



VIJAYANAGARA SRI KRISHNADEVARAYA UNIVERSITY
JNANASAGARA CAMPUS, BALLARI-583105

BACHELOR OF SCIENCE IN ZOOLOGY

PROPOSED SYLLABUS FOR I and II SEMESTER

2024-2025 Onwards

Department Name: Zoology
Semester - I

Course Title: Biology of Non Chordate and Chordate	Course Code: 24MJZOO1L
Total Contact Hours: 56	No. of Credits: 4
L:T:P- 4:0:0	
Internal Assessment Marks: 20	Duration of SEE: 3 Hours
Semester End Exam Marks:	80

Course Outcomes (COs):

At the end of the course, students will be able to:

- CO1. Group animals on the basis of their morphological characteristics/structures
- CO2. Demonstrate comprehensive identification abilities of Non-Chordate diversity
- CO3. Explain structural and functional diversity of Non-Chordates
- CO4. Develop understanding on the diversity of life with regard to protists non-chordates and chordates.
- CO 5. Examine the diversity and evolutionary history of a taxon through the construction of a basic phylogenetic/cladistics tree.
- CO 6. Understand basics of classification of non-chordates.
- CO 7. Learn the diversity of habit and habitat of the species.
- CO 8. Develop the skills to identify different classes and species of animals.
- CO 9. Know uniqueness of a particular animal and its importance

Unit	Description	Hours
1	<p>Protozoa to Coelenterate Protozoa- General Characters and classifications up classes with examples- <i>Paramecium</i> (Morphology and Reproduction) Porifera- General Characters and classifications up classes with examples (Canal System in porifers) Coelenterata– General Characters and classifications up classes with examples <i>Obelia</i> (Morphology and Reproduction). Ctenophora to Nematelminthes General Characters and classifications up classes with examples Ctenophora –Salient feature Platyhelminthes-<i>Taenia</i> (Tapeworm)(Morphology and Reproduction) Nematelminthes-<i>Ascaris lumbricoides</i> (Morphology and Reproduction)</p>	12
2	<p>Annelida General Characters and classifications up classes with examples <i>Annelida–Hirudinaria</i> (Leech) (Morphology and Reproduction). Arthropoda: General Characters and classifications up classes with examples <i>Arthropoda–Palaemon</i> (Prawn) Morphology, Appendages, Nervous System and Reproduction). Mollusca to Echinodermata: General Characters and classifications up classes with examples <i>Mollusca–Pila</i> (Morphology, Shell, Respiration, Nervous System and Reproduction <i>Echinodermata–Pentoceros</i> (Morphology and Water Vascular System)</p>	16

<p>3</p>	<p>Chordates: Origin of Chordates. Basic characters of chordates and classification upto classes.</p> <p>Hemichordata: Type Study of <i>Balanoglossus</i>–Habit and Habitat ,Morphology, Coelom. Tornaria larva and its affinities. Affinities and systematic position of Hemichordata.</p> <p>Urochordata: Type Study of <i>Herdmania</i>-Habit and Habitat, Morphology, Ascidian tadpole- structure and its retrogressive metamorphosis.</p> <p>Cephalochordata : Type Study of <i>Branchiostoma (Amphioxus)</i>-Habit and Habitat, Morphology, Digestive system, Feeding mechanism, excretory and circulatory system.</p> <p>Agnatha General characters of Agnatha and classification upto classes. Salient features of Cyclostomata and Ostracodermi with orders and examples. Ammocoete larva and its significance.</p>	<p>12</p>
<p>4</p>	<p>Vertebrates: General characters and Classification of different classes of (Pisces, Amphibia, Reptilia, Aves, Mammalia) upto the order with characters for each order citing examples Vertebrates Types of caudalfins, scales and swim bladder in fishes. General characters of Chondrichthyes and Osteichthyes. Interesting features and evolutionary significance of Dipnoi. Salient features of Placodermi with examples.</p>	<p>12</p>
<p>References:</p> <ol style="list-style-type: none"> 1. Barnes, R.S.K.; Calow,P.; Olive,P.J.W.; Golding,D.W.; Spicer, J.I.(2002) The Invertebrates: Synthesis,Blackwell Publishing. 2. Hickman,C.; Roberts,L.S.; Keen,S.L.; Larson, A. and Eisenhour, D. (2018) Animal Diversity, McGraw-Hill. 3. Barrington, E.J.W. (1979) Invertebrate Structure and Functions. II Edition. E.L.B.S. and Nelson. 4. Colbert <i>et al</i>: Colbert’s Evolution of the Vertebrates: A history of the backboned animals through time. (5thed2002, Wiley–Liss). 5. Boradale, L.A. and Potts, E.A. (1961) Invertebrates: A Manual for the use of Students. Asia Publishing Home. 6. Hildebrand:Analysis of vertebrate Structure (4thed1995, JohnWiley) 7. Kenneth V.Kardong (20015).Vertebrates:Comparative Anatomy, Function, Evolution McGraw Hill. 8. McFarland<i>et al.</i>,:Vertebrate Life (1979,Macmillan publishing) 9. Parker and Haswell:Text Book of Zoology, Vol. II(1978,ELBS) 10. Romer and Parsons:TheVertebrateBody(6thed1986, CBS Publishing Japan) 11. Young: The Life of vertebrates (3rded. 2006, ELBS/Oxford) 		

