

SYLLABUS

MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI-12

PG COURSES – AFFILIATED COLLEGES

MSc Zoology

(Choice Based Credit System)

(with effect from the academic year 2021-2022 onwards)

Semester-I				
Part	Subject Status	Subject Title	Subject Code	Credit
III	Core-I	Structure and function of Invertebrates	ZZOM11	4
	Core-II	Comparative Anatomy of Chordates	ZZOM 12	4
	Core-III	Environmental Biology	ZZOM13	4
	Core-IV	Biochemistry	ZZOM14	4
	Core Practical I	Practical I (1.1 & 1.2)	ZZOL11	2
	Core Practical II	Practical II (1.3 & 1.4)	ZZOL12	2



STRUCTURE AND FUNCTION OF INVERTEBRATES

Unit: I

Principle of Animal taxonomy

Basic concept of Biosystematics and significance. Species concept; International code of Zoological nomenclature - Taxonomic procedures. New trends in taxonomy –Taxonomic procedures - Animal collection, handling and preservation – process of identification of species-Organization of coelom – Acoelomates – Pseudocoelomates - Coelomates: Protostomia and Deuterostomia.

Unit: II

Locomotion and Nutrition

Locomotion- Pseudopodia - Flagella and ciliary movement in protozoa - Hydrostatic movement in Coelenterata, Annelida and Echinodermata. Nutrition and Digestion - Patterns of feeding and digestion in lower metazoan - Filter feeding in polychaeta, Feeding mechanism in Arthropoda, Mollusca and Echinodermata

Unit: III

Respiration, Circulation and Excretion

Organs of respiration: gills, lungs and trachea - Respiratory pigments - Mechanism of respiration. Hemolymph – tubular and neurogenic heart -blood vessels- Circulation pattern. Excretion - Organs of excretion: coelom, coelom ducts, nephridia and Malpighian tubules - Mechanisms of excretion - Excretion and osmoregulation.

Unit: IV

Nervous system

Primitive nervous system: Coelenterata and Echinodermata - Advanced nervous system: Annelida, Arthropoda (Crustacean and Insecta) and Mollusca (Cephalopoda) - Trends in neural evolution.

Unit: V

Invertebrate larval forms and Minor Phyla

Larval forms of free-living invertebrates - Larval forms of parasites - Strategies and evolutionary significance of larval forms (Crustaceans and Echinoderm larva). Minor Phyla (Structural features and affinities) - Concept and significance - Organization and general characters.



Suggested Reading Materials:

1. Hyman, L.H. The Invertebrates. Vol.1 Protozoa through Ctenophora, McGraw Hill Co., New York.
2. Barrington, E.J.W. Invertebrate structure and function. Thomas Nelson and Sons Ltd., London
3. Jagerstein, G. Evolution of Metazoan Life Cycle, Academic Press, New York & London.
4. Hyman, L.H. The Invertebrates. Vol.8. McGraw Hill Co., New York and London.
5. Barnes, R.D. 1974 Invertebrate Zoology, III edition. W.B. Saunders Co., Philadelphia.
6. Russel-Hunter, W.D. A Biology of Higher Invertebrates, the Macmillan Co. Ltd., London
7. Hyman, L.H. The Invertebrate smaller coelomate groups, Vol. V. McGraw Hill Co., New York.
8. Read, C.P Animal Parasitism. Prentice Hall Inc., New Jersey.
9. Sedgwick, A. A student text book of Zoology. Vol. I, II and III. Central Book Depot, Allahabad.
10. Parker, T, J., Haswell, W.A. Text Book of Zoology, Macmillan Co., London.
11. Jordan, E.L. and Verma, P.S. 2005 Invertebrate Zoology. (14th edition) S. Chand and Company Limited, 7361 Ram Nagar, Qutab Road, New Delhi-110055.
12. Kotpal, R. L. Modern Text book of Zoology, Invertebrates (9th edition) Ratogi Publications, GangtriShivaji Road, Meerut- 250 002.
13. Kotpal, R.L. 2005. Invertebrate Zoology, Rastogi Publications, Meerut. Kotpal, R.L. Minor Phyla, Rastogi Publications, Meerut.
14. EkambaranathaIyer, M. and Ananthakrishnan, T.N. 2003. A Manual of Zoology, Vol I & II Viswanathan Publications, Chennai.
15. Verma, A. Invertebrates: Protozoa to Echinodermata. Naris Publishing House Private Limited. 35-36, Greams Road, Thousand Light. Chennai-6.



