

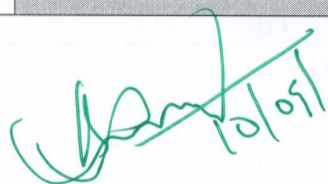


ANDHRA KESARI UNIVERSITY:: ONGOLE

**Model Syllabus for 4-Year UG Honours in B.Sc. (Zoology) as Major in
consonance with Curriculum framework w.e.f. AY 2025-26**

COURSE STRUCTURE (for Semester I to VI)

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
I	I	1	Animal Diversity-I Biology of Non- Chordates	3	3
			Animal Diversity-I Biology of Non-Chordates-Practical	2	1
		2	Animal Diversity-II Biology of Chordates	3	3
			Animal Diversity-II Biology of Chordates-Practical	2	1
	II	3	Cell and Molecular Biology	3	3
			Cell and Molecular Biology-Practical	2	1
		4	Embryology	3	3
			Embryology-Practical	2	1
II	III	5	Genetics	3	3
			Genetics-Practical	2	1
		6	Evolution and Zoogeography	3	3
			Evolution and Zoogeography-Practical	2	1
		7	Animal Physiology: Life Sustaining systems	3	3
			Animal Physiology: Life Sustaining systems-Practical	2	1
	IV	8	Immunology	3	3
			Immunology-Practical	2	1
		9	Animal Biotechnology	3	3
			Animal Biotechnology-Practical	2	1
		10	Wildlife and Conservation Biology	3	3
			Wildlife and Conservation Biology-Practical	2	1
III	V	11	Economic Zoology	3	3
			Economic Zoology-Practical	2	1


 M. Gnan Selthar
 BOS-Chairman
 10/9/25

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits	
		12 A	Biology of Fin Fish & Shell Fish	3	3	
			Biology of Fin Fish & Shell Fish-Practical	2	1	
		OR				
		12 B	Poultry Products and Management	3	3	
			Poultry Products and Management-Practical	2	1	
		OR				
		12 C	Mulberry and Silk Worm Rearing	3	3	
			Mulberry and Silk Worm Rearing-Practical	2	1	
		OR				
		12 D	Basics of Bioinformatics and Computational Tools Course	3	3	
			Basics of Bioinformatics and Computational Tools Course-Practical	2	1	
		OR				
		12 E	Milk and Milk Products Technology	3	3	
			Milk and Milk Products Technology-Practical	2	1	
		13 A	Sustainable Aquaculture	3	3	
			Sustainable Aquaculture-Practical	2	1	
		OR				
		13 B	Poultry Waste Management	3	3	
			Poultry Waste Management-Practical	2	1	
		OR				
		13 C	Silk Technology	3	3	
			Silk Technology-Practical	2	1	
		OR				
		13 D	Molecular Biology and Genetic Technology	3	3	
			Molecular Biology and Genetic Technology-Practical	2	1	
		OR				
		13 E	Milk, Meat Hygiene, Food Safety and Public Health	3	3	
			Milk, Meat Hygiene, Food Safety and Public Health-Practical	2	1	
		VI	14 A	Ornamental Fishery	3	3
				Ornamental Fishery-Practical	2	1
OR						

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits	
		14 B	Poultry Economics and Marketing	3	3	
			Poultry Economics and Marketing-Practical	2	1	
		OR				
		14 C	Therapeutic and Cosmetic Applications	3	3	
			Therapeutic and Cosmetic Applications-Practical	2	1	
		OR				
		14 D	Biostatistics and Programming for Life Sciences	3	3	
			Biostatistics and Programming for Life Sciences-Practical	2	1	
		OR				
		14 E	Livestock Economics, Marketing and Business Management	3	3	
			Livestock Economics, Marketing and Business Management-Practical-Practical	2	1	
		15 A	Post Harvest Technology of Fish and Fisheries	3	3	
			Post Harvest Technology of Fish and Fisheries-Practical	2	1	
		OR				
		15 B	Poultry Entrepreneurship	3	3	
			Poultry Entrepreneurship-Practical	2	1	
		OR				
		15 C	Sericulture Marketing and Entrepreneurship	3	3	
			Sericulture Marketing and Entrepreneurship-Practical	2	1	
		OR				
		15 D	Genomics, Proteomics- Applications in Zoology	3	3	
			Genomics, Proteomics- Applications in Zoology-Practical	2	1	
		OR				
		15 E	Livestock Entrepreneurship	3	3	
			Livestock Entrepreneurship-Practical	2	1	

Note: In the III Year (during the V and VI Semesters), students are required to select a pair of electives from one of the **Five** specified domains. **For example: if set 'A' is chosen, courses 12 to 15 to be chosen as 12 A, 13 A, 14 A and 15 A.** To ensure in-depth understanding and skill development in the chosen domain, students must continue with the same domain electives in both the V and VI Semesters.

