

**St. Joseph's College for Women (Autonomous), Visakhapatnam**  
**Zoology-Semester I**

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

**Practical**

**Credits: 1**

**2 hrs/week**

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**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

**Course Outcomes**

By the completion of the course the graduate should able to –

CO 1: L2- Describe and place the invertebrates according to their taxonomic position

CO 2: L3- Show versatility in identification of museum specimens.

CO 3: L3- Develop the basic laboratory skills including microscopy, and careful observation.

CO 4: L3- Discuss the importance of preservation of 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. **Nemathelminths:** *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-> Appendages of prawn
- <https://www.youtube.com/watch?v=5VIJ59oX7G0> NS OF PRAWN
- <https://www.youtube.com/watch?v=sMutOON6zHE> STATOCYST
- <https://www.youtube.com/watch?v=zSTYRtliac0> Radula of pila

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**St. Joseph's College for Women (Autonomous), Visakhapatnam**  
**Zoology-Semester I**

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

Theory

Credits: 3

3 hrs/week

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**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 –

CO 1: L2- Describe the concept of animal kingdom classification and general characters of Protozoa

CO 2: L4- Analyze the classification of Porifera and Coelenterata with taxonomic keys

CO 3: L4- Identify and categorize various species within Phylum Platyhelminthes and Nematelminthes using examples, parasitic adaptations.

CO 4: L4- Classify Phylum Annelida & Arthropoda using examples and economic importance of vermicomposting & economic importance of insects.

CO 5: L2- Discuss phylum Mollusca, Echinodermata, and Hemichordata using suitable examples and the biological processes involved in pearl formation and water vascular system.

**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

**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

### 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
- 3.3 Life cycle and pathogenicity of *Ascaris lumbricoides*

### 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

### 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

### CO-CURRICULAR ACTIVITIES:

- Preparation of chart/model of phylogenic 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
- Additional info-*Coenorhabditis***

### 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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**St. Joseph's College for Women (Autonomous), Visakhapatnam**  
**Zoology-Semester I**

**COURSE 1: ANIMAL DIVERSITY-II BIOLOGY OF CHORDATES**

Practical

Credits: 1

2 hrs/week

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**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

**Course outcomes**

CO 1: Identify the vertebrates according to their taxonomic position.

CO 2: Outline the distinctive features and classification of vertebrates.

CO 3: Reinforce the basic laboratory skills including microscopy and careful observation.

CO 4: Discuss the importance of preservation of museum specimens.

CO 5: Identify and discuss the structure and functional complexity of vertebrates in relation to their ecological habitats and behavioural patterns.

**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- Different types of 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> chordates
- <https://virtualzoology.wordpress.com/scoliodon/> Dissection of NS of shark
- [http://www.zoologyresources.com/uploadfiles/books/dc64b77d8769325515d17c945e46\\_1b45.pdf](http://www.zoologyresources.com/uploadfiles/books/dc64b77d8769325515d17c945e46_1b45.pdf)
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**St. Joseph's College for Women (Autonomous), Visakhapatnam**  
**Zoology-Semester I**

**COURSE 1: ANIMAL DIVERSITY-II BIOLOGY OF CHORDATES**

**Theory**

**Credits: 3**

**3 hrs/week**

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**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.

**Course Outcomes:**By the completion of the course, students shall be able to

- CO1: Outline the characteristics and classification of Chordata, and highlight the features of Protochordates.
- CO2: List & Classify the major chordate groups from Pisces to Mammalia using taxonomic keys."
- CO3: Apply the knowledge of the major architectural features of the organ systems and their functions.
- CO4: Explain the concept of migration in fishes and birds.
- CO5: Summarise the significance of dentition in mammals and evolutionary significance.

**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

**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

## 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 & Non-Poisonous snakes.

## 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

## 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

## 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.

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**St. Joseph's College for Women(A), Visakhapatnam**

**ZOOLOGY SEMESTER-II**

**COURSE 3: CELL & MOLECULAR BIOLOGY-PRACTICAL**

**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

**Course Outcomes**

CO 1: L3-Apply microscopy techniques to observe and analyze the various stages of mitotic and meiotic divisions

CO 2: L3-Demonstrate skill in performing experiments following standard protocol.

CO 3: Comply to safety measures in the laboratory and careful handling of glass ware and maintaining laboratory equipments.

**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.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](https://www.labxchange.org/library/items/lb:LabXchange:f10fd7ad:lx_simulation:1)
- <http://www.zoologyresources.com/uploadfiles/books/dc64b77d8769325515d17c945e461b45.pdf>

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**St. Joseph's College for Women (Autonomous), Visakhapatnam**  
**Zoology-Semester II**

**COURSE 3: CELL & MOLECULAR BIOLOGY**

Theory

Credits: 3 Hrs/week

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**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:** by the completion of the course student will able to –

- CO 1: L2- Describe the basic unit of the living organisms and to differentiate the organisms by their cell structure.
- CO 2: L3- Discuss the fine structure and function of plasma membrane and different cell organelles of eukaryotic cell.
- CO 3: L5- Summarize the cell cycle and bioenergetics of the cell.
- CO 4: L4- Outline the central dogma of molecular biology and flow of genetic information from DNA to proteins.
- CO 5: L2- Explain gene expression phenomenon and biological importance of biomolecules.

**SYLLABUS:**

**UNIT-I Cell Biology-I**

- 1.1 Definition, history, prokaryotic and eukaryotic cells, virus, viroids, Prions, 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.

**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

### **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

### **UNIT -IV: Molecular Biology-I**

- 4.1 Structure and types of DNA & RNA. 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

### **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)

### **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 Freifelder
- 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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**St. Joseph's College for Women (Autonomous), Visakhapatnam**  
**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

**Course Outcomes:**

CO1-L2- Recognize the developmental stages of frog and chick embryos as observed through permanent slides / photographs

CO2-L3-Demonstrate characteristics of the cleavage stages, blastula, gastrula, neurula, tail-bud stage, and tadpole stages in frog development.

CO3-L5- Assess the significance of each developmental stage in the overall process of embryogenesis in frogs and chicks.

**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.
5. Observation of fish, shrimp & crab eggs.

**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://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.macollege.in/app/webroot/uploads/department_materials/doc_501.pdf)
- [http://www.zoologyresources.com/uploadfiles/books/dc64b77d8769325515d17c945e461b4\\_5.pdf](http://www.zoologyresources.com/uploadfiles/books/dc64b77d8769325515d17c945e461b4_5.pdf)

**St. Joseph's College for Women (Autonomous), Visakhapatnam**  
**Zoology- Semester II**

**COURSE - EMBRYOLOGY-- Theory**

**Credits: 3**

**3 hrs/week**

**Course Objectives:**

- To provide a comprehensive understanding of the concepts of early animal development.
- Develop a critical appreciation of methodologies specifically used to study the process of embryonic development in animals.
- Learn the different concepts of animal development will be elaborated
- Familiar with different approaches that have been used to study embryology.

**Learning Outcomes:** By completion of the course student will able to

- CO1-L2- Explain the historical perspective and fundamental concepts of embryology.
- CO2-L4- Illustrate the knowledge of gametogenesis, fertilization, and cleavage patterns to understand the process of embryonic development in animals.
- CO3- L3- Develop knowledge about the fate of germinal layers and extraembryonic membranes.
- CO4- L2- Describe the process of regeneration in certain animals.
- CO5-L4- 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

**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

### **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

### **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

### **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)

### **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*, 8<sup>th</sup> 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.

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# ST. JOSEPH'S COLLEGE FOR WOMEN(A), VISAKHAPATNAM

## COURSE 5: ANIMAL DIVERSITY-II BIOLOGY OF CHORDATES

Practical

Credits: 1

2

hrs/week

Z-Ma1-3551(2)

### LEARNING 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

**LEARNING OUTCOMES:** By the end of the course, students will be able to

CO 1: Identify the vertebrates according to their taxonomic position.

CO 2: Outline the distinctive features and classification of vertebrates.

CO 3: Reinforce the basic laboratory skills including microscopy and careful observation.

CO 4: Discuss the importance of preservation of museum specimens.

CO 5: Identify and discuss the structure and functional complexity of vertebrates in relation to their ecological habitats and behavioural patterns.

### 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, Amblystoma, Axolotl larva, Hyla,*
5. **Reptilia:** *Draco, Chamaeleon, Uromastix, Testudo, Trionyx, Russels viper, Naja, Krait, Hydrophis, Crocodile.*
6. **Aves:** *Psittacula, Eudynamis, Bubo, Alcedo.*
7. **Mammalia:** *Ornithorhynchus, Pteropus, Funambulus.*
8. **Dissections-**As per UGC guidelines
9. *Scoliodon IX and X, Cranial nerves*
10. *Scoliodon Brain*
11. *Scoliodon-Digestive system*
12. *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>

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**ST. JOSEPH'S COLLEGE FOR WOMEN(A), VISAKHAPATNAM**  
**SEMESTER-III**

**Course 5-ANIMAL DIVERSITY-II BIOLOGY OF CHORDATES**

Theory	Credits: 3	3 hrs/week
Z Ma1-3501(3)		

**LEARNING 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 the graduate should able to –

- **CO1:** Describe the general characteristics and classification of Chordata and the salient features of Cephalochordata, Urochordata and Protochordates emphasizing the affinities with other chordate groups.
- **CO2:** Apply knowledge of the and major architectural features of the integumentary, skeletal, nervous, muscular, digestive, respiratory, circulatory, excretory, and reproductive systems to describe their structures and functions.
- **CO3:** List the unique features of chordates and use key features to differentiate between vertebrate groups. Relate the ecological role of different groups of vertebrates.
- **CO4:** Define the term migration, discuss migration in fishes and birds.
- **CO5:** Summarise the significance of dentition in mammals and evolutionary significance.

**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*

## 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

## 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 and non-poisonous snakes.

## 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.

## 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

### Co-curricular activities (suggested)

- 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). 852pages. (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. (NewCentral 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.

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**ST. JOSEPH'S COLLEGE FOR WOMEN(A), VISAKHAPATNAM**  
**SEMESTER-III**

**COURSE 7: ANIMAL BIOTECHNOLOGY**

Practical

Credits: 1

2

hrs/week

Z-Ma3-3551(2)

**LEARNING OBJECTIVES**

This course will provide students with a practical knowledge in animal biotechnology, by the completion of the course the graduate shall be able to –

- Acquire knowledge on Cloning vectors widely used in biotechnology
- Empower with the process of DNA quantification and amplification
- Explain purification of biological compounds by paper chromatography
- Get insight maintenance of laboratory apparatus
- Understand principles of animal culture, media preparation

**LEARNING OUTCOMES**

By the end of the course, students will be able to

CO 1: L3-Demonstrate the separation of biological compounds using chromatography technique.

CO 2: L4-Perform practical tasks involving the separation and purification of biological compounds using paper and thin-layer chromatography techniques.

CO 3: L4-Comply to standardized procedures using safety measures in the laboratory and careful handling of glass ware and maintaining laboratory equipments.

**SYLLABUS:**

1. Cloning Vectors: Plasmid vectors: pBR and pUC series, Bacteriophage lambda and M13 based vectors, Cosmids, BACs, YACs, (Charts/Images/Models)
2. DNA quantification using DPA Method.
3. Techniques: DNA Fingerprinting
4. Separation, Purification of biological compounds by paper chromatography
5. Cleaning and sterilization of glass and plastic wares for cell culture.
6. Preparation of cell culture media.
7. Amplification of DNA by PCR
8. Isolation and visualization of Plasmid DNA from E-coli.

