salient features of invertebrates.
Protozoa- General characters and outline classification up to classes with Indian or local examples.
Type study: *Paramecium caudatum*: Morphology, nutrition, osmoregulation, excretion. Reproduction (Binary fission and conjugation).
General topic: Life cycle, pathogenicity and control measures of *Entamoeba histolytica.*
Porifera - General characters and outline classification up to classes with Indian or local examples.
Type study: *Leucosolenia*- External morphology – body wall – Reproduction.
General topics – Canal system in sponges

Unit II Coelenterata and Platyhelminthes

Coelenterata **-** General characters and outline classification up to classes with Indian or local examples.
Type study: *Obelia* – External characters and reproduction
General topic: Polymorphism in coelenterates.
Platyhelminthes **-** General characters and outline classification up to classes with Indian or local examples.
Type study: *Taenia solium*- Morphology and reproduction
General topic: Parasitic adaptations in Platyhelminthes

Unit III Aschelminthes and Annelida

Aschelminthes - General characters and classification up to classes with Indian or local examples.
Type study: *Ascaris* – External morphology and life cycle
General topic: Nematode parasites – *Wuchereria bancrofti*, *Ancylostoma duodinale*
Annelida- General characters and classification up to classes with Indian or local examples.
Type study: Earthworm – Morphology and reproduction
General topic: Biological significance of earthworm

Unit IV Arthropoda

General characters and classification up to classes with Indian or local examples.
Type of study: *Penaeus* – external morphology – reproduction and life history.
General topic: Beneficial insects (Honey bee).

Unit V Mollusca and Echinodermata

Mollusca -General characters and classification up to classes with Indian or local examples.

Type of study: *Pila globosa*– morphology, reproduction and nervous system
General topic: Pearl formation in bivalves
Echinodermata - General characters and classification up to classes with Indian or local examples.
Type study: *Asterias* – External morphology – water vascular system
General topic: Larval forms of echinoderms and their phylogenetic significance.

Text Books:

1. Kotpal R.L. *Modern Text Book of Zoology: Invertebrates.* Meerut: Rastogi Publications 2009.
2. EkambaranathaIyer M. and T.N. Ananthakrishnan. *A Manual of Zoology*. Vol. 1. India: S. Viswanathan Pvt Ltd 1977.

Books for Reference

1. Nair N.C. Leelavathi. S and N.A. Soundara Pandian. *Text book of Invertebrates*. Nagercoil: Saras Publication 2006.
2. Murugan. T and N. Arumugam. *Invertebrates*. Nagercoil: Saras Publication, 2006.
3. Jordan. E.L and P.S. Verma. *Invertebrate Zoology*. New Delhi: S. Chand and Company Ltd, 2007.
2. Mary. S. Gardiner. *The Biologyof Invertebrates*. New York : Mc Graw-Hill Book Company 1972.
5. Robert. D Barnes. *Invertebrate Zoology*. Japan Holt Saunders, International Editions 1982.

Websites for Reference

http://www.enchantedlearning.com/subjects/invertebrates/index.shtml
http://animalkingdom.net/category/invertebrates/
http://animaldiversity.org/

PRACTICALS

Course Code: 21UZOCR1

Hrs / Week – 2 **Credit: 1**

I. Dissections

Cockroach: Digestive system and Nervous system

II. Mountings

Cockroach: Mouthparts

Earthworm: Body setae and pineal setae

Prawn: Appendages

III. Spotters

Studies of the animals with classification upto order with ecological importance of the following animals :

Paramecium, Entamoeba histolytica, Leucosolenia, Sycon, Obelia colony, *Physalia, Taenia solium, Fasciola, Ascaris lumbricoides,* (male & female), *Wuchereria bancrofti, Anchylostoma*, Earthworm, Nereis, *Penaeus*, *Oryctus rhinoceros*, *Pila*, Sepia, *Asterias*, Sea cucumber.

Observation of the following permanent slides

Taenia solium- scolex, larval forms of *Fasciola hepatica* (Redia, cercaria), larval forms of *Penaeus* (nauplius, zoea, protozoea, mysis), larval forms of Echinoderms (bipinnaria, auricularia).