COMPARATIVE ANATOMY OF CHORDATES

Unit: I

Origin of Chordata and Classification

Concept of Protochordata- The nature of vertebrate morphology - Definition, Diagnostic characters and relation to other disciplines - Importance of the study of vertebrate morphology. Classification of Vertebrates.

Unit: II

Integumentary system

Skin and its derivatives - Development, general structure and functions of skin and its soft and horny derivatives - Glands, scales, horns, claws, nail, hoofs, feathers and hairs.

Unit: III

Endoskeleton and Digestive system

Form and function, Body size and skeletal elements of the body- Comparative account of skull and Vertebral column- Limbs and girdles (Appendicular and axial skeleton). Comparative account of buccal cavity and alimentary canal in Vertebrates.

Unit IV

Circulatory, Respiratory and Nervous system

General plan of circulation in various groups. Blood - Evolution of heart - Evolution of aortic arches and portal systems. Respiratory system –Types and Characters of breathing organs in various groups. Nervous system- Comparative anatomy of the brain and spinal cord in relation to the functions- Nerves- cranial and spinal- Peripheral and Autonomous nervous system

Unit V

Urinogenital system and Sense organs

Evolution of urinogenital system in Vertebrate series - Simple receptors - Organs of olfaction, taste and hearing and vision - Lateral line system - Electroreception.

Suggested Reading Materials:

1. Alexander, R.M. The Chordata. Cambridge University Press, London.
2. Barrington, E.J.W. The Biology of Hemichordata and Protochordata. Oliver and Boyd, Edinburgh.
3. Harish. C. Nigam. Biology of Chordates. S. L. Jain, Arihant Press, M-5,



Industrial Area, Jullundhur City-144004.

4. EkambaranathaIyer M and Ananthakrishnan, T. N.A Manual of Zoology, Chordata N. Viswanatan , S. (Printers and Publishers) Private Ltd,, Chennai.
5. Jordan, E.L and Verma, P. S. Chordate Zoology., (11th edition). S. Chand & company Ltd, 7361, Ram Nagar, Wutab Road, New Delhi- 110 055.
6. Kingsley, J.S. Outlines of Comparative Anatomy of Vertebrates. Central Book Depot, Allahabad.
7. Malcom Jollie, Chordata morphology. East-West Press Pvt. Ltd.,New Okuan 00. Monielli, A.R. The Chordates. Cambridge University Press, London
8. Sedgwick, A. A Students Text Book of Zoology, Vol.II
9. Tansley, K. Vision in vertebrate. Chapman and Hall Ltd., London
10. Torrey, T.W. Morphogenesis of vertebrates, John Wiley and Sons Inc.,New York and London
11. Walters, H.E. and Sayles, L.D. Biology of vertebrates. Macmillan & Co., New York.
12. Weichert, C.K. and Presch, W. Elements of chordate anatomy, 4th edn. McGraw Hall Books Co., New York.
- 13.. Barbiur, T. Reptiles and Amphibians: Their habits and adaptation. Hongton Miffin Co., New York.
14. Kingsely Nobel, G. The biology of the Amphibia. Dover Publications, New York.



ENVIRONMENTAL BIOLOGY

Unit I:

Environment & Concepts

Environment: Abiotic and biotic environment; biotic and abiotic interactions. Habitat and Niche: Concept and types of habitat and niche; fundamental and realized niche; resource partitioning; character displacement.

Unit II:

Population ecology and Species interactions

Population Ecology: Characteristics of a population; population growth curves; population regulation; life history strategies (r and K selection); concept of metapopulation – demes and dispersal, interdemic extinctions, age structured populations. Species Interactions: Types of interactions, interspecific competition, herbivory, carnivory, pollination, symbiosis.

Unit III:

Community Ecology and Ecological Succession

Community Ecology: Nature of communities; community structure and attributes; levels of species diversity and its measurement; edges and ecotones. Ecological Succession: Types; mechanisms; changes involved in succession; concept of climax.