*Note: above practical may be demonstrated in the lab or demonstrated by V- lab*

**REFERENCE WEB LINKS:**

- <https://vlab.amrita.edu/>

- <https://www.vlab.co.in/broad-area-biotechnology-and-biomedical-engineering>
- <https://blog.praxilabs.com/2020/06/30/dna-extraction-virtual-lab/>
- <http://mbvi-au.vlabs.ac.in/>
- [https://webstor.srmist.edu.in/web\\_assets/downloads/2021/18BTC203J-lab-manual.pdf](https://webstor.srmist.edu.in/web_assets/downloads/2021/18BTC203J-lab-manual.pdf)
- [https://webstor.srmist.edu.in/web\\_assets/srm\\_mainsite/files/files/BT%200312%20-%20ANIMAL%20CELL%20AND%20TISSUE%20CULTURE%20LABORATORY.pdf](https://webstor.srmist.edu.in/web_assets/srm_mainsite/files/files/BT%200312%20-%20ANIMAL%20CELL%20AND%20TISSUE%20CULTURE%20LABORATORY.pdf)
- <https://davjalandhar.com/dbt/biotechnology/SOP/BSc%20Biotechnology%20Semester%20V%20%26%20VI.pdf>
- [https://www.austincc.edu/awheeler/Files/BIOL%201414%20Fall%202011/BIOL1414\\_Lab%20Manual\\_Fall%202011.pdf](https://www.austincc.edu/awheeler/Files/BIOL%201414%20Fall%202011/BIOL1414_Lab%20Manual_Fall%202011.pdf)

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# ST. JOSEPH'S COLLEGE FOR WOMEN(A), VISAKHAPATNAM

## SEMESTER-III

### COURSE 7: ANIMAL BIOTECHNOLOGY

Z-Ma3-3501(3)

#### LEARNING OBJECTIVES:

- To provide knowledge on animal cell and tissue culture and their preservation.
- To empower students with latest biotechnology techniques like stem cell technology, genetic engineering, hybridoma technology, transgenic technology and their application in medicine and industry for the benefit of living organisms
- To explain *in vitro* fertilization, embryo transfer technology and other reproduction manipulation methodologies.
- To get insight in applications or recombinant DNA technology in agriculture, production of therapeutic proteins.
- To understand principles of animal culture, media preparation.

#### LEARNING OUTCOMES:

This course will provide students with a deep knowledge in animal biotechnology, by the completion of the course the graduate shall be able to –

- CO1: L3- Demonstrate knowledge of the Vectors and Restriction enzymes used in biotechnology
- CO 2: L3-Summarise the gene delivery mechanism, PCR technique, the principles of DNA sequencing and hybridization.
- CO 3: L4-Explain media preparation, cell culture techniques and stem cell technology.
- CO 4: L4-Analyse the genetic engineering principles and their efficacy in creating transgenic animals, showcasing expertise in assisted reproductive technology.
- CO 5: L3-Apply biotechnological advancements like DNA finger printing, gene therapy highlighting the significance of biotechnology in both industry and agriculture.

#### SYLLABUS:

##### UNIT-I:

- 1.1 Functions of Enzymes and Definition of a vector and characteristics. Restriction modification systems: Types I, II and III.
- 1.2 Mode of action, nomenclature, applications of Type II restriction enzymes in genetic engineering.
- 1.3 **DNA modifying enzymes and their applications:** DNA polymerases, Klenow fragment, Terminal deoxynucleotidyl transferase, kinases, phosphatases, and DNA ligases
- 1.4 **Cloning Vectors:** Plasmid vectors (pBR and pUC series), Bacteriophage (lambda and M13 based vectors), Cosmids, BACs, YACs, and shuttle vectors.

## **UNIT- II:**

**2.1 Gene delivery: Transfection** (Microinjection, electroporation, biolistic method (gene gun), liposome) and **Transduction** (viral mediated delivery).

2.1 **PCR:** Basics of PCR, types of PCR and their applications.

2.2 **DNA Sequencing:** Sanger's method of DNA sequencing- traditional and automated sequencing.

2.3 **Hybridization techniques:** Southern, Northern and Western blotting.

## **UNIT-III:**

3.1 Natural and Synthetic Cell cultures: primary culture, secondary culture, continuous cell lines (Hela, CHO, BHK, VERO, MRC)

3.2 Organ culture; Cryopreservation of cultures.

3.3 Hybridoma Technology: Cell fusion, Production of Monoclonal antibodies (mAb), Applications of mAb.

3.4 Stem cells: Types of stem cells, applications

## **UNIT-IV:**

4.1 **Manipulation of reproduction in animals:** Artificial Insemination, In vitro fertilization

4.2 **Manipulation of reproduction in animals:** Super ovulation, Embryo transfer, Embryo cloning

4.3 **Transgenic Animals:** Strategies of Gene transfer;

4.4 Transgenic - sheep, - fish; applications

## **UNIT-V:**

5.1 DNA fingerprinting and its applications

5.2 **Application of biotechnology in fisheries** – monosex culture in fishes, polyploidy in fishes

5.3 **Gene therapy**-application

5.4 **Bio informatics**- concept-definition-database types

## **REFERENCES BOOKS:**

- Brown TA. (2010). Gene Cloning and DNA Analysis. 6th edition. Blackwell Publishing, Oxford, U.K.
- Clark DP and Pazdernik NJ. (2009). Biotechnology: Applying the Genetic Revolution. Elsevier Academic Press, USA
- Primrose SB and Twyman RM. (2006). Principles of Gene Manipulation and Genomics, 7th edition. Blackwell Publishing, Oxford, U.K.
- Sambrook J and Russell D. (2001). Molecular Cloning-A Laboratory Manual. 3rd

edition. ColdSpring Harbor Laboratory Press

- Wiley JM, Sherwood LM and Woolverton CJ. (2008). Prescott, Harley and Klein's Microbiology. McGraw Hill Higher Education
- Brown TA. (2007). Genomes-3. Garland Science Publishers
- Primrose SB and Twyman RM. (2008). Genomics: Applications in human biology. Blackwell Publishing, Oxford, U.K.
- Animal Cells Culture and Media, D.C. Darling and S.J. Morgan, 1994. BIOS Scientific Publishers Limited.
- Methods in Cell Biology, Volume 57, Jennie P. Mathur and David Barnes, 1998. Animal Cell Culture Methods Academic Press.
- P.K. Gupta: Biotechnology and Genomics, Rastogi publishers (2003).
- B.D. Singh: Biotechnology, Kalyani publishers, 1998 (Reprint 2001)

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**ST. JOSEPH'S COLLEGE FOR WOMEN(A), VISAKHAPATNAM**  
**SEMESTER-III**  
**COURSE 8: EVOLUTION AND ZOOGEOGRAPHY**  
Practical

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Z-Ma4-3551(2)

**LEARNING OBJECTIVES**

- Acquainting and skill enhancement in the usage of laboratory equipment
- To apply the basic concept of inheritance for applied research
- To get familiar with phylogeny and geological history of origin & evolution of animals
- To understand the zoogeographical distribution of animals

**LEARNING OUTCOMES**

By the end of the course, students will be able to

CO1 – L1: Recall key concepts and examples of fossil evidence, homology, analogy, embryological evidences, connecting links, phylogeny of the horse, genetic drift and zoogeographical regions etc.

CO2 – L2: Explain the principles and differences between Lamarckism and Darwinism and describe how embryological evidence supports evolutionary theory.

CO3 – L3: Use examples of Darwin's finches to demonstrate the concept of genetic drift.

CO4 – L4: Analyze the phylogeny of the horse and elephant to understand evolutionary relationships and analyze the significance of connecting links and missing links.

CO5 – L6: Create a detailed chart or map illustrating the zoogeographical regions and the distribution of animals.

**SYLLABUS:**

1. Study of fossil evidences
2. Study of homology and analogy from suitable specimens and pictures
3. Study of embryological evidences by charts/ pictures
4. Study of Lamarckism with images /animations
5. Study of Darwinism with images/ animation
6. Study of connecting links/missing links images/charts
7. Phylogeny of horse and elephant with pictures
8. Study of Genetic Drift by using examples of Darwin's finches (pictures)
9. Visit to Natural History Museum and submission of report
10. Mapping distribution of animals according to zoogeographical regions.
11. Mapping zoogeographical regions

**REFERENCE WEB LINKS:**

- <https://www.labster.com/course-packages/evolution-and-diversity>
- <https://www.biointeractive.org/classroom-resources/stickleback-evolution-virtual-lab>

- <https://www.youtube.com/watch?v=tXbmPhrS4eA>
- <https://www.studocu.com/en-us/document/temple-university/bioe-lab-2-biomaterials/1632834116536-zoogeography-assignment/17915777>
- <https://guides.library.tulsacc.edu/c.php?g=932434&p=6720765>
- [https://bio.libretexts.org/Courses/Butte\\_College/BC%3A\\_BIOL\\_2\\_-\\_Introduction\\_to\\_Human\\_Biology\\_%28Grewal%29/Text/09%3A\\_Biological\\_Evolution/9.3%3A\\_Evidence\\_for\\_Evolution](https://bio.libretexts.org/Courses/Butte_College/BC%3A_BIOL_2_-_Introduction_to_Human_Biology_%28Grewal%29/Text/09%3A_Biological_Evolution/9.3%3A_Evidence_for_Evolution)
- <https://www.coursehero.com/study-guides/boundless-biology/evidence-of-evolution/>

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**ST. JOSEPH'S COLLEGE FOR WOMEN(A), VISAKHAPATNAM**  
**SEMESTER-III**  
**COURSE 8: EVOLUTION AND ZOOGEOGRAPHY**

Theory

Credits: 3

3 hrs/week

Z-Ma4-3501(3)

**LEARNING OBJECTIVES**

- To provide knowledge on origin of life, theories and forces of evolution
- To explore the evidences of evolution
- To Explain the theories of evolution
- To understand the role of variations and mutations in evolution of organisms
- To understand the zoogeographical distribution of animals

**LEARNING OUTCOMES:**

By the end of the course, students will be able to

CO1 – L1: Identify the basic concepts related to the origin of life and biological evolution.

CO2 – L2: Explain how different types of evidence support the theory of evolution.

CO3 – L3: Apply evolutionary theories to explain biological phenomena.

CO4 – L4: Analyze the principles of isolation mechanisms to explain species evolution.

CO5 - L5: Critically assess the factors influencing animal distribution and the significance of zoogeographical realms.

**SYLLABUS:**

**UNIT-I**

- 1.1 Origin of life: different ancient concepts -Origin of Earth and Solar system: Big Bang theory, Primitive atmosphere, formation of macromolecules
- 1.2 Biological evolution: Coacervates, Microspheres, formation of Nucleic acids, Nucleoproteins
- 1.3 Formation of primary organisms, evolution of modes of nutrition, oxygen revolution, present day atmosphere, evolution of eukaryotes.
- 1.4 Experimental evidences in support of Biochemical origin of life (Miller and Urey experiment)

**UNIT-II**

- 2.1 Palaeontological and taxonomical evidences of evolution
- 2.2 Morphological and anatomical evidences of evolution
- 2.3 Embryological and physiological evidences of evolution
- 2.4 Evidences from connecting links, missing links and bio geographical distribution

### **UNIT -III**

- 3.1 Lamarckism-Neo Lamarckism
- 3.2 Germplasm theory-August Weismann
- 3.3 Darwinism-Theory of Natural selection
- 3.4 Modern synthetic theory of evolution (Neo Darwinism)

### **UNIT-IV**

- 4.1 Variations-types-sources of variations- importance in evolution
- 4.2 Mutations-classification-causes-significance in evolution
- 4.3 Isolation mechanisms-role in evolution
- 4.4 Sewall wright effect, Hardy Weinberg Principle

### **UNIT-V**

- 5.1 Animal distribution and barriers of distribution
- 5.2 Zoogeographical realms – Palearctic & Nearctic regions
- 5.3 Zoogeographical realms – Neotropical & Ethiopian regions
- 5.4 Zoogeographical realms – Oriental & Australian regions

### **Co-curricular activities (Suggested)**

- Chart on industrial melanism to teach directed selection, Darwin's finches to teach genetic drift, collection of data on weight of children born in primary health centres to teach stabilizing selection etc.

### **REFERENCES BOOKS:**

- Ridley, M. (2004). Evolution. III Edition. Blackwell Publishing
- Hall, B. K. and Hallgrímsson, B. (2008). Evolution. IV Edition. Jones and Bartlett Publishers
- Douglas, J. Futuyma (1997). Evolutionary Biology. Sinauer Associates.
- Minkoff, E. (1983). Evolutionary Biology. Addison-Wesley.
- Organic evolution by Organic evolution by Dr. Veer Bala Rastogi, 2019 Kedar Nath Ramnath
- Palaeontology and Zoogeography Organic evolution by Dr. Veer Bala Rastogi, 2019 Kedar Nath Ramnath
- Rastogi VB. 1991. *Organic Evolution*. Kedar Nath Ram Nath Publications, Meerut, Uttar Pradesh, India.
- Stahl FW. 1965. *Mechanics of Inheritance*. Prentice-Hall.
- White MJD. 1973. *Animal Cytology and Evolution*. Cambridge Univ. Press

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# ST. JOSEPH'S COLLEGE FOR WOMEN(A), VISAKHAPATNAM

## SEMESTER-IV COURSE 9: EMBRYOLOGY

### LEARNING 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

### LEARNING OUTCOMES

CO1-L2- Recognise the developmental stages of frog and chick embryos as observed through permanent slides / photographs

CO2-L3-Demonstrate characteristics of the cleavage stages, blastula, gastrula, neurula, tail-bud stage, and tadpole stages in frog development.