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10/09/14

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(Dr. R. AKHAR KUMAR)

Syllabus adopted & approved
M. Gaur Sarda 10/9/25
BOS Chairman - Zoology

SEMESTER-I

COURSE 1: ANIMAL DIVERSITY-I BIOLOGY OF NON-CHORDATES

Theory

Credits: 3

3 hrs/week

COURSE OBJECTIVES:

- To understand the taxonomic position of protozoa to helminthes.
- To understand the general characteristics of animals belonging to Protozoa to Hemichordate.
- To understand the structural organization of animals phylum from protozoa to Hemi Chordata.
- To understand the origin and evolutionary relationship of different phyla from Protozoa to Hemi Chordata.
- To understand the origin and evolutionary relationship of different phylum from annelids to hemichordates.

LEARNING OUTCOMES:

By the completion of the course student will able to –

- Describe concept of animal kingdom classification and general characters of Protozoa
- Classify Porifera and Coelenterata with taxonomic keys
- Classify Phylum Platy & Nematelminthes using examples, parasitic adaptation
- Describe Phylum Annelida & Arthropoda using examples and economic importance of vermicomposting & economic importance of insects.
- Describe Mollusca, Echinodermata & Hemichordata with suitable examples in relation to the phylogeny

SYLLABUS:

UNIT-I

- 1.1 Whittakers five kingdom concept and classification of Animal Kingdom.
- 1.2 Protozoa General Characters and classification up to classes with suitable examples
- 1.3 Protozoa Locomotion & nutrition
- 1.4 Protozoa reproduction

Activity: Assignment /Seminar on the above

Evaluation: Marks to be awarded for written and oral presentations

UNIT –II

- 2.1 Porifera General characters and classification up to classes with suitable examples
- 2.2 Canal system in sponges
- 2.3 Coelenterata General characters and classification up to classes with suitable examples
- 2.4 Polymorphism in coelenterates & Corals and coral reefs

Activity: Assignment /Seminar /Quiz/Project on the above

Evaluation: Evaluation of Written part Evaluation of oral Presentation, Assessment of students in Quiz participation and Ranking - Evaluation of Project Report and oral presentation

UNIT – III

- 3.1 Platyhelminthes General characters and classification up to classes with suitable examples
- 3.2 Parasitic Adaptations in helminths
- 3.3 Nematelminthes General characters and classification up to classes with suitable examples
- 3.4 Life cycle and pathogenicity of *Ascaris lumbricoides*

Activity: *Assignment /Seminar /Quiz/Project/Peer teaching on the above*

Evaluation: *Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity*

UNIT – IV

- 4.1 Annelida General characters and classification up to classes with suitable examples
- 4.2 Vermiculture - Scope, significance, earthworm species, processing, Vermicompost, economic importance of vermicompost
- 4.3 Arthropoda General characters and classification up to classes with suitable examples
- 4.4 *Peripatus* - Structure and affinities

Activity: *Assignment /Seminar /Quiz/Project/Peer teaching on the above*

Evaluation: *Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity*

UNIT – V

- 5.1 Mollusca General characters and classification up to classes with suitable examples
- 5.2 Pearl formation in Pelecypoda
- 5.3 Echinodermata General characters and classification up to classes with suitable examples
Water vascular system in star fish
- 5.4 Hemichordata General characters and classification up to classes with suitable examples
Balanoglossus - Structure and affinities

Activity: *Assignment /Seminar /Quiz/Project/Peer teaching on the above*

Evaluation: *Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity*

CO-CURRICULAR ACTIVITIES:

- Preparation of chart/model of phylogenetic tree of life, 5-kingdom classification
- Visit to Zoology Museum or Coral Island as part of Zoological tour
- Charts on polymorphism
- Clay models of canal system in sponges
- Plaster-of-paris model of *Peripatus*
- Construction of a vermicompost in each college, manufacture of manure by students and donating to local farmers
- Chart on pearl forming layers using clay
- Visit to a pearl culture rearing industry/institute
- Live model of water vascular system
- Observation of *Balanoglossus* for its tubicolous habit

REFERENCE BOOKS:

- L.H. Hyman „*The Invertebrates' Vol I, II and V.* – M.C. Graw Hill Company Ltd.
- Kotpal, R.L. 1988 - 1992 Protozoa, Porifera, Coelenterata, Helminthes, Arthropoda, Mollusca, Echinodermata. Rastogi Publications, Meerut.
- E.L. Jordan and P.S. Verma „*Invertebrate Zoology' S. Chand and Company.*

- R.D. Barnes „*Invertebrate Zoology*’ by: W.B. Saunders CO., 1986.
- Barrington. E.J.W., „*Invertebrate structure and Function*’ by ELBS.
- P.S. Dhami and J.K. Dhami. *Invertebrate Zoology*. S. Chand and Co. New Delhi.
- Parker, T.J. and Haswell “*A text book of Zoology*’ by, W.A., Mac Millan Co. London.
- Barnes, R.D. (1982). *Invertebrate Zoology*, V Edition”

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10/09/25

Syllabus adapted approved
M. Ghanshyam 10/9/25
Zoology - BOS Chairman

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10/09/25

SEMESTER-I

COURSE 1: ANIMAL DIVERSITY-I BIOLOGY OF NON-CHORDATES

Practical

Credits: 1

2 hrs/week

COURSE OBJECTIVES:

- To understand the importance of preservation of museum specimens
- To identify animals based on special identifying characters
- To understand different organ systems through demo or virtual dissections
- To maintain a neat, labelled record of identified museum specimens

SYLLABUS:

1. Study of museum slides / specimens / models (Classification of animals up to orders)
2. Protozoa: *Amoeba*, *Paramecium*, *Paramecium Binary fission and Conjugation*, *Vorticella*, *Entamoeba histolytica*, *Plasmodium vivax*
3. Porifera: *Sycon*, *Spongilla*, *Euspongia*, *Sycon- T.S & L.S*, Spicules, Gemmule
4. Coelenterata: *Obelia – Colony & Medusa*, *Aurelia*, *Physalia*, *Velella*, *Corallium*, *Gorgonia*, *Pennatula*
5. Platyhelminthes: *Planaria*, *Fasciola hepatica*, *Fasciola larval forms – Miracidium*, *Redia*, *Cercaria*, *Echinococcus granulosus*, *Taenia solium*, *Schistosoma haematobium*
6. Nematelminths: *Ascaris (Male & Female)*, *Dracunculus*, *Ancylostoma*, *Wuchereria*
7. Annelida: *Nereis*, *Aphrodite*, *Chaetopteurs*, *Hirudinaria*, Trochophore larva
8. Arthropoda: *Cancer*, *Palaemon*, *Scorpion*, *Scolopendra*, *Sacculina*, *Limulus*, *Peripatus*,
9. Larvae - Nauplius, Mysis, Zoea, Mouth parts of male & female *Anopheles* and *Culex*, Mouthparts of Housefly and Butterfly.
10. Mollusca: *Chiton*, *Pila*, *Unio*, *Pteredo*, *Murex*, *Sepia*, *Loligo*, *Octopus*, *Nautilus*, Glochidium larva
11. Echinodermata: *Asterias*, *Ophiothrix*, *Echinus*, *Clypeaster*, *Cucumaria*, *Antedon*, Bipinnaria larva
12. Hemichordata: *Balanoglossus*, Tornaria larva

Dissections:

Computer - aided techniques should be adopted or show virtual dissections Dissection of edible (Prawn/Pila) invertebrate as per UGC guidelines

An "Animal album" containing photographs, cut outs, with appropriate write up about the above- mentioned taxa. Different taxa/ topics may be given to different sets of students for this purpose

REFERENCE WEB LINKS:

- <https://virtualmicroscopy.peabody.yale.edu/>
- <https://tnhm.in/category/assorted-gallery-for-vertebrates-and-invertebrates/invertebrates/>
- <http://www.nhc.ed.ac.uk/index.php?page=24.25.312>
- <https://biologyjunction.com/invertebrate-notes/>
- <https://lanwebs.lander.edu/faculty/rsfox/invertebrates/>
- <https://www.youtube.com/watch?v=iqrVmz625WA>
- <https://www.youtube.com/watch?v=5VIJ59oX7G0>
- <https://www.youtube.com/watch?v=sMutOON6zHE>
- <https://www.youtube.com/watch?v=zSTYRtliac0>

SEMESTER-I

COURSE 2: ANIMAL DIVERSITY-II BIOLOGY OF CHORDATES

Theory

Credits: 3

3 hrs/week

COURSE OBJECTIVES:

- To understand the animal kingdom.
- To understand the taxonomic position of Protochordata to Mammalia.
- To understand the general characteristics of animals belonging to Fishes to Reptilians.
- To understand the body organization of Chordata.
- To understand the taxonomic position of Protherian mammals.

LEARNING OUTCOMES:

By the completion of the course student will be able to –

- Describe general taxonomic rules on animal classification of chordates
- Classify Protochordata to Mammalia with taxonomic keys
- Understand Mammals with specific structural adaptations
- Understand the significance of dentition and evolutionary significance
- Understand the origin and evolutionary relationship of different phyla from Prochordata to Mammalia.

SYLLABUS:

UNIT - I

- 1.1 General characters and classification of Chordata up to classes
- 1.2 Salient features of Cephalochordata, Salient features of Urochordata
- 1.3 Structure and life history of *Herdmania*, Retrogressive metamorphosis –Process and Significance
- 1.4 Cyclostomata, General characters, Comparison of Petromyzon and Myxine

Activity: Model preparation /Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

UNIT - II

- 2.1 General characters of Fishes, Salient features Dipnoi
- 2.2 *Scoliodon*: External features, Digestive system, Respiratory system
- 2.3 *Scoliodon* Structure and function of Heart, Structure and functions of the Brain.
- 2.4 Migration in Fishes, Types of Scales

Activity: Model preparation /Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

UNIT - III

- 3.1 General characters of Amphibia, General characters of Reptilia
- 3.2 *Rana hexadactyla*: External features, Respiratory system, Structure and function of Heart
- 3.3 *Rana hexadactyla* structure and functions of the Brain
- 3.4 *Calotes*: External features, Digestive system, structure and function of Brain
- 3.5 Identification of Poisonous snakes

Activity: *Model preparation /Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above*

Evaluation: *Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity*

UNIT - IV

- 4.1 General characters of Aves
- 4.2 *Columba livia*: External features, Digestive system, Respiratory system
- 4.3 *Columba livia*: Structure and function of Heart, structure and function of Brain
- 4.4 Migration in Birds, Flight adaptation in birds

Activity: *Model preparation/Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above*

Evaluation: *Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity*

UNIT - V

- 5.1 General characters of Mammalia
- 5.2 Classification of Mammalia up to sub - classes with examples
- 5.3 Comparison of Prototherians, Metatherians and Eutherians
- 5.4 Dentition in mammals, Aquatic mammals Adaptations

Activity: *Model preparation/Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above*

Evaluation: *Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity*

CO-CURRICULAR ACTIVITIES

- Preparation of charts on Chordate classification (with representative animal photos) and retrogressive metamorphosis
- Clay models of Herdmania and Amphioxus
- Visit to local fish market and identification of local cartilaginous and bony fishes
- Maintaining of aquarium by students
- Model of fish heart and brain
- Preparation of slides of scales of fishes
- Visit to local/nearby river to identify migratory fishes and prepare study notes
- Preparation of Charts on above topics by students (Eg: comparative account of vertebrate heart/brain/lungs, identification of snakes etc.)
- Collecting and preparation of Museum specimens with dead frogs/snakes/lizards etc., and/or their skeletons
- Additional input on types of snake poisons and their antidotes (student activity).
- Collection of bird feathers and submission of report on Plumology
- Taxidermic preparation of dead birds for Zoology Museum
- Map pointing of prototherian and metatherian mammals
- Chart preparation for dentition in mammals

REFERENCE BOOKS:

- J.Z. Young, 2006. The life of vertebrates. (The Oxford University Press, New Delhi). 646 pages. Reprinted
- Arumugam, N. Chordate Zoology, Vol. 2. Saras Publication. 278 pages. 200 figs.
- A.J. Marshall, 1995. Textbook of zoology, Vertebrates. (The McMillan Press Ltd., UK). 852 pages. (Revised edition of Parker & Haswell, 1961).
- M. Ekambaranatha Ayyar, 1973. A manual of zoology. Part II. (S. Viswanathan Pvt. Ltd., Madras).
- P.S. Dhama & J.K. Dhama, 1981. Chordate zoology. (R. Chand & Co.). 550 pages.
- Gurdarshan Singh & H. Bhaskar, 2002. Advanced Chordate Zoology. Campus Books, 6 Vols.,
1573 pp., tables, figs.
- A.K. Sinha, S. Adhikari & B.B. Ganguly, 1978. Biology of animals. Vol. II. Chordates. (New Central Book Agency, Calcutta). 560 pages.
- R.L. Kotpal, 2022. Modern textbook of zoology, Vertebrates. (Rastogi Publ., Meerut). 632 pages.
- E.L. Jordan & P.S. Verma, 1998. Chordate zoology. (S. Chand & Co.). 1092 pages.
- G.S. Sandhu, 2005. Objective Chordate Zoology. Campus Books, vii, 169 pp.
- Sandhu, G.S. & H. Bhaskar, H. 2004. Textbook of Chordate Zoology. Campus Books, 2 vols., xx, 964 p., figs.
- Veena, 2008. Lower Chordata. (Sonali Publ.), 374 p., tables, 117 figs.

Syllabus adopted & approved
M. Gurubaksh 10/9/15
Zoology BOS Chairman

T. J. ...
10/9/15

SEMESTER-I

COURSE 2: ANIMAL DIVERSITY-II BIOLOGY OF CHORDATES

Practical

Credits: 1

2 hrs/week

COURSE OBJECTIVES:

- To understand the importance of preservation of museum specimens
- To identify animals based on special identifying characters
- To understand different organ systems through demo or virtual dissections
- To maintain a neat, labeled record of identified museum specimens

SYLLABUS:

1. Protochordata: *Herdmania*, *Amphioxus*, *Amphioxus* T.S through pharynx.
2. Cyclostomes: *Petromyzon* and *Myxine*.
3. Pisces: *Pristis*, *Torpedo*, *Hippocampus*, *Exocoetus*, *Echeneis*, *Labeo*, *Catla*, *Clarius*, *Channa*, *Anguilla*.
4. Amphibia: *Ichthyophis*, *Ambystoma*, *Axolotl* larva, *Hyla*,
5. Reptilia: *Draco*, *Chamaeleon*, *Uromastyx*, *Testudo*, *Trionyx*, *Russel's viper*, *Naja*, *Krait*, *Hydrophis*, *Crocodile*.
6. Aves: *Psittacula*, *Eudynamis*, *Bubo*, *Alcedo*.
7. Mammalia: *Ornithorhynchus*, *Pteropus*, *Funambulus*.
8. **Dissections**-As per UGC guidelines *Scoliodon IX* and *X* Cranial nerves, *Scoliodon* Brain
9. Mounting of fish scales

- Note:
1. Dissections are to be demonstrated only by the faculty or virtual.
 2. Laboratory Record work shall be submitted at the time of practical examination.

REFERENCE WEB LINKS:

- <https://nt7-mhe-complex-assets.mheducation.com/nt7-mhe-complex-assets/Upload-20190715/InspireScience6-8CA/LS15/index.html>
- <https://themammallab.com/>
- <http://abacus.bates.edu/acad/depts/biobook/LabConCh.htm>
- <https://virtualzoology.wordpress.com/scoliodon/>
- <http://www.zoologyresources.com/uploadfiles/books/dc64b77d8769325515d17c945e461b45.pdf>

Syllabus adopted & approved

M. Guruselvaraj 10/9/25

Zoology BOS Chairman

T. Arulraj
10/09/25

(Signature)
10/09/25

SEMESTER-II

COURSE 3: CELL & MOLECULAR BIOLOGY

Theory

Credits: 3

3 hrs/week

COURSE OBJECTIVES:

- To understand the cell and distinguish between prokaryotic and eukaryotic cell
- To understand the role of different cell organelles in maintenance of life activities
- To acquaint the students with the concepts of cell division and cell cycle
- To acquaint student with basic concepts of molecular biology as to how characters are expressed with a coordinated functioning of replication, transcription and translation in all living beings
- To acquaint the students on the biological importance of biomolecules.