IV. Collection and submission of any five invertebrate specimens

Books for Reference

1. Nair N.C. Arumugam N. Leelavathi. S. Soundara Pandian N. and T. Murugan. *Practical Zoology Invertebrata Vol. 1*. Nagercoil: Saras Publication 2013.
2. Richard A. Boolootain and Donald Heyneman. *An Illustrated Laboratory Text in Zoology.* U.S.A: Holt, Rinehart and Winston 1977.

SEMESTER II			
Core II	**Chordata**		
Course Code: 21UZOC21	**Hrs/ Week : 6**	**Hrs/ Sem : 90**	**Credits : 6**

Objective:

- To impart information on the morphology and comparative anatomy of chordates.
- To provide knowledge on the organization and diversity of chordates.

Course Outcomes:

CO. No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	explain the fundamental organization of chordates.	1	Un
CO-2	classify the phylum Chordata	1	Un
CO-3	appreciate the basic concepts of chordate diversity	1	Un
CO-4	analyse the characters of different classes of the chordates	2	An
CO-5	identify the major groups within the phylum Chordata	1	Un
CO-6	reason out the inclusion of different representative animals in particular class	8	An
CO-7	recognize the different structural organizations from evolutionary point of view	8	Ev
CO-8	compare the anatomy of different functional systems in chordates.	2	Ev

Unit I Chordata- Prochordata

Chordata introduction - General characters of chordates and classification up to classes with examples. General characters of prochordates, Type study: *Amphioxus*- external morphology - digestive and excretory system. External morphology and biological significance of the following – *Ascidian, Balanoglossus*. General characters of vertebrates, Agnatha - General characters - Type study: Petromyzon - External morphology, breeding and migration.

Unit II Pisces and Amphibia

Pisces: General characters and classification up to sub-classes with examples. Type study: *Scoliodon sorrakowah* - Fins and scales, digestive system, respiratory system, circulatory system, sense organs, reproductive system - General topic: Migration of fishes

Amphibia: General characteristics and classification up to orders with examples. Type study: *Rana hexadactyla* – External morphology, skin, digestive, respiratory, circulatory and nervous system, reproductive system, General topic: Parental care in Amphibia

Unit III Reptilia and Aves

Reptilia: General characters and classification up to order. Type study: *Calotes* - External morphology, digestive system and circulatory system only. General Topic: Identification of poisonous and non poisonous snakes.

Aves: General characteristics and classification up to subclasses. Type study: *Columba livia* - external morphology, flight muscle, digestive system, respiratory system, urinogenital system. General topic: Migration in birds and flight adaptations of birds.

Unit IV Mammalia

Mammalia: General characteristics and classification up to subclasses with examples. Type study: *Oryctolagus cuniculus* – dentition, digestive system, respiratory system,

circulatory system, urinogenital system. General topics: Egg laying mammals and adaptations of aquatic mammals.

Unit V Comparative Anatomy

Comparative anatomy: Respiratory system- skin, gills, lungs, air sacs, air bladder and accessory respiratory organs in fishes. Circulatory system – Evolution of heart and aortic arches, venous system and lymphatic system.

Text Books

1. Kotpal R.L. *Modern Text Book of Zoology - Vertebrates.* Meerut: Rastogi Publications. 2019.
2. Jordan E.L and Verma P.S. *Chordate Zoology.* New Delhi: S. Chand & Co Ltd. 2006.
3. Thangamani. A, Prasanna Kumar. S. Narayanan. L.M, N. Arumugam. *Chordata.* Nagercoil: Saras Publication. 2006.

Books for Reference

1. Ekambaranatha Iyer M., Anantha Krishnan T.N. *Manual of Zoology Vol II* Chennai: S. Viswanathan Pvt Ltd. 1995.
2. Jordan E.L and Verma P.S. *Chordate Zoology.* New Delhi: S. Chand & Co. Ltd. 2006.
3. Newman. H.H. *The Phylum Chordata.* Motikala: Satish Book Enterprise.1987.
4. Prasad S.N. *Vertebrate Zoology.* Allahabad: Kitab Mahal Private Ltd. 2005.

