MANONMANIAM SUNDARANAR UNIVERISTY,
TIRUNELVELI-12

SYLLABUS

UG - COURSES – AFFILIATED COLLEGES

Course Structure for M. Sc. Zoology
(Choice Based Credit System)
(with effect from the academic year 2024-2025 onwards)

Semester-I				
Part	**Subject Status**	**Subject Title**	**Subject Code**	**Credit**
III	CORE I	STRUCTURE AND FUNCTION OF INVERTEBRATES	WZOM11	5
III	CORE II	COMPARATIVE ANATOMY OF VERTEBRATES	WZOM12	5
III	CORE III	LAB COURSE IN INVERTEBRATES & VERTEBRATES	WZOL11	4
III	ELECTIVE I	BIOCHEMISTRY	WZOE11	3
III	ELECTIVE II	SERICULTURE	WZOE14	3

Total Marks: 100 Internal Exam: 25 marks + External Exam: 75 marks

A. **Scheme for internal Assessment**:
Maximum marks for written test: **20 marks**
3 internal tests, each of **I hour** duration shall be conducted every semester.
To the average of the **best two** written examinations must be added the marks scored in. The **assignment** for 5 marks.

The break up for internal assessment shall be:
Written test- 20 marks; Assignment -5 marks Total - 25 marks

B. Scheme of External Examination
3 hrs. examination at the end of the semester
A – Part : 1 mark question two - from each unit
B – Part : 5 marks question one - from each unit
C – Part : 8 marks question one - from each unit

- **Conversion of Marks into Grade Points and Letter Grades**

S.No	Marks	Letter Grade	Grade point (GP)	Performance
1	90-100	O	10	Outstanding
2	80-89	A+	9	Excellent
3	70-79	A	8	Very Good
4	60-69	B+	7	Good
5	50-59	B	6	Above Average
6	40-49	C	5	Pass
7	0-39	RA	-	Reappear
8	0	AA	-	Absent

- **Cumulative Grade Point Average (CGPA)**

$$\mathbf{CGPA} = \frac{\mathbf{\Sigma\,(GP \times C)}}{\mathbf{\Sigma C}}$$

- **GP** = Grade point, **C** = Credit
- CGPA is calculated only for Part-III courses
- CGPA for a semester is awarded on cumulative basis

- **Classification**
  a) First Class with Distinction : CGPA $\geq$ 7.5*****
  b) First Class : CGPA $\geq$ 6.0
  c) Second Class : CGPA $\geq$ 5.0 and $<$ 6.0
  d) Third Class : CGPA$<$ 5.0

STRUCTURE AND FUNCTION OF INVERTEBRATES

Course Objectives:

The main objectives of this course are:

- To understand the concept of classification and their characteristic features of major group of invertebrates.
- To realize the range of diversification of invertebrate animals.
- To enable the students to find out the ancestors or derivatives of any taxon.
- To know the functional morphology of system biology of invertebrates.

Units I

Structure and function in invertebrates: Principles of Animal taxonomy; Species concept; International code of zoological nomenclature; Taxonomic procedures; New trends in taxonomy

UNIT II

Organization of coelom: Acoelomates; Pseudocoelomates; Coelomates: Protostomia and Deuterostomia; Locomotion: Flagella and ciliary movement in Protozoa; Hydrostatic movement in Coelenterata, Annelida and Echinodermata

UNIT III

Nutrition and Digestion: Patterns of feeding and digestion in lower metazoan; Filter feeding in Polychaeta, Mollusca, and Echinodermata. Respiration: Organs of respiration: Gills, lungs, and trachea; Respiratory pigments; Mechanism of respiration

UNIT IV

Excretion: Organs of excretion: coelom, coelomoducts, Nephridia and Malphigian tubules; Mechanisms of excretion; Excretion and osmoregulation. Nervous system: Primitive nervous system: Coelenterata and Echinodermata; Advanced nervous system: Annelida, Arthropoda (Crustacea and lnsecta) and Mollusca (Cephalopoda); Trends in neural evolution

UNIT V

Invertebrate larvae: Larval forms of free-living invertebrates - Larval forms of parasites; Strategies and Evolutionary significance of larval forms. Minor Phyla: Concept and significance; Organization and general characters

Reading list

1. Barrington, E. J.W. 1979. Invertebrate Structure and Function. The English Language Book Society and Nelson, pp-765.

Recommended texts

1. Barnes, R. D. 1974. Invertebrate Zoology, (Second Edition), Holt-Saunders International Edition, pp-1024.
2. Barnes, R. S. K., P. Calow, P. J. W. Olive, D. W. Golding, J. J. Spicer. 2013.