Question Paper Pattern for UG Semester Major

Paper Code:	Paper Title:		
Duration of Exam	3Hours	Max Marks	80
Instruction:	Answer all the sections		

Section-A

I. Answer any TEN of the following questions	10x2	20 Marks
. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12.		

Section-B

Answer any FIVE of the following questions (5X4=20)	20 Marks
13. 14. 15. 16. 17. 18.	

Section-C

III. Answer any Four of the following questions (4X10=40)	40 Marks
19. 20. 21. 22. 23.	

Department Name: Zoology
Semester - I

Course Title: Biology of Non Chordate and Chordate	Course Code: 24MJZOO1P
Total Contact Hours: 56	No. of Credits: 2
L:T:P- 0:0:2	
Internal Assessment Marks: 10	Duration of SEE: 3 Hours
Semester End Exam Marks:	40

Course Outcomes (COs):

At the end of the course, students will be able to:

CO1 At the end of the course the student should be able to:

CO2 Understand basics of classification of non-chordates.

CO3 Learn the diversity of habit and habitat of the species.

CO4 Develop the skills to identify different classes and species of animals.

CO5 Know uniqueness of a particular animal and its importance

CO6 Enhancement of basic laboratory skill like keen observation and drawing.

CO7 To demonstrate comprehensive identification abilities of chordate diversity

CO8. Able to explain structural and functional diversity of chordate diversity

CO9. To understand evolutionary relationship amongst chordates

CO10. To take up research in biological sciences.

CO11 To realize that very similar physiological mechanisms are used in very diverse organisms.

CO12 To Get a flavor of research by working on project besides improving their writing skills. It will further enable the students to think and interpret individually.

List of Experiments / Programs (For a Lab Course)

Sl.No	Experiment / Program
1	<p>Preparation and observation of protozoan culture. Protozoa: Systematics of <i>Amoeba</i>, <i>Euglena</i>, <i>Noctiluca</i>, <i>Paramecium</i> and <i>Vorticella</i> (Permanent slides). Porifera: Systematics of <i>Sycon</i>, <i>Euplectella</i>, <i>Hyalonema</i>, <i>Spongilla</i> and <i>Euspongia</i> (Specimens). Study of permanent slides of T.S of <i>Sycon</i>, spicules and gemmules. Cnidaria: Systematics of <i>Aurelia</i> and <i>Metridium</i> (Specimens). Slides of <i>Hydra</i>, <i>Obelia</i>-polyp and medusa and <i>Ephyra</i> larva, T.S. of <i>Metridium</i> passing through mesenteries. Study of Coral: <i>Astraea</i>, <i>Fungia</i>, <i>Meandrina</i>, <i>Corallium</i>, <i>Gorgonia</i>, <i>Millepora</i> and <i>Pennatula</i>. Helminthes: Systematics of <i>Planaria</i>, <i>Fasciola hepatica</i> and <i>Taenia solium</i>, <i>Ascaris</i>-Male and female (Specimens). Slides of T.S. of <i>Planaria</i>, T.S of male and female <i>Ascaris</i>. Annelida: Systematics of <i>Nereis</i>, <i>Heteronereis</i>, <i>Sabella</i>, <i>Aphrodite</i> (Specimens). Slide of T.S. of Earthworm through typhlosole. Dissection of digestive and nervous system of earthworm/leech Arthropoda: Systematics of <i>Panaeus</i>, <i>Palaemon</i>, <i>Astracus</i>, Scorpion, Spider, <i>Limulus</i>, <i>Peripatus</i>, <i>Millipede</i>, <i>Centipede</i>, Prayingmantis, Termite Queen, Moth, Butterfly, Dung beetle/ Rhinoceros beetle (Anysix specimens). Slide of Larvae-Nauplius, Zoea, Mysis. Mouth parts of mosquito/cockraoch Dissection of digestive and nervous system of cockraoch Mollusca: Systematics of <i>Chiton</i>, <i>Mytilus</i>, <i>Aplysia</i>, <i>Pila</i>, <i>Octopus</i>, <i>Sepia</i> (Specimens) and</p>

