

GOVERNMENT COLLEGE FOR WOMEN (AUTONOMOUS) KUMBAKONAM
(Common course structure – B.Sc. – 2023 - 2024)

Department :Zoology

Programme Code:

SEMESTER – I

Part	Course Type	Course Code	Title of the Course	Hrs/ Week	Credits	Exam Hrs	Marks		
							CIA	ESE	Total
I	LC – I	U231T1	தமிழியல் வளஆதாரங்கள்	6	3	3	25	75	100
II	ELC - I	U231E1	General English - I	6	3	3	25	75	100
III	CC – I	U23ZC101	Invertebrata Theory	5	5	3	25	75	100
III	CC – II	U23ZC102P	Lab course in Invertebrata	3	2	3	40	60	100
III	EC – I	U23ZGE1	Biology of Invertebrates and Chordates	4	4	3	25	75	100
III	EC – II	U23ZGE2P	Lab course in Biology of Invertebrates and Chordates	2	1	3	40	60	100
IV	VE	U231VE	Value education	2	2	3	25	75	100
IV	FC	U23Z1FC	Foundation Course Introductory Zoology	2	2	3	25	75	100
			Total	30	22				800

SEMESTER – II

Part	Course Type	Course Code	Title of the Course	Hrs/ Week	Credits	Exam Hrs	Marks		
							CIA	ESE	Total
I	LC – II	U232T2	தமிழ் மொழிஅமைப்பு	6	3	3	25	75	100
II	ELC – II	U232E2	General English - II	6	3	3	25	75	100
III	CC – III	U23ZC203	Chordata Theory	5	5	3	25	75	100
III	CC - IV	U23ZC204P	Lab course in Chordata	3	2	3	40	60	100
III	EC - III	U23ZGE3	General Principles of Zoology	4	4	3	25	75	100
III	EC - IV	U23ZGE4P	Lab course in General Principles of Zoology	2	1	3	40	60	100
IV	SEC -I	U23Z2SE1	Basic course in ornithology	2	2	3	25	75	100
IV	EVS	U232ES	Environmental Studies	2	2	3	25	75	100
			Total	30	22				800

INVERTEBRATA Sub Code: U23ZC101

Learning Objectives

CO1 -To understand the basic concepts of lower animals and observe the structure and functions.

CO2 - To illustrate and examine the systemic and functional morphology of various group of invertebrates.

CO3 - To differentiate and classify the various groups of animal modes of life and to estimate the biodiversity.

CO4 - To compare and distinguish the general and specific characteristics of reproduction in lower animals.

CO5 - To infer and integrate the parasitic and economic importance of invertebrate animals

UNIT I

Phylum Protozoa:General characters and classification of Phylum Protozoa up to classes.

Type study –*Paramecium* & *Plasmodium*

General Topics:

1. Nutrition in protozoa
2. Locomotion in protozoa
3. Parasitic protozoans (*Entamoeba*, *Trypanosoma*, & *Leishmania*)

UNIT II

Phylum Porifera and Coelenterata:Cnidaria General characters and classification up to Classes.

Type study - *Sycon* and *Obelia*

General Topics:

1. Canal system in sponges
2. Skeleton in sponges.
3. Polymorphism in Hydrozoa.
4. Economic importance of corals and coral reefs.

UNIT III

Phylum Platyhelminthes and Nematelminthes: General characters and classification of up to classes.

Type study – *Fasciola hepatica* and *Ascaris*

General Topics:

1. Parasitic adaptations, Host-parasitic interactions of Helminth parasites.
2. Nematode Parasites and diseases –*Wuchereriabancrofti*, *Enterobiusvermicularis*, *Ancylostomeduodenale*.

UNIT IV

Phylum Annelida and Arthropoda: General characters and classification up to Classes.

Type study: *Nereis* and *Penaeusindicus*.

General Topics:

1. Metamerism
2. Nephridium and coelomoducts
3. Affinities of *Peripatus*
4. Larval forms in Crustacea.

UNIT V

Mollusca and Echinodermata: General characters and classification up to Classes.

Type study: *Pilaglobosa* and *Asterias*.

General Topics:

1. Foot and torsion in Mollusca,
2. Economic importance of Molluscs
3. Water vascular system in Echinodermata
4. Larval forms of Echinoderms.

Course Outcomes

CO1 - Understand the basic concepts of invertebrate animals and recall its structure and functions.

CO2 - Illustrate and examine the systemic and functional morphology of various groups of invertebrata.

CO3 - Differentiate and classify the animal's mode of life in various taxa and estimate the biodiversity.

CO4 - Explain, and relate the origin, structural organization and evolutionary aspects of invertebrates.

CO5 - Analyze, compare and distinguish the developmental stages and describe the important biological process.