CO3-L5- Assess the significance of each developmental stage in the overall process of embryogenesis in frogs and chicks.

### 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://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.macollege.in/app/webroot/uploads/department_materials/doc_501.pdf)
- <http://www.zoologyresources.com/uploadfiles/books/dc64b77d8769325515d17e945e461b45.pdf>

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# **ST. JOSEPH'S COLLEGE FOR WOMEN(A), VISAKHAPATNAM**

## **SEMESTER-IV COURSE 9: EMBRYOLOGY**

**Z-Ma1-4501(3)**

### **LEARNING OBJECTIVES**

The objective of this course is

- To provide a comprehensive understanding of the concepts of early animal development.
- Develop a critical appreciation of methodologies specifically used to study the process of embryonic development in animals.
- Learn the different concepts of animal development will be elaborated
- Familiar with different approaches that have been used to study embryology.

Topics that will be discussed are organogenesis and regeneration.

### **LEARNING OUTCOMES:**

by the completion of the course the graduate shall able to –

CO1-L2- Explain the historical perspective and fundamental concepts of embryology.

CO2-L4- Illustrate the knowledge of gametogenesis, fertilization, and cleavage patterns to understand the process of embryonic development in animals.

CO3- L3- Develop knowledge about the fate of germinal layers and extraembryonic membranes.

CO4- L2- Describe the process of regeneration in certain animals.

CO5-L4- Examine the process of organogenesis

### **SYLLABUS:**

#### **UNIT-I:**

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

#### **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

### **UNIT-III:**

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

### **UNIT-IV:**

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

### **UNIT-V:**

- 5.1 Organogenesis of Central Nervous system
- 5.2 Organogenesis of Eye, Ear
- 5.3 Organogenesis of Skin
- 5.3 Organogenesis of Circulatory system  
(\* Organogenesis in Human need to be explained)

### **Co-curricular activities (Suggested)**

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*. KedaraNath Ram Nath Publishers, Meerut, Uttar Pradesh.
- Schatten H and Schatten G. 1989. *Molecular Biology of Fertilization*. Academic Press, New York.

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# ST. JOSEPH'S COLLEGE FOR WOMEN(A), VISAKHAPATNAM

## SEMESTER-IV COURSE 11: IMMUNOLOGY Z-Ma4-4551(2)

### LEARNING OBJECTIVES

- To acquire knowledge on the distribution of lymphoid organs
- To study the histology of lymphoid organs
- To acquaint with the process of blood grouping with kit
- To acquaint with the ELISA test
- To acquaint with the Widal test

### LEARNING OUTCOMES

By the end of the course, students will be able to

CO1 – L1: Identify the structure and function of lymphoid organs, and the basic principles behind blood group determination, ELISA, immunoelectrophoresis, and various diagnostic tests.

CO2 – L2: Describe the histological features of the spleen, thymus, and lymph nodes, and the principles behind the Widal test, Differential Leukocyte Count, and RPR test.

CO3 – L3: Conduct blood group determination, ELISA, immunoelectrophoresis, and Widal tests, and implement these techniques in practical scenarios.

CO4 – L4: Examine the results of ELISA, immunoelectrophoresis, and Widal tests, and interpret the differential leukocyte count and monocyte isolation results.

CO5 – L5: Assess the effectiveness and accuracy of different immunological tests.

### SYLLABUS:

1. Demonstration of lymphoid organs (as per UGC guidelines)
2. Histological study of spleen, thymus and lymph nodes (through prepared slides)
3. Process of phagocytosis (through charts)
4. Genetic basis of diversity of immunoglobulins
5. Blood group determination
6. Demonstration of ELISA
7. Demonstration of Immunoelectrophoresis
8. Testing for Typhoid antigens by Widal test.
9. Differential Leukocyte Count
10. Isolation of monocytes from blood.
11. Rapid Plasma Reagin (RPR) Test

### REFERENCE WEB LINKS:

- <https://vlab.amrita.edu/?sub=3&brch=69>
- <https://iv11-au.vlabs.ac.in/List%20of%20experiments.html>

- <https://ivl2-au.vlabs.ac.in/List%20of%20experiments.html>
- <https://www.medicine.mcgill.ca/physio/vlab/immun/vlabmenuimmun.htm>
- <http://www.zoologyresources.com/uploadfiles/books/dc64b77d8769325515d17c945e461b45.pdf>
- <http://www.lucp.net/books-pdf/Lab%20Manual%20Dr.%20Idris%20Adewale%20Ahmed/15.%20BASIC%20IMMUNOLOGY.pdf>
- [https://www.avit.ac.in/lab/immunology\\_bioprocess\\_engineering\\_lab/download/17BTCC89/lab\\_manual.pdf](https://www.avit.ac.in/lab/immunology_bioprocess_engineering_lab/download/17BTCC89/lab_manual.pdf)
- <https://www.urmc.rochester.edu/MediaLibraries/URMCMedia/labs/frelinger-lab/documents/Immunology-Lab-Manual.pdf>
- [https://webstor.srmist.edu.in/web\\_assets/downloads/2021/18BTC106J-lab-manual.pdf](https://webstor.srmist.edu.in/web_assets/downloads/2021/18BTC106J-lab-manual.pdf)

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**ST. JOSEPH'S COLLEGE FOR WOMEN(A), VISAKHAPATNAM**

**SEMESTER-IV  
COURSE 11: IMMUNOLOGY**

**Z-Ma3-4501(3)**

**LEARNING OBJECTIVES**

- To promote critical thinking among students.
- To provide students with a foundation in immunological processes
- To provide students with knowledge on how the immune system works building on their previous knowledge
- To clearly state the role of the immune system.
- To compare and contrast the innate versus adaptive immune systems.
- To provide an overview of the interaction between the immune system and pathogens.

**COURSE OUTCOMES:**

By the end of the course, students will be able to

- CO1 – L1: Describe fundamental concepts of immune system's cells, organs and various immunological processes.
- CO2 – L2: Explain the properties of antigens, B and T cell epitopes, paratopes, haptens, and adjuvants.
- CO3 – L3: Apply knowledge to Understand the structure and classify the types and functions of antibodies.
- CO4 – L4: Analyse the structure and functions of major histocompatibility complexes and the pathways of antigen presentation.
- CO5 – L5: Critically assess the effectiveness of different vaccines, the impact of hypersensitivity reactions, and the mechanisms of graft rejection in organ transplantation.

**SYLLABUS:**

**UNIT – I: Overview of Immune system**

- 1.1 Introduction to basic concepts in Immunology
- 1.2 Innate and adaptive immunity
- 1.3 Cells of immune system
- 1.4 Organs of immune system

## **UNIT – II: Antigens**

- 2.1 Basic properties of antigens
- 2.2 B and T cell epitopes, paratopes
- 2.3 Haptens and adjuvants
- 2.4 Factors influencing immunogenicity

## **UNIT – III: Antibodies**

- 3.1 Structure of antibody
- 3.2 Classes of antibodies
- 3.3 Functions of antibodies
- 3.4 Monoclonal antibodies

## **UNIT – IV: Working of Immune system**

- 4.1 Structure and functions of major histocompatibility complexes
- 4.2 Exogenous pathway of antigen presentation and processing
- 4.3 Endogenous pathway of antigen presentation and processing
- 4.4. Basic properties and functions of cytokines

## **UNIT – V: Immune system in health and disease**

- 5.1 Gell and Coombs' classification and brief description of various types of hypersensitivities
- 5.2 Introduction to concepts of autoimmunity and immunodeficiency
- 5.3 General introduction to vaccines Types of vaccines, Immunization programme
- 5.4 Organ transplantation- Graft rejection, immune suppressors

## **Co-curricular activities (suggested)**

- Organizing awareness on immunization importance in local village in association with NCC and NSS teams
- Charts on types of cells and organs of immune system
- Student study projects on aspects such as – identification of allergies among students (hypersensitivity), blood groups in the class (antigens and antibodies duly reported) etc., as per the creativity and vision of the lecturer and students

**REFERENCES BOOKS:**

- Judy Owen, Jenni Punt, Sharon Stranford 2013 Kuby Immunology: International Edition W. H. Freeman
- Abbas AK, 2011, Cellular and Molecular Immunology 7th Ed. Elsevier Health Sciences – India.
- Delves P, Martin S, Burton D, Roitt IM 2011 Roitt's Essential Immunology. 12th Ed. Wiley- Blackwell Scientific Publication, Oxford.
- Murphy K, 2011 Janeway's Immunobiology. 8th Ed. Garland Science Publishers, New York.
- Peakman M, and Vergani D. (2009). Basic and Clinical Immunology. 2nd edition Churchill Livingstone Publishers, Edinberg.
- Richard Coico, Geoffrey Sunshine 2008 Immunology: A Short Course, 6th Edition Wiley-Blackwell
- Sudha Gangal 2013 Textbook of Basic and Clinical Immunology Orient Blackswan Private Limited - New Delhi

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**ST.JOSEPH'S COLLEGE FOR WOMEN(A), VISAKHAPATNAM  
COMMON VALUE-ADDED COURSE**

**ENVIRONMENTAL EDUCATION**

Credits: 2

2 hrs/week

**Course objective:** A Generic Course intended to create awareness that the life of human beings is an integral part of environment and to inculcate the skills required to protect environment from all sides.

**Learning outcomes:** On completion of this course the students will be able to .....

1. Explain the nature, components of an ecosystem and that humans are an integral part of nature.
2. Analyse the importance of environment, the goods and services of a healthy biodiversity, dependence of humans on environment.
3. Evaluate the causes and consequences of environmental destruction, population explosion, and assess global problems arising from anthropogenic activities.
4. Discuss the laws/ acts made by government to prevent pollution, to protect biodiversity and environment as a whole.
5. Interpret international agreements and national movements, and realize citizen's role in protecting environment and nature.

**Unit 1: Environment and Natural Resources**

1. Multidisciplinary nature of environmental education; scope and importance.
2. Man as an integral product and part of the Nature.
3. A brief account of land, forest and water resources in India and their importance.
4. Biodiversity : Definition; importance of Biodiversity - ecological, consumptive, productive, social, ethical and moral, aesthetic, and option value.
5. Levels of Biodiversity: genetic, species and ecosystem diversity.

## **Unit-2: Environmental degradation and impacts**

1. Human population growth and its impacts on environment; land use change, land degradation, soil erosion and desertification.
2. Use and over-exploitation of surface and ground water, construction of dams, floods, conflicts over water (within India).
3. Deforestation: Causes and effects due to expansion of agriculture, firewood, mining, forest fires and building of new habitats.
4. Non-renewable energy resources, their utilization and influences.
5. A brief account of air, water, soil and noise pollutions; Biological, industrial and solid wastes in urban areas. Human health and economic risks.
6. Green house effect - global warming; ocean acidification, ozone layer depletion, acid rains and impacts on human communities and agriculture.
7. Threats to biodiversity: Natural calamities, habitat destruction and fragmentation, over exploitation, hunting and poaching, introduction of exotic species, pollution, predator and pest control.

## **Unit 3: Conservation of Environment**

1. Concept of sustainability and sustainable development with judicious use of land, water and forest resources; afforestation.
2. Control measures for various types of pollution; use of renewable and alternate sources of energy.
3. Solid waste management: Control measures of urban and industrial waste.
4. Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.
5. Environment Laws: Environment Protection Act; Act; Wildlife Protection Act; Forest Conservation Act.
6. International agreements: Montreal and Kyoto protocols; Environmental movements: Bishnois of Rajasthan, Chipko, Silent valley.

### **Suggested activities to learner: (4 hours)**

1. Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc
2. Visit to a local polluted site-Urban/Rural/Industrial/Agricultural site.
3. Study of common plants, insects, birds and basic principles of identification.
4. Study of simple ecosystems-forest, tank, pond, lake,mangroves etc.
5. Case study of a Forest ecosystem or a pond ecosystem.