Glochidium larva (Slide).
Dissection of digestive, nervous system and Pedal ganglia of Freshwater mussle.

Shell Pattern-*Unio, Ostrea, Cypria, Murex, Nautilus, Patella, Dentalium*, Cuttlebone.

Echinodermata: Systematics of Seastar, Brittlestar, Sea Urchin, Sea cucumber, Sealily (Specimens). Slides of Bipinnaria larva, Echino pluteus larva and Pedicellaria.

Protochordata:

Balanoglossus and terebratulid T. S through proboscis

Ascidian/*Herdmania* and *Amphioxus*, T.S. of *Amphioxus* through pharynx and intestine.

Cyclostomata-*Petromyzon*, Ammocoete larva and *Myxine*

Pisces:

Cartilaginous Fishes – *Narcine, Trygon, Pristis, Myliobatis*

Bony Fishes – Zebrafish, Hippocampus, Muraena, Ostracion, Tetradon, Pleuronectes, Diodon, Echeneis. (Any six).

Ornamental fishes:

-Siamese, Koi, Oscar, Betta Sp., Neon tetra, Guppies, Goldfish, Angelfish, Rainbow fish, Mollies (Any four).

Accessory respiratory organs – *Saccobranchus, Clarias* and *Anabas*.

Amphibia:

-*Rana, Bufo, Ambystoma, Axolotl* larva, *Necturus* and *Ichthyophis*.

Reptilia:

-Turtle, Tortoise, *Mabuya, Calotes*, Chameleon, *Varanus*.

snakes – Dryophis, Ratsnake, Brahmini, Cobra, Krait, Russell's viper and Hydrophis;

Aves: Beak and feet modifications in the following examples: Duck, Crow, Sparrow, Parrot, Kingfisher, Eagle or Hawk.

Mammalia:

Mongoose, Squirrel, Pangolin, Hedge Hog, Rat and Loris.

Virtual Dissection/Cultured specimens:

Shark/Bony fish: Afferent and efferent branchial systems, glossopharyngeal and vagus nerves.

Virtual Dissection/Cultured specimens:

Rat: Dissection (only demonstration) – Circulatory system (arterial and venous), urinogenital system.

Minimum any 15 practical shall be completed during the course

Diagrams shall be drawn in the record books (Pasting of Photocopy of images/figures not to encouraged/allowed)

References:

1. Barnes, R.S.K.; Calow, P.; Olive, P.J.W.; Golding, D.W.; Spicer, J.I. (2002) The Invertebrates: Synthesis, Blackwell Publishing.
2. Hickman, C.; Roberts, L.S.; Keen, S.L.; Larson, A. and Eisenhour, D. (2018) Animal Diversity, McGraw-Hill.
3. Barrington, E.J.W. (1979) Invertebrate Structure and Functions. II Edition. E.L.B.S. and Nelson.