Text Books

(Latest Editions)

1. EkambaranathaIyer, 2000. A Manual of Zoology, 10th edition, Viswanathan, S., Printers & Publishers Pvt Ltd
2. Jordan, E.L. and Verma P.S, 1995. Invertebrate Zoology, 12th edn. S. Chand& Co.
3. EkambaranathaAyyar, and T. N. Ananthakrishnan, 2000. A Manual of Zoology. Vol 1 (Invertebrata). Part II – Viswanathan Pvt. Ltd, 842pp
4. Kotpal R.L. 2019. Modern Text Book of Zoology, Invertebrates 9th Ed., Rastogi Publications, Gangotri, Shivaji Road, Meerut, 1004 pp.

References Books

(Latest editions, and the style as given below must be strictly adhered to)

1. Ruppert and Barnes, R.D. (2006). Invertebrate Zoology, VIII Edition. Holt Saunders International Edition.
2. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). The Invertebrates: A New Synthesis, III Edition, Blackwell Science
3. Barrington, E.J.W. (1979). Invertebrate Structure and Functions. II Edition, E.L.B.S. and Nelson

4. Hyman L.H, 1955. The invertebrates - Vol. I to Vol. VII – McGraw Hill Book Co.
5. Parker, J. and Haswell , 1978. A text book of Zoology Vol. I - Williams and Williams.

Web Resources

1. <https://www.nationalgeographic.com/animals/invertebrates/>
2. <https://bit.ly/3kABzKa>
3. <https://www.nio.org/>
4. <https://greatbarrierreef.org/>

Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	S							
CO 2	M	S						
CO 3				S		S		
CO 4				S	S	M		
CO 5			S					S

S-Strong(3) M-Medium (2) L-Low (1) B N

INVERTEBRATA PRACTICALS SUB CODE: U23ZC102P

Learning Objectives

CO1 - To identify the different groups of invertebrate animals by observing their external characteristics.

CO2 - To understand the organs, organ system and their functions in lower animals.

CO3 - To get knowledge about the different modes of life and their adaptation based on the environment.

CO4 - Able to dissect and display the internal organs and mount the mouthparts and scales of invertebrates.

UNIT I

Major Dissection : Cockroach: Circulatory system, Nervous system, Reproductive system. Earthworm: Nervous System, Reproductive system. *Pilaglobosa*: Nervous system. Prawn: Nervous system (including Appendages).

UNIT II

Minor Dissection: Cockroach: Digestive system. Earthworm: Viscera, Lateral hearts.

Pilaglobosa: Digestive system (Including radula). Freshwater Mussel: Digestive system.

UNIT III

Mounting: Earthworm: Body setae; Pineal setae. *Pilaglobosa*: Radula. Freshwater muscle: Pedal ganglia.

UNIT IV

Mounting : Cockroach: Salivary apparatus, Mouth parts - Honey Bee, House fly and Mosquito mouth parts.

UNIT V

Spotters :(i). Protozoa: Amoeba, Paramecium, Paramecium Binary fission and Conjugation, Vorticella, Entamoeba histolytica, Plasmodium vivax **(ii). Porifera:** Sycon, Spongilla, Euspongia, Sycon - T.S & L.S, Spicules, Gemmule **(iii). Coelenterata:** Obelia – Colony

& Medusa, Aurelia, Physalia, Velella, Corallium, Gorgonia, Pennatulid **(iv). Platyhelminthes:** Planaria, Fasciola hepatica, Fasciola larval forms – Miracidium, Redia, Cercaria, Echinococcus granulosus, Taeniasolium, Schistosoma haematobium **(v). Nematelminthes:** Ascaris (Male & Female), Dracunculus, Ancylostoma, Wuchereria **(vi). Annelida:** Nereis, Aphrodite, Chaetopterus, Hirudinaria, Trochophore larva **(vii). Arthropoda:** Cancer, Palaemon, Scorpion, Scolopendra, Sacculina, Limulus, Peripatus, Larvae - Nauplius, Mysis, Zoea, Mouth parts of male & female Anopheles and Culex, Mouthparts of Housefly and Butterfly. **(viii). Mollusca:** Chiton, Pila, Unio, Pteredo, Murex, Sepia, Loligo, Octopus, Nautilus, Glochidium larva **(ix). Echinodermata:** Asterias, Ophiothrix, Echinus, Clypeaster, Cucumaria, Antedon, Bipinnaria larva

Insect pollinators: Bees and pollinators

Insects associated with human diseases: Mosquitoes, housefly, bed bug, human head louse. **Insects associated with household materials:** Ants, Termites, Silver fish.

Insect pests: Pest of rice, Pest of Sugarcane, Pest of coconut, Pest of cotton, Pests of vegetables, Pests of fruits, Pest of stored products.

Course Outcomes

On completion of this course, students will;

CO1 - Identify and label the external features of different groups of invertebrate animals.