### **Suggested text book :**

- ErachBarucha (2004) *Text book of Environmental Studies for Undergraduate courses* (Prepared for University Grants Commission) Universities Press.
- PurnimaSmarath (2018) *Environmental studies* Kalyani Publishers, Ludhiana

### **Reference books :**

- Odum, E.P., Odum, H.T. & Andrews, J. (1971) *Fundamentals of Ecology*. Philadelphia:Saunders.
- Pepper, I.L., Gerba, C.P. &Brusseau, M.L. (2011). *Environmental and Pollution Science*.Academic Press.
- Raven, P.H., Hassenzahl, D.M. & Berg, L.R. (2012) *Environment. 8th edition*. JohnWiley & Sons.
- Singh, J.S., Singh, S.P. and Gupta, S.R. (2014) *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi.
- Sengupta, R. (2003) *Ecology and economics: An approach to sustainable development*.OUP.
- Wilson, E. O. (2006) *The Creation: An appeal to save life on earth*. New York: Norton.
- Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll (2006) *Principles of Conservation Biology*. Sunderland: Sinauer Associates.

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# **St. Joseph's College for Women (Autonomous), Visakhapatnam**

## **Zoology-Semester V**

### **POSTHARVEST TECHNOLOGY OF FISH & FISHERIES**

**Practical**

**3 hrs/week**

**Course objectives:** To enable the students to

- Acquire skill in preparation of value-added products of fish and fishery products.
- Gain knowledge on the various fish preservation techniques.
- Follow safety and hygienic measures in sea food processing plants.

**COURSE OUTCOMES:** By the end of the course, students will be able to

CO1: L3-Apply organoleptic methods to identify fresh fish and assess spoilage in dried/cured products.

CO2: L3-Demonstrate skill in preparation of value-added products from fishes.

CO 3: L3- Practice better fish preservation methods to prevent spoilage of fish.

CO4: L3-- Illustrate skill in developing flow charts for fish processing and hazard analysis.

CO5: L6-Evaluate the situation for following safety and hygienic procedures according to National and International standards.

#### **SYLLABUS:**

1. Evaluation of fish/ fishery products for organo leptic, chemical and microbial quality (TPC).
2. Preparation of dried, cured and fermented fish products
3. Examination of salt, protein, moisture in dried / cured products
4. Examination of spoilage of dried / cured fish products, marinades, pickles, sauce.
5. Preparation of Isin glass, collagen and chitosan from shrimp and crab shell.
6. Developing flow charts and exercises in identification of hazards – preparation of hazard analysis worksheet.
7. Corrective action procedures in processing of fish- flow chart- work sheet preparation

(\*Refer the following web sites for complete procedure method and estimations of above listed practical's)

#### **REFERENCES:**

1. Dr Sunitha Rai, Fish Processing Technology, 2015, Random Publications
2. [https://ecourses.icar.gov.in/e-Learningdownload3\\_new.aspx?Degree\\_Id=03](https://ecourses.icar.gov.in/e-Learningdownload3_new.aspx?Degree_Id=03)

3. <https://vikaspedia.in/agriculture/fisheries/post-harvest-and-marketing/processing-in-fisheries/fermented-products>
4. <https://krishi.icar.gov.in/jspui/bitstream/123456789/20500/1/Fermentation%20technology%20for%20fish.pdf>
5. <http://jebas.org/00200620122014/Abujam%20et%20al%20JEBAS.pdf>
6. [https://krishi.icar.gov.in/jspui/bitstream/123456789/20770/1/Training%20Manual\\_Hygienic%20drying%20and%20packing%20of%20fish.pdf](https://krishi.icar.gov.in/jspui/bitstream/123456789/20770/1/Training%20Manual_Hygienic%20drying%20and%20packing%20of%20fish.pdf)
7. [https://krishi.icar.gov.in/jspui/bitstream/123456789/20770/1/Training%20Manual\\_Hygienic%20drying%20and%20packing%20of%20fish.pdf](https://krishi.icar.gov.in/jspui/bitstream/123456789/20770/1/Training%20Manual_Hygienic%20drying%20and%20packing%20of%20fish.pdf)
8. [https://agritech.tnau.ac.in/fishery/fish\\_byproducts.html](https://agritech.tnau.ac.in/fishery/fish_byproducts.html)
9. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5352841/>
10. <http://www.fao.org/3/i1136e/i1136e.pdf>
11. <http://www.fao.org/3/x5989e/X5989e01.htm#What%20is%20sensory%20assessment>

**Co-Curricular Activities-** a. Mandatory:

1. For Teacher: Training of students by the teacher in laboratory/field in various steps of post-harvest techniques of fishes, on the advanced techniques in post-harvest technology – Training of students on other employability skills in the Post-harvest sector of Aquaculture Industry- like Processing, Packing, marketing of processed aqua products.
2. For Student: Students shall (individually) visit - Any fish/shrimp Processing Plant/Packing industry and make observations on post harvesting techniques and submit a brief handwritten Fieldwork/Project work Report with pictures and data /survey in 10 pages.
3. Max marks for Fieldwork/Project work Report: 05.
4. Suggested Format for Fieldwork/Project work: Title page, student details, index page, details of place visited, observations made, findings and acknowledgements
5. (IE): Unit tests,

**b. Suggested Co-Curricular Activities**

1. Observation of fish/shrimp processing plants – visit web sites of processing companies and record the details of that Unit.
2. Interaction with local fishermen to know the method of preservation and details with the available traditional technology
3. Collection of web resources on the Quality assurance, quality control measures in Aqua Industries- cross checking the standards during the visit to any processing units.
4. Assignments, Seminar, Group discussion. Quiz, Collection of Material, invited lectures, Video preparation etc.,

**St. Joseph's College for Women (Autonomous), Visakhapatnam**  
**Zoology-Semester V**

**POSTHARVEST TECHNOLOGY OF FISH & FISHERIES**

Theory

Credits: 3

3 hrs/week

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**Course objectives: To enable the students to**

- Identify the traditional and advanced methods of fish preservation employed in Aquaculture.
- Gain knowledge about processing and preservation of fish and their by- products.
- Recognize the quality control and sanitation standards in maintaining the quality of sea food products.
- Identify hazards and suggest suitable good manufacturing practices in preventing hazards.
- Discuss the principles of HACCP

**COURSE OUTCOMES:** By the end of the course, students will be able to

CO1: L2-Summarize the principles and methods of fish preservation, and suggest methods for maintaining fish quality during handling, storage and transportation.

CO2: L3-Apply knowledge of traditional & advanced methods of fish preservation to maintain the quality of the fish.

CO3: L2-Discuss the processing and preparation of commercially important products and by-products of fish.

CO 4: L3-Apply principles of sanitation and environmental hygiene to follow quality control practices in processing plants.

CO5:L3-Demonstrate Good laboratory practices, corrective procedures for sanitation in processing plants.

CO6: Recall the principles of HACCP, develop plan that addresses the hazards in sea food quality and suggest corrective measures.

## **SYLLABUS:**

### **Unit – I Handling and Principles of fish Preservation**

- 1.1 Handling of fresh fish, storage and transport of fresh fish, post mortem changes (rigor mortis and spoilage), spoilage in marine fish and freshwater fish.
- 1.2 Principles of preservation – cleaning, lowering of temperature, rising of temperature, denudation, use of salt, use of fish preservatives, exposure to low radiation of gamma rays.

### **Unit – II Methods of fish Preservation**

- 2.1 Traditional methods - sun drying, salt curing, pickling and smoking.
- 2.2. Advanced methods – chilling or icing, refrigerated sea water, freezing, canning, irradiation and Accelerated Freeze drying (AFD).

### **Unit – III Processing and preservation of fish and fish by-products**

- 1.1 Fish products – fish minced meat, fish meal, fish oil, fish liquid (ensilage), fish protein concentrate, fish chowder, fish cake, fish sauce, fish salads, fish powder, pet food from trash fish, fish manure.
- 1.2 Fish by-products – fish glue, Using glass, chitosan, pearl essence, shark fins, fish Leather and fish maws.

### **Unit – IV Sanitation and Quality control**

- 4.1 Sanitation in processing plants - Environmental hygiene and Personal hygiene in processing plants.
- 4.2 Quality Control of fish and fishery products – pre-processing control, control during processing and control after processing.

### **Unit – V Quality Assurance, Management and Certification**

- 1.1. Seafood Quality Assurance and Systems: Good Manufacturing Practices (GMPs); Good Laboratory Practices (GLPs); Standard Operating Procedures (SOPs); Concept of Hazard Analysis and Critical Control Points (HACCP) in seafood safety.
- 5.2 National and International standards – ISO 9000: 2000 Series of Quality Assurance System, *Codex Alimentarius*, FSSAI.

### **References:**

1. Santharam R, N Sukumaran and P Natarajan 1987. A manual of aquaculture, Oxford-IBH, NewDelhi
2. Lakshmi Prasad's, Fish Processing Technology 2012, Arjun Publishing House
3. Dr Sunitha Rai, Fish Processing Technology, 2015, Random Publications
4. Safety and Quality Issues in Fish Processing (Woodhead Publishing Series in Food Science, Technology and Nutrition) by H A Bremner K.A Mahanthy, Innovations in Fishing and Fish Processing Technologies, January 2021

### **Web resources:**

5. <http://ecoursesonline.iasri.res.in/mod/page/view.php?id=145743>
6. [https://ecourses.icar.gov.in/e-Learningdownload3\\_new.aspx?Degree\\_Id=03](https://ecourses.icar.gov.in/e-Learningdownload3_new.aspx?Degree_Id=03)

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**St. Joseph's College for Women(A), Visakhapatnam**  
**Zoology-Semester V**

**POULTRY MANAGEMENT-II (POULTRY PRODUCTION AND  
MANAGEMENT) - THEORY**

**Course Objectives (COBs):**

The course is designed to:

1. Understand the etiology, prevention, and control of common poultry diseases, vaccination schedules, and disinfection practices.
2. Analyze the economics of poultry production systems and evaluate the feasibility of different rearing methods.
3. Apply scientific principles of breeder flock management including housing, feeding, light, and reproduction practices.
4. Evaluate breeder healthcare strategies, vaccination programs, fertility disorders, and effective culling practices.
5. Develop skills in hatchery management, including incubation, sanitation, record keeping, and use of computer applications.

**Course Outcomes (COs):** By the end of the course, students will be able to:

CO1 L1-Identify and explain bacterial, viral, fungal, parasitic, and nutritional diseases of poultry and recommend appropriate preventive measures.

CO2 L2- Explain poultry vaccination schedules for layers, broilers, and breeders and demonstrate proper pre- and post-care.

CO3 L4-Analyze the economics of poultry production.

CO4-L5- Appraise breeder flock management approaches, focusing on nutrition, fertility correction, and culling methods.

CO5-L5-Develop effective hatchery management plans by applying incubation principles & hatchery hygiene practices.

## **Syllabus**

### **Unit-1 HEALTH CARE**

1.1 Common poultry diseases: bacterial, viral, fungal, parasitic and nutritional deficiencies. (Any 4 diseases).

1.2 Vaccination schedule for commercial layers and broilers: factors that govern vaccination schedule; vaccination principles type, methods, pre and post vaccination care.

1.3 Disinfection: Types of disinfectants; mode of action; recommended procedure; precaution and handling.

### **Unit-2 ECONOMICS**

2.1 Economics of layer and broiler production

2.2 Preparation of project reports in different systems of rearing for layer & broilers for the establishment of poultry farms.

2.3 Feasibility studies on poultry rearing- in context of small units and their profitability.

2.4 Export/import of poultry and poultry products.

### **Unit-3 BREEDER FLOCK MANAGEMENT**

3.1 Layer and broiler breeder flock management (include debeaking, culling), housing & space requirements.

3.2 Different stage of management during life cycle; Light management during growing and laying period, Artificial insemination.

3.3 Feeding: Feed restriction, separate male feeding. Nutrient requirement of layer and broiler breeders of different age groups.