LEARNING OUTCOMES:

The overall course outcome is that the student shall develop deeper understanding of what life is and how it functions at cellular level. This course will provide students with a deep knowledge in Cell and molecular biology by the completion of the course student will able to –

- Understand the basic UNIT of the living organisms and to differentiate the organisms by their cell structure.
- Describe fine structure and function of plasma membrane and different cell organelles of eukaryotic cell.
- Explain the cell cycle and bioenergetics of the cell
- Understand the central dogma of molecular biology and flow of genetic information from DNA to proteins
- Understand the gene expression phenomenon and biological importance of biomolecules

SYLLABUS:

UNIT-I Cell Biology-I

- 1.1 Definition, history, prokaryotic and eukaryotic cells, virus, viroids, mycoplasma
- 1.2 Electron microscopic structure of animal cell.
- 1.3 Plasma membrane –Models and Fluid mosaic model
- 1.4 Transport functions of plasma membrane-Active – passive- facilitated.

Activity: *Model preparation of cell/Assignment /Students Seminar /Quiz/Project/Peer teaching on the above*

Evaluation: *Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity*

UNIT -II Cell Biology-II

- 2.1 Structure and functions of Golgi complex & Endoplasmic Reticulum
- 2.2 Structure and functions of Lysosomes & Ribosomes
- 2.3 Structure and functions of Mitochondria & Centriole
- 2.4 Structure and functions of Nucleus & Chromosomes

Activity: *Model preparation of cell organelles/Assignment /Students Seminar /Quiz/Project/Peer teaching on the above*

Evaluation: *Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity*

UNIT – III: Cell Biology-III

- 3.1 Cell Division- mitosis, meiosis
- 3.2 Cell cycle – stages- check points- regulation
- 3.3 Abnormal cell growth- cancer- apoptosis
- 3.4 Bio energetics- Glycolysis-Krebs cycle-ETS

Activity: Model preparation cell division /Assignment /Students Seminar /Quiz/Project/Peer teaching/Report writing after watching any video on the above

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

UNIT -IV: Molecular Biology-I

- 4.1 Central Dogma of Molecular Biology
- 4.2 Basic concepts of - DNA replication – Overview (Semi-conservative mechanism, Semi- discontinuous mode, Origin & Propagation of replication fork)
- 4.3 Transcription in prokaryotes – Initiation, Elongation and Termination, Post-transcriptional modifications (basics)
- 4.4 Translation – Initiation, Elongation and Termination

Activity: Model preparation of DNA/Assignment /Students Seminar /Quiz/Project/Peer teaching/Report writing after watching any video on the above

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

UNIT -V: Molecular Biology-II

- 5.1 Gene Expression in prokaryotes (Lac Operon); Gene Expression in eukaryotes
- 5.2 Biomolecules- Carbohydrates (Glucose- structure-properties- biological importance only)
- 5.3 Biomolecules- Protein (Amino acid- structure- properties- biological importance only)
- 5.4 Biomolecules- Lipids (Fatty acid- structure - properties- biological importance only)

Activity: Assignment /Students Seminar /Quiz/Project/Peer teaching/Report writing after watching any video on the above

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

CO-CURRICULAR ACTIVITIES:

- Model of animal cell
- Working model of mitochondria to encourage creativity among students
- Photo album of scientists of cell biology
- Charts on plasma membrane models/cell organelles
- Charts on central dogma/lac operon/genetic code
- Model of semi-conservative model of DNA replication
- Power point presentation of any of the above topics by students

REFERENCE BOOKS:

- Lodish, Berk, Zipursky, Matsudaria, Baltimore, Darnell, Molecular Cell Biology. Freeman and company New York. * Cell Biology by De Robertis
- Bruce Alberts, Molecular Biology of the Cell * Rastogi, Cytology *Varma & Aggarwal, Cell Biology *C.B. Pawar, Cell Biology * Molecular Biology by Frei fielder
- Instant Notes in Molecular Biology by Bios scientific publishers and Viva Books Private Limited * James D. Watson, Nancy H. Hopkins „Molecular Biology of the Gene“