The Invertebrates: A Synthesis. Third Edition. John Wiles & Sons Inc., Hoboken. New Jersey, New Delhi.
3. Dechenik, J. A. 2015. Biology of Invertebrates (Seventh Edition). Published by McGraw Hill Education (India) Private Limited, pp-624.

COMPARATIVE ANATOMY OF VERTEBRATES

Course Objectives:

The main objectives of this course are:

- Exemplifying the vertebrate origin and the intermediary position of Prochordates between invertebrates and vertebrates.
- Acquires the knowledge on evolution and adaptive radiation of Agnatha and Pisces.
- Understanding knowledge about the first terrestrial vertebrates and the adaptive radiation of land animals
- Imparting conceptual knowledge about the animal life in the air and their behaviours.
- Understanding the origin and efficiency of mammals and evolutionary changes that occurred in the life of vertebrates.

Units I

Origin of vertebrates: Concept of Protochordata; The nature of vertebrate morphology; Definition, scope and relation to other disciplines; Importance of the study of vertebrate morphology.

UNIT II

Origin and classification of vertebrates; Vertebrate integument and its derivatives. Development, general structure and functions of skin and its derivatives; Glands, scales, horns, claws, nails, hoofs, feathers and hairs.

UNIT III

General plan of circulation in various groups; Blood; Evolution of heart; Evolution of aortic arches and portal systems. Respiratory system: Characters of respiratory tissue; Internal and external respiration; Comparative account of respiratory organs.

UNIT IV

Skeletal system: Form, function, body size and skeletal elements of the body; Comparative account of jaw suspensorium, Vertebral column; Limbs and girdles; Evolution of Urinogenital system in vertebrate series.

UNIT V

Sense organs: Simple receptors; Organs of Olfaction and taste; Lateral line system; Electroreception. Nervous system: Comparative anatomy of the brain in relation to its functions; Comparative anatomy of spinal cord; Nerves- Cranial, Peripheral and Autonomous nervous systems.

Reading list

1. Swayam Prabha https://www.swayamprabha.gov.in/index.php/program/archive/9
2. Yong, J. Z. 1981. The life of Vertebrates, English language Book society, London, pp- 645.
3. Romer, A.S. 1971. The Vertebrate body, W.B.S. Saunders, Philadelphia, pp-600.

Recommended texts

1. Waterman, A.J. 1972. Chordate Structure and Function, MacMillan Co., New York, pp.587.
2. Parker T. J. and W. A. Haswell. 1962. A text book of Zoology, Vol. 2, Vertebrates, 7th Edition, Mac Millan Press, London, pp-750.
3. Ekambaranatha Ayyar and T. N. Ananthakrishnan. 2009. Manual of Zoology, Vol – II, S. Viswanathan Pvt. Ltd. Chennai.
4. Kotpal, 2019. R.L. Modern Text Book of Zoology Vertebrates, 4th Edition, Rastogi Publications, Meerut, pp-968.

Core Course III: LAB COURSE IN INVERTEBRATES & VERTEBRATES

Course Objectives:

The main objectives of this course are:

- Understanding the different systems in invertebrates & vertebrates.
- Learning about various animal species, their phylogenetic affinities and their adaptive features
- Imparting conceptual knowledge about the salient features and functional anatomy.
- Developing the skill in mounting techniques of the biological samples.
- Gaining fundamental knowledge on the skeletal system

INVERTEBRATES

Dissection / Virtual

Earthworm : Nervous system

Pila : Digestive and nervous systems

Sepia : Nervous system

Cockroach : Nervous system

Grasshopper : Digestive system and mouth parts

Prawn : Appendages, nervous and digestive systems

Crab : Nervous system

Study of the following slides with special reference to their salient features and their modes of life