Practicals

Course Code: 21UZOCR2

Hrs / Week – 2 **Credit-1**

1. Dissections and mountings:

Fish - Digestive system

Frog - Arterial system (virtual dissection)

Frog - Venous system (virtual dissection)

Scoliodon - Placoid scales

Teleost fish - Ctenoid and cycloid scales

Frog - Brain (virtual dissection)

Feathers - Observation of barbs and barbules

2. Museum specimens: slides/ models/ charts.

Prochordata - *Amphioxus, Balanoglossus,* Ascidian

Agnatha - *Petromyzon*

Pisces - *Scoliodon*, Eel, *Narcine*, *Hippocampus*,

Amphibia - *Rhacophorus,* Salamander, *Ichthyophis*

Reptilia - Draco, Typhlops, *Naja naja*, Krait, Dryophis, Chameleon

Aves –*Columba livia*, Quill feather, Kingfisher, *Archaeopteryx*

Mammalia - Bat, *Oryctolagus cuniculus*, Platypus

3. Collection of any five locally available fishes.

Books for Reference

1. Verma, P.S. *A Manual of Practical Zoology – Chordates.* New Delhi: S. Chand & Company Ltd. 2008.
2. Jeyasurya, L.M. Narayanan, Thangamani and Prasanna Kumar. *Practical Zoology - Vol-2 Chordata.* Nagercoil: Saras Publication. 2013.
3. Richard A. Boolootian/ Donald Heyneman. *An illustrated laboratory text in Zoology.* U.S.A: Holt, Rinehart and Winston. 1997.

SEMESTER I			
PROFESSIONAL ENGLISH FOR ZOOLOGY – I			
Course Code:21UZOPE1	**Hrs/ Week : 2**	**Hrs/ Sem : 30**	**Credits : 2**

Objectives:

- To develop language and communication skills of the students by offering adequate practice in professional contexts.
- To enhance competence in reading, writing, listening and speaking.

Course Outcomes:

CO. No.	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	recognize their own ability to improve their own competence in using the language	1,5	Un, Ap
CO-2	use language for speaking with confidence in an intelligible and acceptable manner	5	Ap
CO-3	understand the importance of reading for life	4,6	Un
CO-4	read independently unfamiliar texts with comprehension	4,6	Un
CO-5	understand the importance of writing and apply in academic life	2, 8	Un, Ap
CO-6	write simple sentences without committing error of spelling or grammar	8	An, Ap
CO-7	listen to lectures and interpret critically	3,8	Un, Ap
CO- 8	become proficient in communication and become confident to present themselves.	5,7	Un, Ap

UNIT 1: COMMUNICATION

Listening: Listening to instructions and following– Instructions to use microscope.

Speaking: Pair walk- dialogue between a patient and nutritionist (formal conversation)

Reading: Comprehension passage - Professor Har Gobind Khorana.

Writing: Developing stories from pictures - Life Cycle / Metamorphosis of a Butterfly

Vocabulary: Unit specific - Incorporated into the LSRW tasks

UNIT 2: DESCRIPTION

Listening: Listening to descriptive video clip and gist writing - How to grow Hibiscus cutting in water.

Speaking: Role play - Conversation between a Zoology teacher and a student

Reading: Skimming/Scanning - Ultra sound scanning machine

Writing: Compare and contrast expressions – plant and animal cell

Vocabulary: Unit specific - Incorporated into the LSRW tasks

UNIT 3: NEGOTIATION STRATEGIES

Listening: Listening to interviews of specialist - Mario Molina (Ozone scientist) - https://www.youtube.com/watch?v=iGf4TGHO_Jc

Speaking: Brain storming - Mind Mapping(Microorganisms)

Reading: Passage reading - The basic macronutrients and micronutrients

Writing: Essay Writing - Essay on Conservation of Nature

Vocabulary: Unit specific - Incorporated into the LSRW tasks

UNIT 4: PRESENTATION SKILLS

Listening: Listening to lecture and syllabification - Iron deficiency (https://www.youtube.com/watch?v=Q3b-Vsh5NEo)

Speaking: Preparation for a short speech - Chocolate is a psycho addictive food

Reading: Reading comprehension passage - Louis Pasteur-Synonyms

Writing: Recommendations (Using laptop or PC)

Vocabulary: Unit specific - Incorporated into the LSRW tasks

UNIT 5: CRITICAL THINKING SKILLS

Listening: Listening and comprehending – Introduction to enzymes

Speaking: Making a power point presentation - Do's and Dont's.