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Formative Assessment for Practical	
Assessment Occasion/type	Marks
Test/Presentation/Project/Seminars	5
Laboratory Performance/Participation	5
Total	0 Marks

B.Sc. I Semester Practical Examination

Time: 3 hours

Max. Marks: 40

- | | |
|----------------------------|----------|
| 1. Major Experimentation | 12 marks |
| 2. Minor experiment | 08 marks |
| 3. Spotting/Identification | 10 marks |
| 4. Record Book | 5 marks |
| 5. Viva | 5 marks |

Department Name: Zoology
Semester – II

Course Title: Cell and Molecular Biology and Histology	Course Code: 24MJZOO2L
Total Contact Hours: 56	No. of Credits: 4
L:T:P-4-0-0	
Internal Assessment Marks: 20	Duration of SEE: 3 Hours
Semester End Exam Marks:	80

Course Outcomes (COs):

At the end of the course, students will be able to understand:

- 1.CO1. The structure and function of the cell organelles
2. CO2. The chromatin structure and its location
3. CO3. The basic principle of life, how a cell divides leading to the growth of an organism and also reproduces to form a new organisms.
- 4.CO4. How a cell communicates with its neighbouring cells.
5. CO5. After successful accomplishment of the course, the learners will be able to acquire better understanding and comprehensive knowledge regarding most of the essential aspects of Molecular Biology subject which in turn will provide a fantastic opportunity to develop professional skill related to the field of molecular biology.
6. CO6 To obtain the knowledge about the tissues and organs.

Unit	Description	Hours
1	<p>Structure and Function of Cell Organelles I in Animal cell Plasma membrane: chemical structure—lipids and proteins Endomembrane system: protein targeting and sorting, transport, endocytosis and exocytosis</p> <p>Structure and Function of Cell Organelles II in Animal Cell Cytoskeleton: microtubules, microfilaments, intermediate filaments Mitochondria: Structure, oxidative phosphorylation; electron transport system Peroxisome and Ribosome: structure and function</p> <p>Nucleus and Chromatin Structure Structure and function of nucleus in eukaryotes Chemical structure and base composition of DNA and RNA DNA supercoiling, chromatin organization, structure of chromosomes Types of DNA and RNA</p>	16
2	<p>Cell cycle, Cell Division and Cell Signaling Cell division: mitosis and meiosis Introduction to Cell cycle and its regulation, apoptosis Signal transduction: intracellular 11 signalling and cell surface receptors, via G-protein linked receptors Cell-cell interaction: cell adhesion molecules, cellular junctions</p> <p>Process of Transcription Fine structure of gene (Cistron, Recon, Muton) RNA polymerases - types and functions Transcription in prokaryotes and eukaryotes</p>	14
3	<p>Process of Translation Genetic code and its salient features</p>	14

	<p>Translation in prokaryotes and eukaryotes</p> <p>Regulation of gene expression-I</p> <p>Regulation of gene expression in prokaryotes- lac operon (inducible) and trp operon (repressible) in E. coli</p> <p>Regulation of gene expression in eukaryotes - Role of chromatin (euchromatin and heterochromatin) in gene expression.</p> <p>Post-transcriptional modification: capping, splicing, polyadenylation</p> <p>Concept of RNA editing (mRNA), gene silencing, and, RNAi</p>	
4	<p>Histology</p> <p>Study of histological structure and functions of following Mammalian organs</p> <p>Introduction to histology,</p> <p>Tongue with reference to mucosa papillae and taste bud.</p> <p>Alimentary canal: Basic histological organisation with reference to: Stomach (T.S), small intestine (T.S.)</p> <p>Glands associated with digestive system: Liver (C.S) and Pancreas (C.S.) including both exocrine and endocrine component.</p> <p>Kidney: Structure of nephron. T.S. of kidney passing through cortex and medulla</p> <p>Reproductive organs: a) Testis (T.S) with reference to seminiferous tubules and cell of leydig b) Ovary (C.S.)- Primary, secondary and matured (graafian) follicle corpus luteum and corpus albicans.</p> <p>Histology of endocrine glands: 1) Pituitary 2) Thyroid 3) Adrenal</p>	12
	<p>1. References:</p> <p>2. Nelson & Cox: Leininger's Principles of Biochemistry: McMillan (2000)</p> <p>3. Zubay et al: Principles of Biochemistry: WCB (1995)</p> <p>4. Voet & Voet: Biochemistry Vols 1 & 2: Wiley (2004)</p> <p>5. Murray et al: Harper's Illustrated Biochemistry: McGraw Hill (2003) Elliott and Elliott: Biochemistry and Molecular Biology: Oxford University Press .</p> <p>6. Bailey Text Book of Histology. 1971 16th edition. Wilfred M. Copenhaver Richar P. Bung and Mary bartell Bunge. The William and Wilkings Company Baltimore.</p> <p>7. Histology 979. 8th Arthur W. Ham. David H. Cormark. J. B. Lippincot. Co. Philadelphia.</p>	