### **Unit-4 BREEDER HEALTHCARE**

4.1 Vaccination of breeder flock; difference between vaccination schedule of broilers and commercial birds.

4.2 Common diseases of breeders (Infectious and metabolic disorders)-prevention.

4.3 Fertility disorder- etiology, diagnosis and corrective measures. Selection and culling of breeder flocks

## **Unit-5 HATCHERY PRACTICES**

- 5.1 Management principles of incubation.
- 5.2 Factors affecting fertility and hatchability. Selection, care and incubation of hatching eggs. Fumigation; sanitation and hatchery hygiene.
- 5.3 Maintenance of hatchery records, break-out analysis, factors affecting unhatched eggs.
- 5.4 Computer applications for hatchery management

### **REFERENCES:**

1. HVS Chauhan, S. Roy, Poultry Diseases, Diagnosis and Treatment, New Age International Publishers-2018

### **Web resources:**

2. <https://www.drvet.in/p/e-books.html>
3. <https://byjus.com/biology/animal-husbandry-poultry-farming/>
4. [https://www.helpforag.app/2018/02/livestock-production-and-management-lpm\\_14.html?m=1](https://www.helpforag.app/2018/02/livestock-production-and-management-lpm_14.html?m=1)

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**St. Joseph's College for Women(A), Visakhapatnam**  
**Zoology-Semester V**

**POULTRY MANAGEMENT-II (POULTRY PRODUCTION AND  
MANAGEMENT)-PRAC**

Course Objectives (COBs):

- To identify and study histopathological changes in normal and diseased poultry organs.
- To practice planning and reporting in poultry production systems.
- To design and interpret rearing systems of layers and broilers using flow charts.

**LEARNING OUTCOMES: On successful completion of this practical course, student shall be able to:**

- Identify Poultry diseases by observation
- Analyze Poultry establishment feasibility
- Understand the Poultry Records

**SYLLABUS:**

1. Poultry Viral diseases – Observation of histopathological slides (normal & diseased organs)
2. Poultry Fungal Diseases- Observation of histopathological slides (normal & diseased organs)
3. Poultry Bacterial Diseases-Observation of histopathological slides (normal & diseased organs)
4. Feasibility study of Poultry establishment: (Preparation of feasibility study report with given parameters)
5. Rearing of Layers – (Preparation of Flow chart).
6. Rearing of broiler- Flow chart.
7. Hatchery records- Model study/analysis- Report with modified data.
8. Types of eggs-diversified poultry species

## REFERENCES:

1. HVS Chauhan, S. Roy, Poultry Diseases, Diagnosis and Treatment, New Age International Publishers-2018
2. Flow chart hatchery: <http://lms.tanuvvas.ac.in/mod/resource/view.php?id=45106>
3. Feasibility report:  
<https://www.manage.gov.in/stry&fcac/content/19.%20Project%20Report%20on%20Layer%20Poultry.pdf>

## Co-Curricular Activities

### a) Mandatory:

1. For Teacher: Training of students by the teacher laboratory and field on skills in different practices employed in poultry with regard to the disease management – analysis of poultry project- preparation of flow chart – Observation of Poultry records – computerization activities
2. For Student: students shall (individually) visit a Layer/ Broiler Poultry farming places (small scale/corporate), make observations on practices- resources – management and marketing - analysis and submit a handwritten Fieldwork/Project work Report of 10 pages with necessary images.
3. Max marks for Fieldwork/Project work Report: 05.
4. Suggested Format for Fieldwork/Project work: Title page, student details, index page, details of place visited, observations made, findings and acknowledgements.
6. (IE): Unit tests.

### b) Suggested Co-Curricular Activities

1. Preparation of Poultry diseases charts
2. Preparation of feasibility report poultry establishment with different variables
3. Seminar, Assignment, Group discussion. Quiz, Collection of Material, Invited Lecture, Video preparation etc.

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# **St. Joseph's College for Women(A), Visakhapatnam**

## **Zoology-Semester V**

### **Poultry Management- (POULTRY FARMING)-Practical**

#### **Objectives:**

The course aims to:

1. Introduce students to different poultry rearing and housing systems using physical and web-based models.
2. Develop the ability to identify and describe morphological and production traits of layer and broiler breeds.
3. Familiarize students with CARI and Nandanam breeds, emphasizing their economic and scientific importance.
4. Promote application of practical knowledge in poultry management for sustainable practices.

#### **Course Outcomes (CO) – Practical**

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

CO1: L1-Illustrate & observe different poultry rearing systems using models, images, and charts.

CO2: L3- Demonstrate knowledge on various poultry housing types and summarize their importance in scientific poultry keeping.

CO3: L1-Identify and record important characteristics of layer breeds and broiler breeds using images and models.

CO4: L1-Recognize the key features of CARI-developed poultry breeds.

CO5: L4-Distinguish /Identify the traits of Nandanam breeds and evaluate their economic importance.

#### **Syllabus:**

1. Different types of Poultry rearing (Students has to observe and draw the different types of poultry rearing systems)
2. Different types of poultry Housing - Models / Images/charts
3. Different layer breeds, indigenous breeds and modern breeds – (images/charts/ Models) (Observation of characters)
4. Types of broilers & Dual-purpose breeds (images/charts/ Models) (Identification of important Characters),

5. CARI breeds characters –images/charts
6. Nandanam breeds- images/charts (Identification of characters)
7. Diversified poultry species- characters –images/charts

\*\*\* (This practical is 70 % (Web based /virtual) 30% physical: student and teachers must browse the web for the specimens' models – write down the important characters based on the web resources)

8. Commercially important breeds (duck, geese, Guinea fowl, Emu, quail & turkey)

### References:

1. A Text Book of Animal Husbandry, C. C. Banerjee, Oxford and IBH, Publish Co, ISBN: 9788120412606
2. [http://www.agritech.tnau.ac.in/expert\\_system/poultry/Poultry%20House%20Construction.html](http://www.agritech.tnau.ac.in/expert_system/poultry/Poultry%20House%20Construction.html)
3. <https://petkeen.com/best-chicken-breeds-for-eggs/>
4. <https://garden.decorexpro.com/en/hozyajstvo/ptitsevodstvo/porody-brojlnykh-kur-s-foto-i-opisaniem.html>

### Co-Curricular Activities:

#### a) Mandatory:

1. For Teacher: Training of students by the teacher in laboratory and field on the techniques of identification of layers, broilers and management practices in poultry.
2. For Student: Students shall Individually visit a Poultry farm, make observations and report on the Rearing, Housing, Brooding, Feeding and water management activities. The student shall submit a handwritten Fieldwork/Project work Report on the observations along with pictures in the given format not exceeding 10 pages to teacher.
3. Max marks for Fieldwork/Project work Report: 05.
4. Suggested Format for Fieldwork/Project work: Title page, student details, index page, details of place visited, observations made, findings and acknowledgements.
5. Unit tests. (IE)

#### b) Suggested Co-Curricular Activities

1. Web resources – visiting the web sites of CARI-IZATNAGA <https://cari.icar.gov.in> procuring additional information on the poultry breeds
2. Web resources- visiting the web site of NANADANAM [http://www.tanuv.ac.in/ippmmadhavaram\\_tech.html](http://www.tanuv.ac.in/ippmmadhavaram_tech.html)
3. Collection of additional data on different types of Poultry breeds
4. Seminar, Assignment, Group discussion. Quiz, Collection of Material, Invited Lecture, Video preparation etc.

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**St. Joseph's College for Women(A), Visakhapatnam**  
**Zoology-Semester V**  
**Poultry Management-I- (Poultry Farming) Theory**

Credits: 3

**Course Objectives:**

- Understand the importance, present status, and future prospects of the Indian poultry industry.
- Gain knowledge on scientific poultry keeping, modern breeds, and production lines for eggs and meat.
- Familiarize students with diversified poultry species such as ducks, geese, guinea fowl, and emu, along with their economic importance.
- Highlight the significance of indigenous/desi breeds, their characteristics, and improved varieties developed for rural and commercial farming.
- Learn about the specialized poultry breeds developed by Central Avian Research Institute (CARI) and state institutions for sustainable poultry production.

**Course Outcomes: By the completion of the course student will able to –**

**CO1: L3 Explain** the importance of poultry farming, and the present status and future prospects of the poultry industry.

**CO2: L2-Describe** the various breeds of poultry based on their utility in commercial egg and meat production.

**CO3: L2-** Summarise the diversified poultry species (ducks, geese, guinea fowl, emu), their advantages and economic aspects.

**CO4: L1 Identify** indigenous/desi breeds, and evaluate their economic potential along with improved varieties.

**CO5: L2Describe** the poultry breeds developed by CARI and state institutes and assess their contribution to Indian poultry farming.

# Syllabus

## Unit 1- Indian poultry Industry

- 1.1 Importance of poultry farming and poultry development in India.
- 1.2 Present status and future prospectus of poultry Industry
- 1.3 Classification of poultry based on genetics Utility (layers, Broilers, Dual -purpose)
- 1.4 Poultry Housing

## Unit -2 Scientific Poultry Keeping

- 2.1 Modern breeds of Chicken
- 2.2 Present day egg production lines- meat production lines
- 2.3 Mini breeds- dwarfism in mini-Leghorns

## Unit-3 Diversified Poultry

- 3.1 Rearing systems of poultry
- 3.2 Ducks and Geese-classification- rearing system-classification-advantages
- 3.3 Guinea fowls - guinea fowl farming in India-Production-varieties
- 3.4 Emu-rearing- Economical aspects-commercial products

## Unit-4 Desi Chickens:

- 4.1 Indigenous breeds and economical aspects of desi chicken
- 4.2 Indigenous breeds-Aseel-Chittagong- Kadaknath-Bursa
- 4.3 Improved varieties in India – Giriraja-Vanaraja-Girirani-Kalinga brown, Gramapriya, Swarna dhara.

## Unit -5 Breeds from Central Avian Research Institute – Izatnagar

- 5.1 CARI Nirbheek - CARI- Shyama-HITCARI (Naked Neck Cross)
- 5.2 CARI- Priya Layer, CARI- Sonali Layer,
- 5.3 CARIBRO-VISHAL, CARI-RAINBRO,
- 5.4 Nandanam chicken-I, Nandanam Chicken-II, Nandanam-Quail

## REFERENCES:

1. Text Book of Poultry Science, P V Sreenivasaiah, Write and Print Publications, ISBN No. 9788192970592, 8192970590
2. Poultry Science Practices, Nilothpal Ghosh, CBS Publication & Distributions, 2015
3. Principles of Poultry Science, 1996, CAB Publishers, ISBN 9780851991221
4. A Text Book of Animal Husbandry, C. C. Banerjee, Oxford and IBH, Publish Co, ISBN: 9788120412606

## Web sources:

5. <https://www.drvtet.in/p/e-books.html>
6. <https://byjus.com/biology/animal-husbandry-poultry-farming/>
7. [https://www.helpforag.app/2018/02/livestock-production-and-management-lpm\\_14.html?m=1](https://www.helpforag.app/2018/02/livestock-production-and-management-lpm_14.html?m=1)

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# St. Joseph's College for Women (Autonomous), Visakhapatnam

## Zoology-Semester-V

### SUSTAINABLE AQUACULTURE MANAGEMENT

Practical

Credits: 1

2 hrs/week

**OBJECTIVES:** To enable the students to

- Identify the characters of Fresh water cultivable species.
- Recognise the importance of various quality parameters in culture ponds.
- Identify shrimp and fish diseases.
- Acquire knowledge of Hypophysation technique.

#### LEARNING OUTCOMES:

On successful completion of this practical course, student shall be able to:

CO1: L1-Identify cultivable fish species in freshwater, brackish water, and marine based on their morphological characteristics.

CO2: L3-Apply practical skills to estimate physico-chemical characteristics of water used for aquaculture.

CO3: L3-Appraise the techniques involved in hypophysation for induced breeding of carps

CO 4: L4- Examine the symptoms associated with cultured fish and shrimp diseases

CO5: L6-Recommend measures to prevent diseases in aquaculture.