Unit IV:

Ecosystem and Biogeography

Ecosystem: Structure and functions; energy flow and mineral cycling (C,N,S, and P); primary and secondary production ; structure and function of some Indian ecosystems: terrestrial (forest, grassland) and aquatic (fresh water, marine, estuarine). Biogeography: Major terrestrial biomes; theory of island biogeography; biogeographical zones of India.

Unit V:

Pollution and Conservation

Environmental pollution: Air, water, soil and radioactive- Sources, effects and control; Biodiversity: status, types and threats; major drivers of biodiversity change; biodiversity management approaches. Conservation Biology: Principles of conservation, major approaches to management, Wildlife Management-



Sanctuaries and National parks; Biodiversity hot spots - Remote sensing - Indian case studies on conservation / management strategy (Project Tiger, Biosphere reserves). Environmental Impact Assessment.

Suggested Reading Materials:

1. Eugene P. Odum and Gary W. Barrett. 2004 Fundamentals of Ecology. Brooks / Cole Publisher.
2. Eugene P. Odum. 1983. Basic Ecology: Fundamentals of Ecology. Holt-Saunders Publishers, Japan.
3. Turk J. and Turk A: Environmental Science. 1988. Saunders College Publishers.
4. Primark, R.B.: A Primer of Conservation Biology. 4th edition. 2008. Sinauer Associates Publishers.
5. Sharma, P. D. Ecology and Environment 13th edition. 2017. Rastogi Publications
6. Kanagasabai, C.S. 2005. Environmental Studies. Rasee publishers. Madurai.
7. Yogendra, N. and Srivastava, N. 1998. Environmental Pollution, Ashish Publishing House. New Delhi.
8. Sapru R.K. 2001. Environment Management in India, Vol. I & Vol. II Ashish Publishers house, New Delhi.
9. Verma, P.S. and Agarwal, V.K. (2007) Environmental Biology: Principles of Ecology. 11th Reprinted Edition. S. Chand & Co. Ltd., India.
10. Kormondy E. Concepts of Ecology. 1995. 4th edition. Pearson Publishers.
11. Dash M. and Dash S. 2009. Fundamentals of Ecology. McGraw Hill Educations.
12. Raman, N. S., Gajbhiye, A. R. and Khandeshwar, S. R. 2019. Environmental Impact Assessment. Dreamtech Press.
13. Lehman, C. Loberg, S. and Clark, 2019. A. Quantitative Ecology: A New Unified Approach. University of Minnesota Libraries Publishing.



BIOCHEMISTRY

Unit I

Structure of atoms and molecules. Bonds – co valent, electrovalent, Vander Waal's and hydrogen bond. Water - Biological importance, pH. Buffers – biological importance. Unique solvent properties – electrolytic dissociation into cations and anions, Henderson Hassel Balch equation

Unit II

Carbohydrates – classification, structure, properties, biological importance and functions. Metabolism – Metabolism – glycolysis, TCA cycle, glycogenesis, gluconeogenesis, glycogenolysis, HMP shunt pathway Metabolic disorder: diabetes and their biomedical significance.

Unit III

Protein- classification, structure, properties, biological importance and functions of amino acid - Ramachandran plot. Protein metabolism – deamination and transamination, urea cycle. Metabolic disorders – phenylketonuria, alkaptonuria, albinism Enzyme - classification, co- enzyme, iso enzyme, ribozyme. Enzyme kinetics

Unit IV

Lipid – Classification of lipids- simple, compound and derived lipids. Biological importance of lipids. Beta oxidation of fatty acids, ketosis, biosynthesis of fatty acids and triglycerides. Metabolic disorders – Hypercholesterolemia, Hyperlipoproteinemia and Atherosclerosis. Role of liver in fat metabolism

Unit V

Vitamins – Structure of water soluble and fat-soluble vitamins and deficiency symptoms. Nucleic acids- synthesis and degradation of purines and pyrimidines (De novo and Salvage pathways). Syndromes associated with nucleic acid metabolism- Lesch -Nyban syndrome, gout.