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10/09/15
Syllabus adopted & approved
H. Gunder Jethal 10/9/15
Zudongy BOS Chairman

SEMESTER-II

COURSE 3: CELL & MOLECULAR BIOLOGY

Practical

Credits: 1

2 hrs/week

COURSE OBJECTIVES:

- Acquainting and skill enhancement in the usage of laboratory microscope
- Hands-on experience of different phases of cell division by experimentation
- Develop skills on human karyotyping and identification of chromosomal disorders
- To apply the basic concept of inheritance for applied research
- To get familiar with phylogeny and geological history of origin & evolution of animals

SYLLABUS:

1. Preparation of temporary slides of Mitotic divisions with onion root tips
2. Observation of various stages of Mitosis with prepared slides
3. Observation of various stages of Meiosis with prepared slides
4. Mounting of salivary gland chromosomes of Chironomus
5. Test for carbohydrate in given biological sample (Benedicts test)
6. Test for Protein in given biological sample (Nitric acid test -white ring)
7. Test for lipid in the given biological sample (Saponification test)

REFERENCE WEB LINKS:

- <https://cbi-au.vlabs.ac.in/>
- <https://www.youtube.com/watch?v=xhnUZAyNdQk>
- https://www.youtube.com/watch?v=l8LXQq5_VL0
- <https://www.labster.com/simulations>
- <https://www.sciencecourseware.org/BiologyLabsOnline/protected/TranslationLab/index.php>
- <https://virtual-labs.github.io/exp-analysis-of-carbohydrates-au/procedure.html>
- https://www.labxchange.org/library/items/lb:LabXchange:f10fd7ad:lx_simulation:1
- <http://www.zoologyresources.com/uploadfiles/books/dc64b77d8769325515d17c945e461b45.pdf>

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syllabus adopted & approved

M. Ghem Sarker
10/9/25

Zoology BOS chairman

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SEMESTER-II

COURSE 4: EMBRYOLOGY

Theory

Credits: 3

3 hrs/week

COURSE OBJECTIVES:

- The objective of this course is to provide a comprehensive understanding of the concepts of early animal development.
- Students taking this course must develop a critical appreciation of methodologies specifically used to study the process of embryonic development in animals.
- In this course different concepts of animal development will be elaborated
- Students will be made familiar with different approaches that have been used to study embryology.
- Topics that will be discussed are organogenesis and regeneration.

LEARNING OUTCOMES:

The overall course outcome is that the student shall develop deeper understanding of concepts of embryology. This course will provide students with a deep knowledge in embryology, by completion of the course student will be able to –

- Understand the historical perspective and concepts of embryology
- Acquire knowledge on gametogenesis, fertilization and cleavage patterns
- Understand the fate of germinal layers and extraembryonic membranes
- Explain the process of regeneration in certain animals
- Examine the process of organogenesis

SYLLABUS:

UNIT-I:

- 1.1 Historical perspective and basic concepts: Phases of development
- 1.2 Cell-Cell interaction, Pattern formation, Differentiation and growth
- 1.3 Differential gene expression,
- 1.4 Cytoplasmic determinants and asymmetric cell division

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

UNIT-II:

- 2.1 Gametogenesis, Spermatogenesis, Oogenesis;
- 2.2 Types of eggs, Egg membranes; Fertilization (External and Internal)
- 2.3 Planes and patterns of cleavage; Types of Blastulae; Fate maps
- 2.4 Early development of frog and chick up to gastrulation

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above/Model preparation on cleavage planes

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

UNIT-III:

- 3.1 Fate of Germ Layers
- 3.2 Extra-embryonic membranes
- 3.3 Placenta (Structure, types and functions of placenta)
- 3.4 Amniocentesis

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above/Chart preparation on the placenta

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

UNIT-IV:

- 4.1 Metamorphosis: Changes, hormonal regulations in amphibians
- 4.2 Regeneration: Modes of regeneration, epimorphosis, morphallaxis and compensatory regeneration (in Turbellarians)
- 4.3 Ageing: Concepts and Theories
- 4.4 Teratogenic agents and their effects on embryonic development