#### SYLLABUS:

- a. Fresh water Cultivable species any (Fin & Shell Fish Specimens – Observation of morphological characters by observation and drawings)-5
- b. Brackish water cultivable species (Fin & Shell fish- Specimens- Observation of Morphological Character by observing drawing) -5
- c. Hands on training on the use of kits for determination of water quality in aquaculture (DO, Salinity, pH, Turbidity- Testing kits to be used for the estimation of various parameters/ Standard procedure can be demonstrated for the same)
- d. Demonstration of Hypophysation (Procedure of hypophysation to be demonstrated in the practical lab with any edible fish as model)
- e. Viral diseases of Fin & Shell Fish (Observation of his to pathological slides / Charts/ Models of viral pathogens in fin/ shell fish – one edible specimen can be used for observation of same in the laboratory)

f. Bacterial diseases of Fin & Shell Fish (Observation of his to pathological slides / Charts/ Models of Bacterial pathogens in fin/ shell fish – One edible specimen can be used for observation of same in the laboratory)

g. Fungal diseases of Fin & Shell Fish (Observation of his to pathological slides / Charts/ Models of Bacterial pathogens in fin/ shell fish – One edible specimen can be used for observation of same in the laboratory)

#### REFERENCES:

1. Boyd CE 1982. Water Quality Management for Pond Fish Culture. Elsevier Scientific Publishing Company
2. [http://www.fao.org/fishery/docs/CDrom/FAO\\_Training/FAO\\_Training/General/x6708e/x6708e06.htm](http://www.fao.org/fishery/docs/CDrom/FAO_Training/FAO_Training/General/x6708e/x6708e06.htm)
3. [http://aquaticcommons.org/1666/1/Better-Practice3\\_opt.pdf](http://aquaticcommons.org/1666/1/Better-Practice3_opt.pdf)
4. <https://www.notesonzooology.com/india/fishery/fish-diseases-symptoms-and-control-fishery/871>

#### Co-Curricular Activities

a. Mandatory:

1. For Teacher: Training of students by the teacher in laboratory/field on Breeding- Induced breeding in carps -hatchery technology of *P. Vennami*- Farming techniques- disease diagnostic techniques— concepts –Demonstration @ any aqua laboratory
2. For Student: Students shall (individually) visit a Hatchery/Farm/ Aqua diagnostic centre and make careful observations of the process method and implements- protocols and report on the same in 10 pages hand written Fieldwork/Project work Report.
3. Max marks for Fieldwork/Project work Report: 05.
4. Suggested Format for Fieldwork/Project work: Title page, student details, index page, details of place visited, observations made, findings and acknowledgements.
5. (IE). Unit tests.

b. Suggested Co-Curricular Activities

1. Preparation of Model/Charts of Cultivable species of fin fish shell fish
2. Preparation of Model/Chart of Ideal fish Pond- with the standards prescribed.
3. Observation of aquaculture activities in their area (Observation of any activity related to aquaculture in the vicinity of the college/village)
4. Preparation of Model – charts of Fin /Shell fish Diseases with eco-friendly material.
5. Assignments, Group discussion, Seminar, Quiz, Collection of Material, Video preparation etc., Invited lecture

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**St. Joseph's College for Women (Autonomous), Visakhapatnam**  
**Zoology-Semester-V**

**SUSTAINABLE AQUACULTURE MANAGEMENT**

Theory

Credits: 3

3 hrs /week

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**OBJECTIVES: To enable the students to**

- Develop insight about the systems and practices in aquaculture.
- Outline the technique of induced breeding for propagation of species and contributes significantly to the overall aquaculture production.
- Realize the importance of maintaining soil & water quality parameters in the management of culture ponds.
- Recognize the factors for successful management of carp culture ponds.
- Identify fin and shell fish diseases.

**Learning Outcomes:**

CO 1: L4-Appraise about the culture practices and selection of species for aquaculture.

CO 2: L3-Relate theoretical knowledge to plan the layout of a pond and understand the important parameters in water and soil management.

CO 3: L3-Summarise the technique of induced breeding and the culture of Indian major carps.

CO 4: L4-CO4 Outline the essential stages of pre-stocking, stocking, and post-stocking management practices for effective carp culture in ponds.

CO5: L2-Identify the diseases of cultured fish and shrimps and suggest corrective measures

## SYLLABUS:

### Unit: 1

- 1.1 Present status of Aquaculture – Global and National scenario
- 1.2 Criteria for selection of species for culture, Major cultivable species for aquaculture: freshwater, brackish water and marine.
- 1.3 Traditional, extensive, modified extensive, semi-intensive and intensive cultures of fish and shrimp.
- 1.4 Design and construction of fish and shrimp farms

### Unit: 2

- 2.1 Functional classification of ponds – head pond, hatchery, nursery ponds
- 2.2 Functional classification of ponds -rearing, production, stocking and quarantine ponds
- 2.3 Need of fertilizer and manure application in culture ponds
- 2.4 Physio-chemical conditions of soil and water optimum for culture (Temperature, depth, turbidity, light, water, PH, BOD, CO<sub>2</sub> and nutrients)

### Unit: 3

- 3.1 Induced breeding in fishes
- 3.2 Culture of Indian major carps: Pre-stocking management (Dewatering, drying, ploughing / desilting; Predators, weeds and algal blooms and their control, Liming and fertilization)
- 3.3 Culture of Indian major carps - Stocking management
- 3.4 Culture of Indian major carps - post-stocking management

### Unit: 4

- 4.1 Induced Maturation in Shrimps (eye stalk ablation, Cauterization, Hormonal control of Maturation)
- 4.2 *Macrobrachium rosenbergii*- biology, seed production.
- 4.3 Culture of *P. vannamei* – hatchery technology and culture practices
- 4.4 Mixed culture of fish and prawns

### Unit: 5

- 5.1 Viral diseases of cultured Fish & shrimps & etiology-Any 4
- 5.2 Fungal diseases of cultured Fish & shrimps & etiology- Any 4
- 5.3 Bacterial diseases of cultured Fish & shrimps & etiology- Any 4
- 5.4 Parasitic diseases of cultured Fish & shrimps & etiology- Any 4

## REFERENCES:

1. Pillay TVR & M.A.Dill, 1979. Advances in Aquaculture. Fishing News Books Ltd., London
2. Stickney RR 1979. Principles of Warm Water Aquaculture. John Wiley & Sons Inc.1981
3. Boyd CE 1982. Water Quality Management for Pond Fish Culture. Elsevier ScientificPublishing Company.
4. Bose AN et.al. 1991. Costal Aquaculture Engineering. Oxford & IBH Publishing CompanyPvt. Ltd.

### Web resources:

5. [http://www.fao.org/fishery/docs/CDrom/FAO\\_Training/FAO\\_Training/General/x6708e/x6708e06.htm](http://www.fao.org/fishery/docs/CDrom/FAO_Training/FAO_Training/General/x6708e/x6708e06.htm)
6. [http://aquaticcommons.org/1666/1/Better-Practice3\\_opt.pdf](http://aquaticcommons.org/1666/1/Better-Practice3_opt.pdf)
7. <https://www.notesonzoology.com/india/fishery/fish-diseases-symptoms-and-control-fishery/871>





# ST. JOSEPH'S COLLEGE FOR WOMEN(A), VISAKHAPATNAM

## SEMESTER-III

### COURSE 6-GENETICS- PRACTICAL

2 hrs/week

Code: Z-Ma2 -3551 (2)

#### LEARNING OBJECTIVES

- To acquire practical knowledge on the importance of Mendelian principles by solving the problems.
- To provide the required knowledge on the gene interactions
- To acquaint the students on Human karyotype & pedigree analysis basics
- To understand the various genetic concepts through Virtual labs

#### COURSE OUTCOMES

- CO1- K4- Apply practical knowledge on the importance of Mendelian principles by solving the problems.
- CO2- K2- Explain about the gene interactions
- CO3- K2- Describe basics of Human karyotype & pedigree analysis.
- CO4- K2- Discuss the various genetic concepts through Virtual labs

#### SYLLABUS:

1. Study of Mendelian inheritance & Non - mendelian inheritance using suitable examples/Problems
2. Study of linkage recombination, gene mapping using the data
3. Study of human karyotypes
4. Blood grouping and Rh in humans
5. Demonstration of prenatal diagnosis (Virtual lab).
6. Amniocentesis demo or virtual lab
7. Demonstration of Ultrasonography (Virtual lab).
8. Scoring dysmorphic features in syndromic patients
9. Genetic Counselling methods based on case history
10. Construction and analysis of Pedigree

#### REFERENCE WEB LINKS:

- <https://www.iitg.ac.in/cseweb/vlab/anthropology/Experiments/Mendels%20law/index.h>

tml

- <https://learn.genetics.utah.edu/content/labs/>
- [https://virtuallabs.merlot.org/vl\\_biology.html](https://virtuallabs.merlot.org/vl_biology.html)
- <https://blog.praxilabs.com/2020/06/30/dna-extraction-virtual-lab/>
- <https://jru.edu.in/studentcorner/lab-manual/agriculture/Fundamentals%20of%20Genetics.pdf>
- [https://academicworks.cuny.edu/cgi/viewcontent.cgi?article=1008&context=ny\\_oers](https://academicworks.cuny.edu/cgi/viewcontent.cgi?article=1008&context=ny_oers)
- <https://sjce.ac.in/wp-content/uploads/2018/04/Cell-Biology-Genetics-Laboratory-Manual-17-18.pdf>
- <https://www.rlbcu.ac.in/pdf/Agriculture/AGP%20113%20%20Fundamentals%20of%20Genetics>

.pdf

- [https://coabnau.in/uploads/1610707528\\_GPB3.2PracticalManual-Final.pdf](https://coabnau.in/uploads/1610707528_GPB3.2PracticalManual-Final.pdf)

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# ST. JOSEPH'S COLLEGE FOR WOMEN(A), VISAKHAPATNAM

## SEMESTER-III COURSE 6: PRINCIPLES OF GENETICS

Theory

Credits: 3

3hrs/week

Paper Code: Z-Ma2- 3501 (3)

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### LEARNING OBJECTIVES

- To provide the background knowledge on the history of genetics and the importance of Mendelian principles.
- To provide the required knowledge on the gene interactions
- To acquaint the students, distinguish between polygenic, sex-linked, and multiple allelic modes of inheritance and extrachromosomal inheritance.
- To understand the principles of sex determination in animals with a reference to human being, and sex-linked inheritance
- To understand the human karyotyping and the concept of pedigree analysis basics.

### COURSE OUTCOMES

By the completion of the course the graduate should be able to –

- CO1- K2- Explain the history of genetics, gain knowledge basic terminology of genetics
- CO2- K2- Describe about interaction of genes, various types of inheritance patterns existing in animals with reference to non-Mendelian inheritance.
- CO3- K2- Discuss knowledge on chromosomal inheritance
- CO4- K5- Summarize various aspects of genetics involved in sex determination,
- CO5- K4- Analyze in-depth knowledge on human karyotyping, pedigree analysis and chromosomal disorders concepts of proteomics and genomics

### SYLLABUS:

#### UNIT-I:

- 1.1 History of Genetics- Concepts of Phenotype, Genotype, Heredity, Variation, Pure lines and Inbred Lines, Laws of Inheritance
- 1.2 Mendelian Principles on Monohybrid cross, back cross and Test cross
- 1.3 Mendelian Principles on Dihybrid cross

#### UNIT-II:

- 2.1 Linkage - Definition, Types of linkage-complete linkage and incomplete linkage, Significance of linkage.
- 2.2 Crossing over - definition; Mechanism of crossing over: Chiasma Interference and coincidence
- 2.3 Gene Interactions: Incomplete dominance, codominance, Pleiotropy
- 2.4 Gene Interactions: Lethal alleles, Epistasis, Non- Epistasis.

### **UNIT-III:**

- 3.1 Polygenes (Characteristics & examples)
- 3.2 Multiple Alleles (Characteristics and Blood group inheritance)
- 3.3 Rh inheritance erythroblastosis foetalis
- 3.4 Extra chromosomal inheritance- Kappa particles in Paramecium and Torsion (Shell coiling) in snails.