Suggested reading materials:

1. Murray, R. K., Granner, D. K., Mayes, P. A., Rodwell, V. W. (2017) Harper's Biochemistry. Prentice Hall International Inc.
2. Lehninger, A. L., Nelson, D. K., and Cox, M. M. (2015) Principles of Biochemistry. CBS Publishers and distributors, New Delhi.



3. Stryer, L. (2016) Biochemistry. W. H. Freeman and Company, New York.
4. Voet.D. Judith, G. Voet, Charlotte W. Pratt. (2014) Fundamentals of Biochemistry, John Wiley& Sons Inc. New York.
5. Satyanarayanan, U (2015). Essentials of Biochemistry, Uppala Author – Publisher Interlinks, Vijayawada.
6. Eric E. Conn, Paul K. Stump F. George Bruening, Roy H. Doi.2007. Outlines of Biochemistry. (5th edn.) John Wiley & Sons, Inc
7. Elliott, W.H.&C. Elliot. 2003. Biochemistry & Molecular Biology. Oxford University Press, UK
8. Horton, H.R., Morson, L.A., Scrimgeour, K.G., Perry, M.D and J.D. Rawn. 2006. Principles of Biochemistry. Pearson Educations, International, New Delhi.
9. Jermy M. Berg, John L Tymoczko, Lubert Stryer, 2012, Biochemistry. W.H. Freeman
- 10.Keith Wilson and John Walker. 2008. Principles and Techniques of Biochemistry and Molecular biology (6th edn). Cambridge University Press, UK.



PRACTICAL -1

STRUCTURE AND FUNCTION OF INVERTEBRATES

1. Collection, Identification and submission of the following
A. Insects (10 nos.) B. Campus fauna (5 nos.)
2. Mounting of appendages of prawn
3. Mounting of mouth parts of cockroach/mosquito /silk worm larvae.
4. Mounting of trachea of cockroach/ any insect.
5. Dissection of Digestive system, Nervous system and Reproductive system
Cockroach/grasshopper
6. Museum specimen/ slides/models/charts
7. Amoeba, Paramecium, Euglena, Ctenophora, Sagitta, Sycon sponge, Sea cucumber, Madrepora, Chaetopterus, Fresh water mussel, Sepia, Octopus, Star fish.

Larval farms: Bipinnaria larva, Rhabditiform larva, Brachiolaria larva, Ophiopleutus larva. Miracidium larva, Redia larva, Cercaria larva, Nauplius larva, Zoea larva, Mysis larva,

Comparative anatomy of the Chordates

1. Collection, Identification and submission of the following
A. Fishes (5 nos.) B. Campus fauna (5 nos.)
2. Mounting of scales from shark skin and from a bony fish.
3. Observation of gills and fins of fishes
4. Using CD/ virtual software/Animation-Observation and Comparison of anatomy of Circulatory system and Nervous system of Vertebrates.
5. Osteology- Skull, Atlas, Axis, typical cervical vertebrae, fore limb, hind limb, pectoral and pelvic girdle of frog / mammal.
6. Museum specimen/ slides/models/charts
Feathers, beak and claws of birds, Horn and hoof of mammal.



PRACTICAL -2

Environmental Biology

1. Estimation of pH in different water samples.
2. Estimation of Total Dissolved Solids (TDS) in different water samples
3. Estimation of Dissolved oxygen
4. Estimation of Dissolved Carbon dioxide (CO₂) in the given water samples.
5. Estimation of Total alkalinity
6. Observation of commensalism and mutualism
7. Observation of host-parasite relationship
8. Observation of prey-predator relationship
9. Food chain and food web in a nearby ecosystem
10. Visit and field study report on a pond, forest or marine ecosystem.

Biochemistry

1. Salivary amylase activity in relation to temperature
2. Salivary amylase activity in relation to pH
3. Salivary amylase activity in relation to substrate concentration
4. Salivary amylase activity in relation to enzyme concentration
5. Chromatographic separation of amino acid
6. Qualitative analysis of nitrogenous waste products
7. Qualitative analysis of carbohydrate, protein and fat
8. Preparation of standard graph for carbohydrate
9. Preparation of standard graph for Protein
10. Quantitative estimation of muscle protein