Reading : Note making - Water cycle

Writing: Problem and Solution essay - Non-biodegradable waste

Vocabulary: Unit specific - Incorporated into the LSRW tasks

Books for Reference

English for Life Sciences, Tamil Nadu State Council for Higher Education (TANSCHE)

SEMESTER II			
PROFESSIONAL ENGLISH FOR ZOOLOGY – II			
Course Code: 21UZOPE2	**Hrs/ Week : 2**	**Hrs/ Sem : 30**	**Credits : 2**

Objectives:

- To prepare the students of life sciences for exuberant science communication.
- To develop language and communication skills of the students by offering adequate practice in professional contexts.

Course Outcomes:

CO. No	Upon completion of this course, students will be able to	PSO addressed	CL
CO-1	recognise their own ability to improve their own competence in using the language	1,5	Un, Ap
CO-2	use language for speaking with confidence in an intelligible and acceptable manner	5	Ap
CO-3	understand the importance of reading for life	4,6	Un
CO-4	read independently unfamiliar texts with comprehension	4,6	Un
CO-5	understand the importance of writing and apply in academic life	2, 8	Un, Ap
CO-6	write simple sentences without committing error of spelling or grammar	8	An, Ap
CO-7	listen to lectures and interpret critically	3,8	Un, Ap
CO-8	become proficient in communication and become confident to present themselves.	5,7	Un, Ap

UNIT 1: COMMUNICATION

Listening: Listening to an audio text - Importance of water for the lives on earth.

Speaking: Group conversations - Informal discussion in a small group making plans for a get-together.

Reading: Passage reading - Vertebrates and invertebrates

Writing: Narration of story from pictures – Story of an elephant

Vocabulary: Unit specific - Incorporated into the LSRW tasks

UNIT 2: DESCRIPTION

Listening: Illustration of a descriptive process - Induced fertilization in fish

Speaking: Role play - Interview with a famous scientist

Reading: Descriptive reading - What Happened to the Reptiles? (Zai Whitaker)

Writing : Single sentence and extended definitions

Vocabulary: Unit specific - Incorporated into the LSRW tasks

UNIT 3: NEGOTIATION STRATEGIES

Listening : Listening to a passage - The Crescograph ("J.C.Bose" by Aldous Huxley)

Speaking: Small group discussion - Genetically modified crops.

Reading: Passage reading- Fashion Trends.

Writing: Developing essay from the passage -Healthy diet.

Vocabulary: Unit specific-Incorporated into the LSRW tasks.

UNIT 4: PRESENTATION SKILLS

Listening : Listening to lectures and notes taking-
(https://www.youtube.com/watch?v=Dh9ptiJj7TE)

Speaking: Organized speech – Frustrations of colour-blind people. (informative)

Reading: Comprehensive passage - Digestive System and answering questions.

Writing: Descriptive writing – Interpretation - Animals for ever (Gerald Durrell's)

Vocabulary: Unit specific - Incorporated into the LSRW tasks.

UNIT 5: CRITICAL THINKING SKILLS

Listening: Listening for information - Introduction to enzymes

Speaking: Preparation of Power Point presentation – Small group discussion on errors in power point presentation (History of Zoology)

Reading : Note making – Professional Competence and Professional Ethics

Writing: Summary writing - Human immune system.

Vocabulary: Unit specific-Incorporated into the LSRW tasks.

Books for Reference:

English for Life Sciences, Tamil Nadu State Council for Higher Education (TANSCHE)