CO2 - Illustrate and examine the circulatory system, nervous system and reproductive system of invertebrate animals.

CO3 - Differentiate and compare the structure, function and mode of life of various groups of animals.

CO4 - To compare and distinguish the dissected internal organs of lower animals.

CO5 - Prepare and develop the mounting procedure of economically important invertebrates.

Text Books (Latest Editions)

1. EkambaranathaIyyar and T. N. Ananthkrishnan, 1995 A manual of Zoology Vol.I (Part 1, 2) S. Viswanathan, Chennai
2. Ganguly, Sinha and A dhikari , 2 0 1 1 . Biology of Animals: Volume I, New Central Book Agency; 3rd revised edition. 1008 pp.
3. Sinha, Chatterjee and Chattopadhyay, 2 0 1 4. Advanced Practical Zoology, Books & Allied Ltd; 3rd Revised edition, 1 0 7 0 pp.
4. Lal ,S. S, 2016 . Practical Zoology Invertebrate, Rastogi Publications.
5. Verma, P. S. 2010. A Manual of Practical Zoology: Invertebrates, S Chand, 4 97pp.

References Books (Latest editions, and the style as given below must be strictly adhered to)

1. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). *The Invertebrates: A New Synthesis*, III Edition, Blackwell Science.
2. Barnes, R.D. (1982). *Invertebrate Zoology*, V Edition. Holt Saunders International Edition.
3. Barrington, E.J.W. (1979). *Invertebrate Structure and Functions*. II Edition, E.L.B.S. and Nelson
4. Boradale, L.A. and Potts, E.A. (1961). *Invertebrates: A*

Manual for the use of Students. Asia Publishing Home.

5. Lal, S.S. 2005. A text Book of Practical Zoology: Invertebrate, Rastogi, Meerut

Web Resources

1. <https://nbb.gov.in/>
2. <http://www.agshoney.com/training.htm>
3. <https://icar.org.in/>
4. <http://www.csrtimys.res.in/>
5. <http://csb.gov.in/>
6. <https://iinrg.icar.gov.in/>

ALLIED ZOOLOGY I - LAB COURSE IN BIOLOGY OF INVERTEBRATES AND CHORDATES

SUB CODE: U23ZGE1

Learning Objectives

CO1 - To acquire a basic knowledge of diversity and organization of Protozoa, Coelenterata, Helminthes and Annelida.

CO2 - To acquire a basic knowledge of diversity and organization of Arthropoda, Mollusca and Echinodermata

CO3 - To comprehend the taxonomic position and diversity among Protochordata, Pisces and Amphibia

CO4 - To comprehend the taxonomic position and diversity among Reptilia, Aves and Mammalia

CO5 - To acquire detailed knowledge of select invertebrate and chordate forms

UNIT I

Diversity of Invertebrates–I

Principles of taxonomy. Criteria for classification–Symmetry and Coelom–Binomial nomenclature. Classification of Protozoa, Coelenterata, Helminthes and Annelida upto classes with two examples.

UNIT II

Diversity of Invertebrates–II

Classification of Arthropoda, Mollusca and Echinodermata upto class level with examples.

UNIT III

Diversity of Chordates–I

Classification of Prochordata, Pisces and Amphibia upto orders giving two examples.

UNIT IV

Diversity of Chordates–II

Classification of Reptilia, Aves and Mammalia upto orders giving two examples.

UNIT V

Animal organization

Structure and organization of

- (i) Earthworm
- (ii) Rabbit/Rat
- (iii) Prawn/Fish

Course Outcomes

CO1 - Recall the characteristic features invertebrates and chordates.

CO2 - Classify invertebrates up to class level and chordates up to order level

CO3 - Explain and discuss the structural and functional organisation of some invertebrates and chordates

CO4 - Relate the adaptations and habits of animals to their habitat

CO5 - Analyse the taxonomic position of animals.

Text Books (Latest Editions)

1. Ekambaranatha Iyer,-

Outlines of Zoology Viswanathan Publication

References Books (Latest editions, and the style as given below must be strictly adhered to)

1. Ekambaranatha Iyar and T.N. Ananthakrishnian - A Manual of Zoology Invertebrata– Vol II: Viswanathan Publisher
2. Ekambaranatha Iyar and T.N. Ananthakrishnan,- A Manual of Zoology-Invertebrata– Vol III: Viswanathan Publishers.
3. Ekambaranatha Iyar and T.N. Ananthakrishnan, A Manual of Zoology: Chordata Viswanathan Publishers.
4. Jordan E.L. and P.S. Verma-Invertebrate Zoology, S. Chand & Co.