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above /Flow chart preparation on the process of metamorphosis highlighting the periodical changes vs hormone activity

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

UNIT-V:

- 5.1 Comparative study of Gastrulation in Frog, Chick and Mammal
- 5.2 Induction and embryonic organizers (Spemann's experiment)
- 5.3 Organogenesis of Skin
- 5.4 Organogenesis of Circulatory system
(* Organogenesis in Human need to be explained)

Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above /Flow chart preparation on the process of organogenesis highlighting the gradual developments of organ systems

Evaluation: Instructor supposed to prepare a detailed Rubrics for the evaluation of the above activity

CO-CURRICULAR ACTIVITIES:

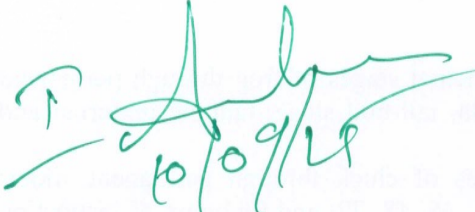
- Preparation of models of different types of eggs in animals
- Chart on frog embryonic development, fate map of frog blastula, cleavage etc.
- Chart on the organogenesis
- RBPT on the Placenta
- Model of extra embryonic membrane
- Laboratory observation of chick embryonic development

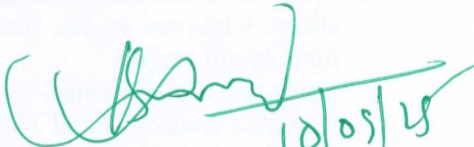
REFERENCES BOOKS:


- Developmental Biology by Balinsky
- Developmental Biology by Gerard Karp
- Chordate embryology by Varma and Agarwal

- Embryology by V.B. Rastogi
- Austen CR and Short RV. 1980. *Reproduction in Mammals*. Cambridge University Press.
- Gilbert SF. 2006. *Developmental Biology*, 8th Edition. Sinauer Associates Inc., Publishers, Sunderland, USA.
- Longo FJ. 1987. *Fertilization*. Chapman & Hall, London.
- Rastogi VB and Jayaraj MS. 1989. *Developmental Biology*. Kedar Anath Ram Nath Publishers, Meerut, Uttar Pradesh.
- Schatten H and Schatten G. 1989. *Molecular Biology of Fertilization*. Academic Press, New York.

Syllabus adopted & approved
 M. Ghem Secha 10/9/25
 BOS Zoology Chairman


 10/09/25


 10/09/25


 M. Ghem Secha
 25/10/25
 BOS - Zoology





SEMESTER-II

COURSE 4: EMBRYOLOGY

Practical

Credits: 1

2 hrs/week

COURSE OBJECTIVES:

- The objective of this course is to provide a comprehensive practical knowledge on the embryology
- Must develop a critical understanding of the early embryological events
- Acquire knowledge on the developmental stages of chick
- Understand the histology of placenta

SYLLABUS:

1. Study of whole mounts and sections of developmental stages of frog through permanent slides: Cleavage stages, blastula, gastrula, neurula, tail-bud stage, tadpole (external and internal gill stages)
2. Study of whole mounts of developmental stages of chick through permanent slides: Primitive streak (13 and 18 hours), 21, 24, 28, 33, 36, 48, 72, and 96 hours of incubation (Hamilton and Hamburger stages)
3. Study of different sections of placenta (photomicrograph/ slides)
4. Project report on chick embryo development

REFERENCE WEB LINKS:

- <https://praxilabs.com/en/3d-simulations/cultivation-and-preparation-of-the-virus-in-chick-embryo-virtual-lab>
- <https://vlab.amrita.edu/>
- <https://www.vlab.co.in/>
- https://www.youtube.com/watch?v=p_tx88He8Pk
- <https://core.ac.uk/download/143957972.pdf>
- <https://egyankosh.ac.in/bitstream/123456789/57549/1/Exercise%207%20Chick%20Embryo.pdf>
- http://www.macollege.in/app/webroot/uploads/department_materials/doc_501.pdf
- <http://www.zoologyresources.com/uploadfiles/books/dc64b77d8769325515d17c945e461b45.pdf>

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• Syllabus adopted & approved
M. Gunderline
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