1. Amoeba
2. Entamoeba histolytica
3. Paramecium
4. Hydra with bud
5. Sporocyst – Liver fluke

6. Cercaria larva
7. Tape worm (Scolex)
8. Ascaris T. S.
9. Mysis of prawn

Spotters

1. Scorpion
2. Penaeus indicus
3. Emerita (Hippa)
4. Perna viridis

Mounting

Earthworm : Body setae
Pila : Radula
Cockroach : Mouth parts
Grasshopper : Mouth parts

CHORDATES

Study the nervous system of Indian dog shark – Dissection / Virtual

1. Nervous system of Scoliodon laticaudatus – 5th or Trigeminal nerve
2. Nervous system of Scoliodon laticaudatus – 7th or Facial nerve
3. Nervous system of Scoliodon laticaudatus – 9th and 10^{th} or Glossopharyngeal & Vagus nerve

Study of the following specimens with special reference to their salient features and their modes of life:

1. Amphioxus sp. (Lancelet)
2. Ascidia sp. (sea squirt)
3. Scoliodon laticaudatus (Indian dog shark)
4. Trygon sp. (Sting ray)
5. Torpedo sp. (Electric ray)
6. Arius maculatus (Cat fish)
7. Belone cancila (Flute fish)
8. Exocoetus poecilopterus (Flying fish)
9. Mugil cephalus (Mullet)
10. Tilapia mossambicus (Tilapia)
11. Rachycentron canadum (Cobia)
12. Tetrodon punctatus (Puffer fish)
13. Dendrophis sp. (Tree snake)

Study of the different types of scales in fishes

1. Cycloid scale
2. Ctenoid scale
3. Placoid scale

Study of the frog skeleton system (Representative samples)

1. Entire skeleton
2. Skull

3. Hyoid apparatus
4. Pectoral girdle and sternum
5. Pelvic girdle
6. Fore limb
7. Hind limb

Mounting

1. Weberian ossicles of fish

Text Books:

1. Lal, S.S. 2009. Practical Zoology, Rastogi Publications, pp-484.
2. Iuliis G. D. and D. Pulerà, 2007. The Dissection of Vertebrates: A Laboratory Manual. Academic Press, Imprint of Elsevier Publication, pp-416.
3. Verma, P.S. 2000. Manual of Practical Zoology: Chordates, S. Chand Publishing Company, pp-528

Reference Books:

1. Preeti, G., and C. Mridula, 2000. Modern Experimental Zoology, Indus International Publication.
2. Sinha, J., A. K. Chatterjeee, P. Chattopadhya. 2011. Advanced Practical Zoology, Arunabha Sen Publishers, pp-1070.

BIOCHEMISTRY

Course Objectives:

The main objectives of this course are:

- Students should know the fundamentals of Biochemistry

UNIT I

Basics of biophysical chemistry and biochemistry: Structure of atoms, molecules and chemical bonds - Principles of biophysical chemistry (pH, buffer, reaction kinetics, thermodynamics, colligative properties).

UNIT II

Biomolecular interactions and their properties: Stabilizing interactions (Vander Waals, electrostatic, hydrogen bonding, hydrophobic interaction etc. - Composition, structure, metabolism and function of biomolecules (carbohydrates, lipids, proteins, nucleic acids and vitamins).

UNIT III

Bioenergetics and enzymology: Bioenergetics, glycolysis, oxidative phosphorylation, coupled reaction, group transfer, biological energy transducers - Principles of catalysis, enzymes and enzyme kinetics, enzyme regulation, mechanism of enzyme catalysis, isoenzymes

UNIT IV

Structural conformation of proteins and nucleic acids: Conformation of proteins (Ramachandran plot, secondary, tertiary, and quaternary structure; domains; motifs and folds)- Conformation of nucleic acids (A-, B-, Z-DNA), t- RNA, micro-RNA).

UNIT V

Stabilizing interactions in biomolecules: Stability of protein and nucleic acid structures - hydrogen bonding, covalent bonding, hydrophobic interactions, and disulfide linkage.