Web Resources

www.sanctuaryasia.com

www.iaszoology.com

Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	S							
CO 2	M	S						
CO 3				S		S		
CO 4				S	S	M		
CO 5			S					S

S-Strong(3)

M-Medium (2)

L-Low (1)

LAB COURSE IN BIOLOGY OF INVERTEBRATES AND CHORDATES

SUB CODE:U23ZGE2P

Major Practical

1. Earthworm–Digestive system.
2. Cockroach digestive system
3. Virtual dissection of frog digestive system using video clipping.

Minor Practical

1. Mounting of body setae.
2. Mounting of *Pila radula*
3. Mounting of fish placoid
4. Mounting of ctenoid scales.
5. Mounting of Honey bee mouth parts.

Spotters

Protozoa: Amoeba, Paramecium;

Sponges, spicules **Cnidaria:**

Annelida: Nereis; Heteronereis **Arthropoda:** Prawn; Peripatus

(connecting link),

Mollusca: Pila, Chiton;

Echinodermata: Starfish, Sea urchin

Prochordata: Amphioxus, Petromyzon,

Ascidian, Tornaria larva; **Pisces:** Shark, Clarius, Hippocampus,

Echeneis, Exocoetetes, Eel, *Gambusia*; **Amphibia:**

Axolotl larva, Ichthyophis, Alytes, Hyla; **Reptilia:** Calotes,

Chelonemydas, Chameleon, Draco, Varanus; **Aves:** Pigeon, Quill feather, Dinopium; **Mammalia:** Bat, Rabbit

Submissions

- 1) Record

Course outcomes

Upon completion, students should be able to

CO1: Have hands on experience of dissecting invertebrates and chordates

CO2: Obtain the ability to identify the important microscopic animals of different phyla

CO3: Able to understand the structural features of invertebrates and Chordates

CO4: Understand the structural complications of invertebrates and Chordates

CO5: Able to correlate the components of mouthparts of different animals with their functions.

FOUNDATION COURSE

SUB CODE: U23Z1FC INTRODUCTORY ZOOLOGY

Unit I

Introduction to Zoology, History of Zoology, Branches of Zoology

Five kingdom classification of animals, Binomial nomenclature--.

Unit II

Life – characteristics of life, Hierarchical level of organization of life, the origin and chemistry of life, cell as the unit of life.

Unit III

Continuity of life –Genetics an overview – Mendel's investigations, the chromosomal basis of inheritance, Gene theory.

Unit IV

Organic evolution-Lamarckism, Darwin's theory, Devries theory of mutation, fossils, micro evolution, and macro evolution

Unit V

Process of Reproduction – Structure of reproductive organs, the role of hormones in reproduction. An outline of the Developmental process -germ cells, gametogenesis, fertilization, cleavage, gastrulation, and organogenesis.

Text books

1. Integrated Principles of Zoology , Hickman, Keen, Eisenhour, Larson, Ansen – Eighteenth edition – McGraw Hill.

Web source

1. <https://www.newworldencyclopedia.org/entry/Zoology>
2. <https://www.studocu.com/ph/document/cebu-normal-university/bachelor-of-science-in-psychology/zoology-introduction-to-zoology/13593002>
3. <https://www.newworldencyclopedia.org/p/index.php?title=Zoology&oldid=688300>

REFERENCE

CHORDATA

SUB CODE:U23ZC203

Learning Objectives

CO1 - To understand the structures and distinct features of Phylum Chordata.

CO2 - To understand and able to distinguish the characteristic features of each subphylum and class.

CO3 = To understand the economic importance of vertebrates

CO4 - To know about the adaptations of vertebrates

CO5 - To understand the evolutionary position of different groups of vertebrates

UNIT I

General Characters and Classification of Phylum Chordata:

Origin of Chordata, Differences between non-chordates and chordates, General characters, Affinities and Systematic position of Hemichordata (*Balanoglossus*), Urochordata (*Ascidia*), Cephalochordata (*Amphioxus*).

UNIT II

Prochordates and Agnatha: Characteristics of subphylum vertebrata, Classification of Vertebrata upto Class level, Agnatha (*Petromyzon*), - Pisces (*Scoliodon sorrakowah*) General characters and classification, Origin of fishes, Affinities of Dipnoi - Types of scales and fins - Accessory respiratory organs - Air bladder - Parental care - Migration - Economic importance.

UNIT III

Amphibia : General characters and classification - Origin of Amphibia - Type study - *Rana hexadactyla* - Adaptive features of Anura, Urodela and Apoda - Neoteny in Urodela - Parental care in Amphibia.

UNIT IV

Reptilia : General characters and classification - Type study – (*Calotes versicolor* (endoskeleton of *Varanus*) - Origin of reptiles

and effects of terrestrialisation, Extinct reptiles. Snakes of India. Poison apparatus and biting mechanism of poisonous snakes - Skull in reptiles as basis of classification

UNIT V

Aves and Mammalia : Aves: General characters and classification – Type study - *Columba livia* - Origin of birds, Flight adaptations, Migration. Mammalia: General characters and classification - Type study - Rabbit - Adaptive radiation in mammals - Egg laying mammals, Marsupials, Flying mammals, Aquatic mammals, Dentition in mammals.