### **UNIT-IV:**

- 4.1 Sex determination- Chromosomal theory and Genic Balance theory
- 4.2 Sex determination- Hormonal, Environmental and Haplo-diploidy types
- 4.3 Sex linked inheritance: X-linked inheritance
- 4.4 Sex linked inheritance: Y-linked & XY-linked inheritance

### **UNIT-V:**

- 5.1 Human karyotyping, Pedigree Analysis(basics)
- 5.2 Autosomal Recessive disorder-Sickle cell anaemia – causes, treatment, inheritance pattern,modes of testing and prevention
- 5.3 Autosomal Dominant disorder- Huntington disease-causes, treatment, inheritance pattern,modes of testing and prevention
- 5.4 Basics on Genomics and Proteomic

### **Co-curricular activities (Suggested)**

- Observation of Mendelian / Non-Mendelian inheritance in the plants of college botanical garden or local village as a student study project activity
- Observation of blood group inheritance in students, from their parents and grandparents
- Karyotyping and preparation of pedigree charts for identifying diseases in family history
- Charts on chromosomal disorders

### **REFERENCE BOOKS:**

- Harper, P. (2010). Practical genetic counselling. CRC Press. Kessler, S. (Ed.). (2013). Genetic counselling: psychological dimensions. Academic Press. 3. Stevenson, A. C., & Davison, B. C. (2016). Genetic counselling. Elsevier.
- Evans, C. (2006). Genetic counselling: a psychological approach. Cambridge University Press.
- References:
- Atlas of Inherited Metabolic Diseases.
- Mendelian Inheritance in Man: A Catalog of Human Genes and Genetic

- Disorders, Victor A. McKusick, 2 Vol I & II
- Stacy L Blachford (Editor) 2001. The Gale Encyclopedia of Genetic Disorders. Gale Group Publishers, Vol.1 (A-L), Vol. II (M-Z).
  - Limoine, W.R. and Cooper, D.NB. 1996: Gene Trophy, Bios Scientific Pub. Oxford.
  - REFERENCES:
  - Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008). Principles of Genetics. VIII Edition. Wiley India
  - Snustad, D.P., Simmons, M.J. (2009). Principles of Genetics. V Edition. John Wiley and Sons Inc.
  - Klug, W.S., Cummings, M.R., Spencer, C.A. (2012). Concepts of Genetics. X Edition. Benjamin Cummings.
  - Russell, P. J. (2009). Genetics- A Molecular Approach. III Edition. Benjamin Cummings.
  - Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C. and Carroll, S.B. Introduction to Genetic Analysis. IX Edition. W. H. Freeman and Co.
  - James D. Watson, Nancy H. Hopkins 'Molecular Biology of the Gene'
  - Gupta P.K., 'Genetics

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# ST. JOSEPH'S COLLEGE FOR WOMEN(A), VISAKHAPATNAM

## SEMESTER-IV

### ANIMAL PHYSIOLOGY: LIFE SUSTAINING SYSTEMS

#### Practical

Code:Z-Ma2-4551(2)

#### LEARNING OBJECTIVES

- · To acquire knowledge of anatomy of certain important organs.
- · To develop the ability to test the biological sample like saliva and urine.
- · To Effectively estimate the blood haemoglobin.
- · To Acquire skill to use the sphygmomanometer in recording blood pressure.
- To observe the ECG

#### COURSE OUTCOMES:

By the completion of the course the graduate shall be able to –

- CO1-K3- Acquire knowledge on anatomy of certain important organs.
- CO2-K5- Develop the ability to test the biological sample like saliva and urine.
- CO3-K2- Estimate effectively the blood haemoglobin.
- CO4-K5- Develop skill to use the sphygmomanometer in recording blood pressure.
- CO5-K3- Demonstrate and explain the ECG

#### SYLLABUS:

1. Examination of sections of mammalian oesophagus, stomach, duodenum, ileum, rectum liver, trachea, lung, kidney and visit to Medical College to observe the preserved whole organs.
2. Study of activity of Salivary amylase under optimum condition
3. Qualitative tests for identification of Carbohydrates
4. Qualitative tests for identification of Proteins
5. Qualitative tests for identification of Fats
6. Urine test for sugar, albumin
7. Estimation of haemoglobin using Sahli's haemoglobinometer
8. Recording of blood pressure using a sphygmomanometer

9. Recording of frog's heart beat under in situ and perfused conditions

10. ECG observation- Spotting/identification of curves from the given ECG

**REFERENCE WEB LINKS:**

· <https://www.vlab.co.in/participating-institute-amrita-vishwa-vidyapeetham>

· <https://library.csi.cuny.edu/oer/virtuallabs-simulations#anatomy>

· <https://www.labster.com/simulations?course-packages=animal-physiology>

·

<http://www.zoologyresources.com/uploadfiles/books/dc64b77d8769325515d17c945e461b45.pdf>

· [https://physiology.elte.hu/gyakorlat/jegyzet/Physiology\\_Pactical\\_\(2013\).pdf](https://physiology.elte.hu/gyakorlat/jegyzet/Physiology_Pactical_(2013).pdf)

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# ST. JOSEPH'S COLLEGE FOR WOMEN(A), VISAKHAPATNAM

## SEMESTER-IV

### ANIMAL PHYSIOLOGY: LIFE SUSTAINING SYSTEMS

Paper code: Z-Ma2-4501(3)

#### LEARNING OBJECTIVES

- To acquire knowledge of organ systems function.
- To develop the ability to integrate physiology from the cellular and molecular level to the organ system and organismic level of organization.
- To Effectively read, evaluate and communicate scientific information related to physiological processes in the body.
- To gain a deep knowledge of current topics in physiology.

**COURSE OUTCOMES:** By the completion of the course the graduate shall be able to –

- CO1- K2- Explain the physiology of digestion and hormonal control of digestion
- CO2-K5- Develop a comprehensive picture of respiratory physiology
- CO3-K2- Summarize about the Renal physiology
- CO4-K2- Describe the physiology of Nerve and muscle
- CO5-K2- Discuss the physiology of heart

#### SYLLABUS:

##### UNIT-I: Physiology of Digestion

- 1.1 Structural organization and functions of gastrointestinal tract and associated glands;
- 1.2 Vitamins & Mineral composition of food & Mechanical and chemical digestion of food;
- 1.3 Absorptions of carbohydrates, lipids, proteins, water, minerals and vitamins;
- 1.4 Hormonal control of secretion of enzymes in Gastrointestinal tract.

##### UNIT-II: Physiology of Respiration

- 2.1 Structural organization of Respiratory system, Mechanism of respiration, Control of respiration
- 2.2 Pulmonary ventilation; Respiratory volumes and capacities;
- 2.3 Transport of oxygen in blood and dissociation curves and the factors influencing it

2.4 Transport of Carbon dioxide in blood; dissociation curves and the factors influencing it, Carbon monoxide poisoning

### **UNIT-III: Renal Physiology`**

3.1 Structure of kidney and its functional unit

3.2 Mechanism of urine formation, counter current mechanism

3.3 Regulation of water balance

3.4 Regulation of acid-base balance

### **UNIT-IV: Physiology of exciting tissues**

4.1 Neuron structure and types

4.2 Nerve impulse transmission- (Myelinated, Non-myelinated, synaptic)

4.3 Types of muscles, Ultra structure of skeletal muscle

4.4 Molecular and chemical basis of muscle contraction

### **UNIT- V: Physiology of Heart**

5.1 Structure of mammalian heart, Coronary circulation;

5.2 Structure and working of conducting myocardial fibres. Origin and conduction of cardiac impulses, Artificial pacemaker

5.3 Cardiac Cycle-Cardiac output and its regulation

5.4 Nervous and chemical regulation of heart rate. Blood pressure and its regulation

### **Co-curricular activities (Suggested)**

- Chart on cardiac cycle, human lung, kidney/nephron structure etc.
- Working model of human / any mammalian heart.
- Working model of human / any mammalian urine formation
- Chart/model of sarcomere
- Chart/model on nerve impulse transmission

## REFERENCES BOOKS:

- Eckert H. *Animal Physiology: Mechanisms and Adaptation*. W.H. Freeman & Company.
- Flory E. *An Introduction to General and Comparative Animal Physiology*. W.B. Saunders Co., Philadelphia.
- Goel KA and Satish KV. 1989. *A Text Book of Animal Physiology*, Rastogi Publications, Meerut, U.P.
- Hoar WS. *General and Comparative Physiology*. Prentice Hall of India, New Delhi.
- Lehninger AL. Nelson and Cox. *Principles of Biochemistry*. Lange Medical Publications, New Delhi.
- Prosser CL and Brown FA. *Comparative Animal Physiology*. W.B. Saunders Company, Philadelphia.

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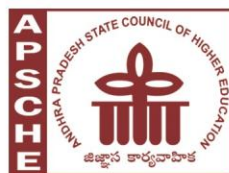
# Model Program Book



# SEMESTER INTERNSHIP

ST. JOSEPH'S COLLEGE FOR WOMEN  
(AUTONOMOUS) VISAKHAPATNAM

SLI 6001 (12)  
From AH Batch



12 Weeks  
200 Marks

# **An Internship Report on**

*(Title of the Semester Internship Program)*

*Submitted in accordance with the requirement for the degree of*

*Under the Faculty Guideship of*

*(Name of the Faculty Guide)*

*Department of*

*(Name of the College)*

**Submitted by:**

*(Name of the Student)*

**Reg.No:** \_\_\_\_\_

*Class & Group* \_\_\_\_\_

*(Name of the College)*

**TITLE PAGE**

# **An Internship Report on**

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*(Title of the Semester Internship Program) Submitted*  
*in accordance with the requirement for the degree of*

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*Under the Faculty Guideship of*

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*(Name of the Faculty Guide)*

*Department of*

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*(Name of the College)*

**Submitted by:**

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*(Name of the Student)*

**Reg.No:** \_\_\_\_\_

*Class & Group* \_\_\_\_\_

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*(Name of the College)*

PROGRAM BOOK FOR  
**SEMESTER INTERNSHIP**

Name of the Student:

Name of the College:

Registration Number:

Period of Internship:                      From:                      To:

Name & Address of the Intern Organization

\_\_\_\_\_ **SJCW(A)**  
YEAR





## Instructions to Students

Please read the detailed Guidelines on Internship hosted on the website of AP State Council of Higher Education <https://apsche.ap.gov.in>

1. It is mandatory for all the students to complete Semester internship either in V Semester or in VI Semester.
2. Every student should identify the organization for internship in consultation with the College Principal/the authorized person nominated by the Principal.
3. Report to the intern organization as per the schedule given by the College. You must make your own arrangements for transportation to reach the organization.
4. You should maintain punctuality in attending the internship. Daily attendance is compulsory.
5. You are expected to learn about the organization, policies, procedures, and processes by interacting with the people working in the organization and by consulting the supervisor attached to the interns.
6. While you are attending the internship, follow the rules and regulations of the intern organization.
7. While in the intern organization, always wear your College Identity Card.
8. If your College has a prescribed dress as uniform, wear the uniform daily, as you attend to your assigned duties.
9. You will be assigned a Faculty Guide from your College. He/She will be creating a WhatsApp group with your fellow interns. Post your daily activity done and/or any difficulty you encounter during the internship.
10. Identify five or more learning objectives in consultation with your Faculty Guide. These learning objectives can address:
  - a. Data and Information you are expected to collect about the organization / industry/institute
  - b. Job Skills you are expected to acquire.
  - c. Development of professional competencies that lead to future career success.
11. Practice professional communication skills with team members, co-interns, and your supervisor. This includes expressing thoughts and ideas effectively through oral, written, and non-verbal communication, and utilizing listening skills.
12. Be aware of the communication culture in your work environment. Follow up and communicate regularly with your supervisor to provide updates on your progress with work assignments.

13. Never be hesitant to ask questions to make sure you fully understand what you need to do your work and to contribute to the organization.
14. Be regular in filling up your Program Book. It shall be filled up in your own handwriting. Add additional sheets wherever necessary.
15. At the end of internship, you shall be evaluated by your Supervisor of the intern organization.
16. There shall also be evaluation at the end of the internship by the Faculty Guide and the Principal.
17. Do not meddle with the instruments/equipment you work with.
18. Ensure that you do not cause any disturbance to the regular activities of the intern organization.
19. Be cordial but not too intimate with the employees of the intern organization and your fellow interns.
20. You should understand that during the internship programme, you are the ambassador of your College, and your behavior during the internship programme is of utmost importance.
21. If you are involved in any discipline related issues, you will be withdrawn from the internship programme immediately and disciplinary action shall be initiated.
22. Do not forget to keep up your family pride and prestige of your College.

.....<<@>>.....

# Student's Declaration

I, \_\_\_\_\_ a student of \_\_\_\_\_  
Program, Reg. No. \_\_\_\_\_ of \_\_\_\_\_  
College do hereby declare that I have completed the mandatory internship  
from \_\_\_\_\_ to \_\_\_\_\_ in \_\_\_\_\_ (Name of  
the intern organization) under the Faculty Guideship of  
\_\_\_\_\_ (Name of the Faculty Guide), Department of  
\_\_\_\_\_  
(Name of the College)

*(Signature and Date)*



# Official Certification

This is to certify that \_\_\_\_\_ (*Name of the student*) Reg. No. \_\_\_\_\_ has completed his/her Internship in \_\_\_\_\_ (*Name of the Intern Organization*) on \_\_\_\_\_ (*Title of the Internship*) under my supervision as a part of partial fulfillment of the requirement for the Degree of \_\_\_\_\_ at \_\_\_\_\_ (*Name of the College*).