Reading list

1. Berg, J. M., J. L. Tymoczko and L. Stryer 2002. Biochemistry. 5th Ed., W.H. Freeman & Co., New York, pp-1050.
2. Kuchel P.W. and G. B. Ralston. 2008. Biochemistry. McGraw Hill (India) Private Limited, UP, pp-580.
3. McKee T. and J. R. McKee. 2012. Biochemistry: The Molecular Basis of Life. (7th Edition). Oxford University Press, US, pp-793.
4. Nelson D.L. and M.M. Cox. 2012. Lehninger's Principles of Biochemistry. (6th Edition). W. H. Freeman Publishers, New York, pp-1158.
5. Satyanarayana U. and U. Chakrapani, 2006. Biochemistry. (3rd Edition). Books and Allied (P) Ltd. Calcutta, pp-695.

Recommended texts

1. Buchanan, B.B., W. Gruissem and R.L. Jones. 2015. Biochemistry and Molecular Biology of Plants. John Wiley and Sons Ltd., UK, pp-1280.
2. Murray, R.K., D.K. Granner, P.A. Mayes and V.W. Rodwell. 2003. Harper's Illustrated Biochemistry (26th Edition), The McGraw-Hill Companies, Inc., USA, pp-704.
3. Palmer, T. 2004. Enzymes. Affiliated East-West Press Pvt. Ltd., New Delhi, pp 416.
4. Voet D. and J.G. Voet. 2011. Biochemistry. (4th Edition). John Wiley & Sons (Asia) Pvt. Ltd., pp-1428.

SERICULTURE

Course Objectives:

The main objectives of this course are:

- Students should know basic concepts and techniques in Sericulture.

UNIT I

Introduction to textile fibers; types- natural and synthetic fibers; sources of silk fiber- Tasar, Muga, Anaphe, Gonometa, Fagara, spider and mussel; properties and importance of silk fiber. History, development, status, characteristics and advantages of sericulture in India.

UNIT II

Host plants; Moriculture- distribution, morphology, propagation- seedling, cutting,

grafting, layering and micropropagation methods, maintenance- irrigation, manuring and pruning, pests and diseases of mulberry.

UNIT III

Biology of Bombyx mori; Races and voltinism. Structure of egg, larva, pupa and adult. Sexual dimorphism- larva, pupa and adult. Anatomy: Digestive system, circulatory, respiratory, Excretory, male and female reproductive system. Silk gland – Structure and Significance-Silk protein. Neuroendocrine system, neuro secretary cells, Corpora allata, Corpora cardiaca, ecydysial gland. Hormonal control of moulting and metamorphosis. Exocrine glands and pheromones.

UNIT IV

Grainage technology: Breeding Stations - methods of industrial egg production, mother moth examination, diapausing and non-diapausing eggs. Incubation and transport of eggs. Silk worm - Rearing: Rearing House (CSB- model) and Rearing appliances. Rearing operation- Disinfection, brushing, maintenance of optimum conditions, feeding, bed cleaning, spacing, care during moulting, mounting, and Harvesting. Rearing methods: Chawki rearing and rearing of late age and mature larvae- Mounting practices.

UNIT V

Physical and commercial characteristics of cocoons. Cocoon harvesting and marketing. Cocoon sorting, stifling, deflossing, riddling, cooking, brushing, reeling and re-reeling. Weaving. By-products of sericulture industry. Reeling operation: reeling appliances- types - raw silk – raw silk testing. Diseases of Silkworm: Fungal, Viral, Bacterial diseases; Pest of silkworm – Uzi fly and Dermestid beetles - causative agent, symptoms, prevention and control measures.

Reading list

1. G. Ganga and J. Sulochana Chetty. 2019. An introduction to sericulture, 2nd edition, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
2. M. Johnson and M. Kesary. 2019. Sericulture, Saras publication, Tamilnadu.
3. Singh, Amardev & Ravinder Kumar. 2013. Sericulture handbook Vol 1, Biotech.
4. M. Madan Mohan Rao. An Introduction to Sericulture, 2nd edition, BS Publications.

Recommended websites

1. https://agritech.tnau.ac.in/sericulture/
2. https://csb.gov.in/