Course Outcomes

CO1 - Classify, Identify and recall the name and distinct features of different subphylum belonging to phylum Chordata.

CO2 - Explain, and relate the origin, structural organization and evolutionary aspects of vertebrates.

CO3 - Analyze, compare and distinguish the developmental stages and describe the important biological process.

CO4 - Correlate the different modes of life and parental care among different vertebrates.

CO5 - Summarise the morphology and ecological adaptations in vertebrates and list out the economic importance.

Text Books (Latest Editions)

1. Ayyar, E.K. and T.N. Ananthkrishnan, 1992. Manual of Zoology Vol. II (Chordata), S. Viswanathan (Printers and Publishers) Pvt Ltd., Madras, 891p.
2. Jordan, E.K. and P.S. Verma, 1995. Chordate Zoology and Elements of Animal Physiology, 10th edition, S. Chand & Co Ltd., Ram Nagar, New Delhi, 1151 pp
3. Nigam, H.C., 1983. Zoology of Chordates, Vishal Publications, Jalandhar - 144008, 942.
4. Ganguly, Sinha, Bharati Goswami and Adhikari, 2004.

Biology of animals Vol.II - New central book Agency (p) Ltd.

5. Kotpal. R.L. A, Modern text book of Zoology Vertebrates- Rastogi publications. 2009

References Books (Latest editions, and the style as given below must be strictly adhered to)

1. Darlington P.J. The Geographical Distribution of Animals, R.E. Krieger Pub. Co.
2. Hall B.K. and Hallgrimsson B. (2008). Strickberger's Evolution. IV Edition. Jones and Bartlett Publishers Inc.
3. Hickman, C.P. Jr., F.M.Hickman and L.S. Roberts, 1984. Integrated Principles of Zoology, 7th Edition, Times Merror/Mosby College Publication. St. Louis. 1065 pp.
4. Newman, H.H., 1981. The Phylum Chordata, Satish Book Enterprise, Agra – 282 003, 477 pp.
5. Parker and Haswell, 1964. Text Book of Zoology, Vol II (Chordata), A.Z.T,B.S. Publishers and Distributors, New Delhi - 110 051, 952 pp.
6. Pough H. Vertebrate life, VIII Edition, Pearson International.
7. Waterman, Allyn J. et al., 1971. Chordate Structure and Function, Mac Millan& Co., New York, 587 pp.
8. Young, J. Z. (2004). The Life of Vertebrates. III Edition. Oxford university press.

Web Resources

1. <http://tolweb.org/Chordata/2499>
2. <https://www.nhm.ac.uk/>
3. <https://bit.ly/3Av1Ejg>

4. <https://bit.ly/3kqTfYz>
5. <https://biologyeducare.com/aves/>
6. <https://www.vedantu.com/biology/mammalia>

Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	S							
CO 2	M	S						
CO 3		S	S	S	S	S		S
CO 4			S	S	S	M		
CO 5			S		S			S

S-Strong(3) M-Medium (2) L-Low (1)

CHORDATA PRACTICAL

Learning Objectives

CO1 - To understand the structures and distinct features of phylum chordata.

CO2 - To understand and able to distinguish the characteristic features of each subphylum and class.

CO3 - To understand and compare the structure of various internal organs in different classes of vertebrates.

CO4 - To know about the classification, adaptations and affinities of chordate animals.

UNIT I

Dissections: Frog (Demo)/ Fish: External features, Digestive system, Arterial system, Venous system, 5th Cranial nerve, 9th and 10th cranial nerves, Male and female urinogenital system.

UNIT II

Mounting: Fish: Placoid and Ctenoid scales, Frog: Hyoid apparatus and Brain (Demo).

UNIT III

Osteology: Frog: Skull and lower jaw, Vertebral column, Pectoral girdle, Pelvic girdle, Forelimb, Hindlimb. Chelonia- Anapsid skull, Pigeon - skull and lower jaw, synsacrum.