Formative Assessment for theory paper	
Assessment Occasion/type	Marks
Internal Assessment (Test) I & II Test (7.5x2)	15
Seminar/Assignment	5
Total	20 Marks

Question Paper Pattern for UG Semester Major

Paper Code:	Paper Title:		
Duration of Exam	3 Hours	Max Marks	80
Instruction:	Answer all the sections		

Section-A

I. Answer any TEN of the following questions	10x2	20 Marks
. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11		

Section-B

Answer any FIVE of the following questions (5X4=20)	20 Marks
13. 14. 15. 16. 17. 18.	

Section-C

III. Answer any Four of the following questions (4X10=40)	40 Marks
19. 20. 21. 22. 23.	

Department Name: Zoology
Semester - II

Course Title: Cell and Molecular Biology and Histology	Course Code: 24MJZOO2P
Total Contact Hours: 56	No. of Credits: 2
L:T:P-0:0:4	
Internal Assessment Marks: 10	Duration of SEE: 3 Hours
Semester End Exam Marks: 40	

Course Outcomes (COs):

At the end of the course, students will be able to:

- CO1.** Use simple and compound microscopes
- CO2.** Prepare stained slides to observe the cell organelles.
- CO3.** Be familiar with the basic principle of life, how a cell divides leading to the growth of an organism and also reproduces to form new organisms.
- CO4.** How chromosomal aberrations are inherited in humans by pedigree analysis in families. The antigen-antibody reaction.
- CO5.** They can perform techniques involved in molecular biology and diagnosis of diseases.

List of Experiments / Programs (For a Lab Course)

Sl.No	Experiment / Program
1	Understanding of simple and compound microscopes.
2	To study different cell types such as buccal epithelial cells, neurons, striated muscle cells using Methylene blue/any suitable stain (virtual/ slaughtered tissue).
3	To study the different stages of Mitosis in root tip of <i>Allium cepa</i> .
4	To study the different stages of Meiosis in grasshopper testis (virtual).
5	To check the permeability of cells using salt solution of different concentrations.
6	Extraction of DNA from the given animal tissue sample.
7	To estimate amount of DNA by di-phenyl amine (DPA) method.
8	Basic principle of histology-Tissue processing (
9	To study the preparation of temporary histological slides by single/double staining methods
10	To study the preparation of permanent temporary histological slides by single/double staining methods
11	Study of histology of endocrine glands (Testes, Ovary, Pancreas, Intestine, Kidney, Liver, Adrenal, Pituitary)

References:

Lodish et al: Molecular Cell Biology: Freeman & Co, USA(2004).
 Alberts et al: Molecular Biology of the Cell: Garland(2002).
 Cooper: Cell: A Molecular Approach: ASM Press(2000).
 Karp: Cell and Molecular Biology: Wiley (2002). Pierce B. Genetics. Freeman(2004).
 Gerald Karp. Cell and Molecular Biology: Concepts and Experiments, 5th Edition. Wiley Publication (2008).
 Harvey Lodish, Arnold Berk, Paul Matsudaira, Chris A. Kaiser, Monty Krieger, Freeman. Molecular Cell

Biology, 5th edition. W. H. & Company (2003).
James D. Watson, Tania A. Baker, Stephen P. Bell, Alexander Gann, Michael Levine, Richard Losick.
Molecular Biology of the Gene, 5th edition. Cold Spring Harbor Laboratory Press (2003).

Pedagogy: Written Assignment/Presentation/Project / Term Papers/Seminar

Formative Assessment for Practical	
Assessment Occasion/type	Marks
Test/Presentation/Project/Seminars	5
Laboratory Performance/Participation	5
Total	10 Marks

B.Sc. I Semester Practical Examination

Time: 3 hours

Max. Marks: 40

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