UNIT IV

Specimen and Slides: (i) **Hemichordata:** Balanoglossus, Tornaria larva (ii). **Protochordata:** Amphioxus, Amphioxus T.S. through pharynx (iii). **Cyclostomata:** Petromyzon, Myxine, Ammocoetus larva (iv). **Pisces:** Sphyrna, Pristis, Torpedo, Channa, Pleuronectes, Hippocampus, Exocoetus, Echieneis, Labeo, Catla, Clarius, Auguilla, Protopterus, Scales: Placoid, Cycloid, Ctenoid (v). **Amphibia:** Ichthyophis, Amblystoma, Siren, Hyla,

SUB CODE:U23ZC204P

Rachophous, Bufo, Rana, Axolotal larva (vi). **Reptilia** : Draco, Chamaeleon, Gecko, Uromastix, Viperarusselli, Naja, Bungarus, Enhydrina, Typhlops, Testudo, Trionyx, Crocodilus, Ptyas. (vii). **Aves:** Archaeopteryx, Passer, Psittacula, Bubo, Alcedo, Columba, Corvus, Pavo; Collection and study of different types of feathers: Quill, Contour, Filoplume, Down (viii). **Mammalia:** Ornithorhynchus, Tachyglossus, Pteropus, Funambulus, Manis, Loris, Hedgehog

UNIT V

Embryology: Stages in the development of Amphioxus, Frog and Chick-Placentain shark and mammals.

Course Outcomes On completion of this course, students will;

CO1 - Identify and recall the name and distinct external and internal features of animals belonging to phylum Chordata.

CO2 - Explain the structural organization of various organs and systems in different classes of vertebrates.

CO3 - Analyse, compare and distinguish the morphological features and developmental stages of chordates

CO4 - Dissect and explain various organs and internal systems in different vertebrates and correlate its function.

CO5 - Summarise the morphology and ecological adaptations in vertebrates and list out the economic importance.

Text book

1. Lal S S, 2009. Practical Zoology Vertebrate, Rajpal and Sons Publishing, 484pp.
2. Verma P.S, 2000. A Manual of Practical Zoology: Chordates, S.Ch and Limited, 627pp.

References Books (Latest editions, and the style as given below must be strictly adhered to)

1. Robert William Hegner, 2015. Practical Zoology, BiblioLife, 522pp.
2. Young, J.Z., 1972. The life of vertebrates. OxfordUni. London.

Web Resources

1. https://www.youtube.com/watch?v=b04hc_kOY10
2. <https://bit.ly/3CzTEy8>
3. <http://tolweb.org/Chordata/2499>
4. <https://www.nhm.ac.uk/>
5. <https://bit.ly/3Av1Ejg>

Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	S							
CO 2	M	S						
CO 3				S		S		
CO 4				S	S	M		
CO 5			S					S

S-Strong(3)

M-Medium (2)

L-Low (1)

ALLIED ZOOLOGY II

SUB CODE: U23ZGE3

GENERAL PRINCIPLES OF ZOOLOGY

Learning Objectives

CO1 - To enable students to learn basic concepts relating to aspects of respiratory, circulatory, excretory nervous and sensory physiology.

CO2 - To enable students to comprehend the processes involved during development

CO3 - To enable students to learn basic concepts of immunity and the working of immune organs and familiarize them with the recommended vaccination schedule

CO4 - To enable students to comprehend the basic concepts of human genetics and patterns of inheritance

CO5 - To enable students to learn about aspects of animal behaviour such as foraging, courtship, nest construction, parental care and learning.

UNIT I

Respiration- Respiratory pigments and transport of gases. Mechanism of blood clotting. Types of excretory products—Ornithine cycle. Structure of neuron— Conduction of nerve impulse, Mechanism of vision and hearing.

UNIT II

Fertilization, Cleavage, Gastrulation and Organogenesis of Frog; Placentation in mammals.

UNIT III

Innate and Acquired - Active and Passive; Antigens and Antibodies; Immunological organs—responses in humans; Vaccination schedule.

UNIT IV

Human Genetics: Human Chromosomes – Sex Determination in Humans; Patterns of Inheritance: Autosomal Dominant, Autosomal Recessive, X-linked, Y-

linked, Mitochondrial, Multiple Allelic and Polygenic; Genetic Counselling.

UNIT V

Animal Behaviour: Foraging, Courtship Behaviour, Shelter and Nest Construction, Parental Care, Learning Behaviour.

Course Outcomes: On completion of this course, students will;

CO1 - Recall the parts and working of body organs and developmental stages, name the patterns of inheritance and list different types of animal behaviour.

CO2 - Analyse the different developmental stages

CO3 - Analyse the working of body and immune systems

CO4 - Analyse the different patterns of inheritance

CO5 - Relate the behaviour of animals to physiology. Analyse the different types of behaviour.

Text Books

(Latest Editions)

Verma P.S. & Agarwal - Developmental Biology, Chordata embryology S. Chand & Co.

References Books

(Latest editions, and the style as given below must be strictly adhered to)

1. Owen, J. A., Punt, J. & Stranford, S. A. - Kuby Immunology. New York: W.H. Freeman & Company
2. Klug, W. S., Cummings, M. R. & Spencer, C - Concepts of Genetics. (12th ed.). New Jersey: Pearson Education
3. Mathur, R.- Animal Behaviour. Meerut: Rastogi.
4. Verma P.S. & Agarwal Developmental Biology, Chordata embryology S. Chand & Co.

Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	S							
CO 2	M	S						
CO 3				S		S		
CO 4				S	S	M		
CO 5			S					S

S-Strong(3)

M-Medium (2)

L-Low (1)

LAB COURSE IN GENERAL PRINCIPLES OF ZOOLOGY

SUB CODE:U23ZGE4P

Unit I

Animal Physiology

1. Qualitative tests for Ammonia,Urea and uric acid.
2. Clotting Time
3. Bleeding Time
4. Models of haemoglobin and ATP.

Unit II

Developmental biology

1. Collection of frog egg from ponds and observation of tadpole formation
2. Observation of Frog: Egg, Cleavage, Blastula, Yolk Plug stage.
3. Yolk sac placenta.

Unit III

Immunology

1. Dissect and display the immunological organs in fish/Rat (Virtual)
2. ABO Blood grouping.
3. Spotters: Immunoglobulin classes

Unit IV

Genetics

1. Recording of Mendelian traits in man
2. Human Karyotype – Normal- Male and Female
3. Chromosomal abnormalities – Autosomal (Down's syndrome) and Sex chromosomal (Turner and Klinefelter syndrome)

Unit V Animal Behaviour

Learning behaviour in practical

Habituation in snail / Phototropism/Geotropism in Earthworm

Spotters: 1. T Maze 2. Pavlovian conditioning in Dog.

Submissions

Record

Course outcomes

CO1: Understand the Physiology of animals

CO2: Gather experience about the embryonic developmental stages

CO3: Obtain skills to dissect out immunological organs and immunological techniques.

CO4: Understand the role of genetics in Human

CO5: Acquiring knowledge on the Animal Behaviour

BASIC COURSE IN ORNITHOLOGY

SUB CODE: U23Z2SE1

Learning 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 macroecology of birds, bird populations and communities, bird diseases, bird conservation and on the role of citizen science in ornithology.

Unit I

Introduction to Ornithology; Bird Lore; Birds and Humans; Classification of Birds, Bird Evolution and Speciation; Endemism

Unit II

External Morphology of the Bird; Structure of bird feather, Internal Structure of the Bird; Adaptations to Flight

Unit III

Bird Behaviour: Foraging, Roosting, Vocalization, Imprinting, Feather care, Bird Intelligence, Social Behaviour, Mixed Species Flocks, Migration

Unit IV

Breeding Biology: Differential investment of sexes; territoriality, courtship and display behaviour, nesting, eggs, incubation and care of young, brood parasitism

Unit V

Studying bird populations and communities, sampling methods; Macro ecology; Molecular Techniques in Ornithology; Avian Disease; Citizen Science and Ornithology; Threats faced by birds; Bird Conservation with case studies

COURSE LEARNING OUTCOME

On successful completion of the course, students will be able to

- Recall the taxonomic position of birds, their external morphology and internal parts, types of bird behaviour, sampling methods and types of avian diseases.
- Identify the external parts of the bird, internal structures of the bird and different types of bird behaviour
- Differentiate birds based on their morphology, foraging strategies and other behaviour
- 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
- Discuss and analyse case studies relating to bird conservation

BOOKS FOR REFERENCE

1. Lovette, I.J and Fitzpatrick, J.W. (2016). *Handbook of Bird Biology*, 3rd ed. Wiley.
2. Birkhead, T. (2013). *Bird Sense: What it's like to be a bird?* Bloomsbury, NY.
3. Birkhead, T., Wimpenny, J., and Montgomerie, B. (2014). *Ten Thousand Birds: 4. Ornithology since Darwin*. Princeton University Press, Princeton, NJ.
5. Gill, F.B, and Prum, R.O. (2019). *Ornithology*, 4th ed. Macmillan.

**VALUE ADDED COURSE
MANAGEMENT OF COW-BASED RESOURCES**

Course duration: 30 hours (Theory 18 hours; Practical 12 hours)

Course objectives:

- To facilitate agriculture-based rural students with a cow-based lifestyle to earn more.
- To promote sustainable rural economy.
- To establish animal-human-agriculture synergy for sustainable development.

Unit I (6hours Theory)

Scope of cow-based income generation; Differences between indigenous and exotic cows; A1 and A2 milk; Demand for Indian cow products at the national and international market; Successful Cow based entrepreneurs in India.

Unit II (6 hours Theory)

Value addition of cow urine: Medicinal values of cow urine; Go Ark _Physical and chemical properties of Go Ark, Applications of Go Ark in Agriculture, Aquaculture,and medicine.

Unit III (6 hoursTheory)

Value addition of cow dung: Properties of cow dung; Differences in Indian and exotic cow's dung; Value added products of cow dung _ fuel cakes, fuel logs, floor coating material, mud-brick additives, pond fertilizer, pH balancer, tooth polish, and Panchagavya.

Unit IV (6 hours Practical)

Preparation of Go Ark, Value-added Go Ark with medicinal plants, Panchagavya preparation

Unit V (6 hours Practical)

Preparation of cow dung-based mosquito repellent coils, Dhoop sticks, Agal lamps, Dolls, and Bath powder/soap _ Field visit for Unit IV and Unit V

Course Outcomes:

- Students acquire knowledge on the value of Indian cows and cow products.
- Students obtain skills to produce value-added products of cow urine and dung
- Students have learnedtechniques to turn out dry cows that are considered as a burdeninto income generators.

ENVIRONMENTAL STUDIES

SUB CODE: U232ES

Objectives: To acquire the knowledge on the Environment - principles, definition and importance, its influence on the living organism through ecosystem structure and components, various habitats, sources of pollution and conservation of wildlife, influence of population growth, health and rights.

UNIT-I

The Multidisciplinary Nature of Environmental Studies

- Definition, Scope and Importance.
- Renewable and Non-Renewable Resources.
- Nature Resources and associated problems.

UNIT-II

Biodiversity and its Conservation

- Introduction-Definition.
- Biodiversity at global, national and local levels.
- India as a mega-diversity nation.
- Hot-spots of biodiversity.
- Conservation of Biodiversity: In-Situ and Ex-situ conservation of Biodiversity.

UNIT- III

Environmental Pollution Definition

- Causes, Effects on layer and Control Measures of :
a. Air Pollution – Climate Change,

global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies.

Human Population and the Environment

- Population growth explosion, variation among nations – Family Welfare programme.
- Environment and Human Health.

b. Water pollution.

c. Soil pollution.

d. Noise pollution.

- Solid Waste Management: Causes, Effects and Control measures of urban and Industrial Wastes.
- Role of an individual in prevention of pollution
- Disaster Management: Floods, Earthquake, Cyclone and landslides.

UNIT- IV

Social Issues and the Environment

- From un-sustainable to sustainable development.
- Urban Problems related to energy.
- Water Conservation, rainwater harvesting, Watershed Management.

UNIT-V

- Resettlement and rehabilitation of people : its problems and concerns case studies.
- Environment protection Act.
- Air (prevention and control of pollution) Act.
- Wildlife protection Act.
- Forest conservation Act.
- Issues involved in enforcement of environmental legislation.
- Public awareness.

- Health.
- Human Rights.
- HIV/AIDS.
- Women and child welfare.

Role of Information Technology

- Human Rights.
- HIV/AIDS.
- Women and child welfare.
- Role of Information Technology in Environment and human health.
- Case Studies.

ReferenceBooks:

- 1 BernisAnandharaj(2016)Soolnilaiyiyal.Chrisolitepublications.Adyar, Chennai.
- 2 OdumE.P(1971).Fundamentals of ecology.W.B SaundersCompany, Philadelpnia.
- 3 KendeighS.C(1961).Animalecology.PrenticeHall.
- 4 ClarksGL(1954).ElementsofEcology.JohnWileyandsons,Newyork.
- 5 PurohitS.S.,ShamiDHandA.KAgarval(2004).Environmen
talsciences-Anewapproach.Agrobi,Jodhpur.
- 6 KrishnamurthyK.V(2003).IntroductiontoBiodiversity.OxfordandIBH.

CourseOutcomes

CO1:Gain knowledgeof surroundingenvironment.

CO2:Understandthediversitiesatlocalandnationallevels.

CO3:Learntheimpactofvarious pollutantsinAir, WaterandNoise.

CO4:Understandthevarious
actstocontrolthepollutionandcreatingawareness.

CO5:Acquire knowledge of the significance of Natural
resources and recent advances in information technology

VALUE EDUCATION(YOGA)

SUB CODE: U231VE

Objectives:To gain knowledge on Values of life, behaviour, responsibilities, health, disorders and reforms values of life with morality and its impact of globalization, self control regulation, Exercise, meditation, yoga.

Course outcomes:

UNIT-I

Introduction to values: Values of life, Factors affecting values of life, significance of life value education

UNIT-II

Behaviour: Respect to the parents, respect to the teachers, worship, self respects

Social oriented values: Unity, equality, family, Citizen's responsibility, Patriotism

UNIT-III

Physical and mental health: Quality food, personal hygiene, women's health, Thought power

UNIT-IV

Disorders and Reforms: Values of life with morality and its impact of globalization, Impact of media, Reforms, Self control regulation, Exercise, meditation, yoga.

References

1. Jayakrishna(2016). Value education with section on Yoga. Viva Publication.
2. B.K.S.Iyengar(2006). Light

on yoga, Thorson Publication.

3. Swami Vishnu Devanandha(1995). Complete Illustration of Yoga, RHUS Publishers.
4. Hansaji J. Yogendra(2018). Yoga for all, Rupa Publications, India.