This is accepted for evaluation.

*(Signatory with Date and Seal)*

## Endorsements

*Faculty Guide*

*Head of the Department*

*Principal*



## **Certificate from Intern Organization**

This is to certify that \_\_\_\_\_ (*Name of the intern*)  
Reg. No \_\_\_\_\_ of \_\_\_\_\_ (*Name of the*  
*College*) underwent internship in \_\_\_\_\_ (*Name of the*  
*Intern Organization*) from \_\_\_\_\_ to \_\_\_\_\_

The overall performance of the intern during his/her internship is found to be  
\_\_\_\_\_ (*Satisfactory/Not Satisfactory*).

*Authorized Signatory with Date and Seal*



# Acknowledgements



# Contents



## **CHAPTER 1: EXECUTIVE SUMMARY**

The internship report shall have a brief executive summary. It shall include five or more Learning Objectives and Outcomes achieved, a brief description of the sector of business and intern organization and summary of all the activities done by the intern during the period.



## **CHAPTER 2: OVERVIEW OF THE ORGANIZATION**

### **Suggestive contents**

- A. Introduction of the Organization
- B. Vision, Mission, and Values of the Organization
- C. Policy of the Organization, in relation to the intern role
- D. Organizational Structure
- E. Roles and responsibilities of the employees in which the intern is placed.
- F. Performance of the Organization in terms of turnover, profits, market reach and market value.
- G. Future Plans of the Organization.



### **CHAPTER 3: INTERNSHIP PART**

*Description of the Activities/Responsibilities in the Intern Organization during Internship, which shall include - details of working conditions, weekly work schedule, equipment used, and tasks performed. This part could end by reflecting on what kind of skills the intern acquired.*



### ACTIVITY LOG FOR THE FIRST WEEK

<b>Day &amp; Date</b>	<b>Brief description of the daily activity</b>	<b>Learning Outcome</b>	<b>Person In-Charge Signature</b>
Day - 1			
Day - 2			
Day - 3			
Day - 4			
Day - 5			
Day - 6			



### ACTIVITY LOG FOR THE SECOND WEEK

<b>Day &amp; Date</b>	<b>Brief description of the daily activity</b>	<b>Learning Outcome</b>	<b>Person In-Charge Signature</b>
Day - 1			
Day - 2			
Day - 3			
Day - 4			
Day - 5			
Day - 6			



**Bi-Weekly Repot-I**  
**Hard Copy to be submitted After Second Week**

**ACTIVITY LOG FOR THE THIRD WEEK**

<b>Day &amp; Date</b>	<b>Brief description of the daily activity</b>	<b>Learning Outcome</b>	<b>Person In-Charge Signature</b>
Day - 1			
Day - 2			
Day - 3			
Day - 4			
Day - 5			
Day -6			



### ACTIVITY LOG FOR THE FORTH WEEK

<b>Day &amp; Date</b>	<b>Brief description of the daily activity</b>	<b>Learning Outcome</b>	<b>Person In-Charge Signature</b>
Day - 1			
Day - 2			
Day - 3			
Day - 4			
Day - 5			
Day - 6			



**Bi-Weekly Reput-2**  
**Hard Copy to be submitted After Fourth Week**



**Monthly Report – I**  
**Typed hard copy to be submitted after Four weeks**

**ACTIVITY LOG FOR THE FIFTH WEEK**

<b>Day &amp; Date</b>	<b>Brief description of the daily activity</b>	<b>Learning Outcome</b>	<b>Person In-Charge Signature</b>
Day - 1			
Day - 2			
Day - 3			
Day - 4			
Day - 5			
Day - 6			



### ACTIVITY LOG FOR THE SIXTH WEEK

<b>Day &amp; Date</b>	<b>Brief description of the daily activity</b>	<b>Learning Outcome</b>	<b>Person In-Charge Signature</b>
Day - 1			
Day - 2			
Day - 3			
Day - 4			
Day - 5			
Day - 6			



**Bi-Weekly Reput-3**  
**Hard Copy to be submitted After Sixth Week**

### ACTIVITY LOG FOR THE SEVEN WEEK

<b>Day &amp; Date</b>	<b>Brief description of the daily activity</b>	<b>Learning Outcome</b>	<b>Person In-Charge Signature</b>
Day - 1			
Day - 2			
Day - 3			
Day - 4			
Day - 5			
Day -6			



**ACTIVITY LOG FOR THE EIGHTH WEEK**

<b>Day &amp; Date</b>	<b>Brief description of the daily activity</b>	<b>Learning Outcome</b>	<b>Person In-Charge Signature</b>
Day - 1			
Day - 2			
Day - 3			
Day - 4			
Day - 5			
Day - 6			



**Bi-Weekly Reput-4**  
**Hard Copy to be submitted After Eighth Week**



**Monthly Report - 2**  
**Typed hard copy to be submitted after Eighth week**

**ACTIVITY LOG FOR THE NINETH WEEK**

<b>Day &amp; Date</b>	<b>Brief description of the daily activity</b>	<b>Learning Outcome</b>	<b>Person In-Charge Signature</b>
Day - 1			
Day - 2			
Day - 3			
Day - 4			
Day - 5			
Day - 6			



### ACTIVITY LOG FOR THE TENTH WEEK

<b>Day &amp; Date</b>	<b>Brief description of the daily activity</b>	<b>Learning Outcome</b>	<b>Person In-Charge Signature</b>
Day - 1			
Day - 2			
Day - 3			
Day - 4			
Day - 5			
Day - 6			



**Bi - Weekly Report - 5**  
**Hard copy to be submitted after Tenth week**

**ACTIVITY LOG FOR THE ELEVENTH WEEK**

<b>Day &amp; Date</b>	<b>Brief description of the daily activity</b>	<b>Learning Outcome</b>	<b>Person In-Charge Signature</b>
Day - 1			
Day - 2			
Day - 3			
Day - 4			
Day - 5			
Day - 6			



### ACTIVITY LOG FOR THE TWELVETH WEEK

<b>Day &amp; Date</b>	<b>Brief description of the daily activity</b>	<b>Learning Outcome</b>	<b>Person In-Charge Signature</b>
Day - 1			
Day - 2			
Day - 3			
Day - 4			
Day - 5			
Day - 6			



**Bi Weekly Report - 6**  
**Hard copy to be submitted after Twelfth week**

**Monthly Report - 3**  
**Typed hard copy to be submitted after Twelfth week**

**ACTIVITY LOG FOR THE THIRTEENTH WEEK**

<b>Day &amp; Date</b>	<b>Brief description of the daily activity</b>	<b>Learning Outcome</b>	<b>Person In-Charge Signature</b>
Day - 1			
Day - 2			
Day - 3			
Day - 4			
Day - 5			
Day -6			



**ACTIVITY LOG FOR THE FOURTEENTH WEEK**

<b>Day &amp; Date</b>	<b>Brief description of the daily activity</b>	<b>Learning Outcome</b>	<b>Person In-Charge Signature</b>
Day - 1			
Day - 2			
Day - 3			
Day - 4			
Day - 5			
Day - 6			



**Bi-Weekly Report - 7**  
**Hard copy to be submitted after 14<sup>th</sup> week**

**ACTIVITY LOG FOR THE FIFTEENTH WEEK**

<b>Day &amp; Date</b>	<b>Brief description of the daily activity</b>	<b>Learning Outcome</b>	<b>Person In-Charge Signature</b>
Day - 1			
Day - 2			
Day - 3			
Day - 4			
Day - 5			
Day -6			



**Bi weekly Report - 8**  
**Hard copy to be submitted at the end of 15<sup>th</sup> / 16<sup>th</sup> week**



**Monthly Report - 4**  
**Typed hard copy to be submitted after 16<sup>th</sup> week**



**CHAPTER 4: PROJECT REPORT**  
**OVERALL INTERNSHIP REPORT**

## **CHAPTER 5: OUTCOMES DESCRIPTION**

**5.1 Describe the work environment you have experienced** (*in terms of people interactions, facilities available and maintenance, clarity of job roles, protocols, procedures, processes, discipline, time management, harmonious relationships, socialization, mutual support and teamwork, motivation, space and ventilation, etc.*)



**5.2 Describe the real time technical skills you have acquired** (*in terms of the job-related skills and hands on experience*)



**5.3 Describe the managerial skills you have acquired** *(in terms of planning, leadership, team work, behaviour, workmanship, productive use of time, weekly improvement in competencies, goal setting, decision making, performance analysis, etc.*



**5.4 Describe how you could improve your communication skills** (*in terms of improvement in oral communication, written communication, conversational abilities, confidence levels while communicating, anxiety management, understanding others, getting understood by others, extempore speech, ability to articulate the key points, closing the conversation, maintaining niceties and protocols, greeting, thanking and appreciating others, etc.,*)



**5.5 Describe how could you could enhance your abilities in group discussions, participation in teams, contribution as a team member, leading a team/activity.**



**5.6 Describe the technological developments you have observed and relevant to the subject area of training** (*focus on digital technologies relevant to your job role*)



## *Student Self Evaluation of the Semester Internship*

<b>Student Name:</b>	<b>Registration No:</b>	
<b>Term of Internship:</b>	<b>From:</b>	<b>To :</b>
<b>Date of Evaluation:</b>		
<b>Organization Name &amp; Address:</b>		

**Please rate your performance in the following areas:**

**Rating Scale:**                      **Letter grade of CGPA calculation to be provided**

1	Oral communication	1	2	3	4	5
2	Written communication	1	2	3	4	5
3	Proactiveness	1	2	3	4	5
4	Interaction ability with community	1	2	3	4	5
5	Positive Attitude	1	2	3	4	5
6	Self-confidence	1	2	3	4	5
7	Ability to learn	1	2	3	4	5
8	Work Plan and organization	1	2	3	4	5
9	Professionalism	1	2	3	4	5
10	Creativity	1	2	3	4	5
11	Quality of work done	1	2	3	4	5
12	Time Management	1	2	3	4	5
13	Understanding the Community	1	2	3	4	5
14	Achievement of Desired Outcomes	1	2	3	4	5
15	Regularity	1	2	3	4	5
<b>16</b>	<b>OVERALL PERFORMANCE</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>

**Date:**

**Signature of the Student**

## *Evaluation by the Supervisor of the Intern Organization*

<b>Student Name:</b>	<b>Registration No:</b>
<b>Term of Internship:</b>	<b>From: To :</b>
<b>Date of Evaluation:</b>	
<b>Organization Name &amp; Address:</b>	
<b>Name &amp; Address of the Supervisor with Mobile Number</b>	

Please rate the student's performance in the following areas:

Rating Scale: 1 is lowest and 5 is highest rank

1	Oral communication	1	2	3	4	5
2	Written communication	1	2	3	4	5
3	Proactiveness	1	2	3	4	5
4	Interaction ability with community	1	2	3	4	5
5	Positive Attitude	1	2	3	4	5
6	Self-confidence	1	2	3	4	5
7	Ability to learn	1	2	3	4	5
8	Work Plan and organization	1	2	3	4	5
9	Professionalism	1	2	3	4	5
10	Creativity	1	2	3	4	5
11	Quality of work done	1	2	3	4	5
12	Time Management	1	2	3	4	5
13	Understanding the Community	1	2	3	4	5
14	Achievement of Desired Outcomes	1	2	3	4	5
15	Regularity	1	2	3	4	5
<b>16</b>	<b>OVERALL PERFORMANCE</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>

**Date:**

**Signature of the Supervisor**

<b>% Aggregated marks</b>	<b>Description</b>	<b>Grade Letter</b>	<b>Grade points</b>
90 - ≤ 100	Outstanding	<b>O</b>	10.0
80 - < 90	Excellent	<b>A+</b>	9.0
70 - < 80	Very Good	<b>A</b>	8.0
60 - < 70	Good	<b>B+</b>	7.0
55 - < 60	Above Average	<b>B</b>	6.0
50 - < 55	Average	<b>C</b>	5.0
40 - < 50	Pass	<b>P</b>	4.0
<40	Fail	<b>F</b>	0.0

## **PHOTOS & VIDEO LINKS**



## Assessment

<b>Assessment Component</b>	<b>Max Marks</b>	<b>Assessment method</b>
1. Continuous Assessment	80	Internal
2. End semester Assessment	80	External
3. VivaVoce	40	External
<b>TOTAL MARKS</b>	<b>100</b>	
<b>Assessment Component</b>	<b>Max Marks</b>	<b>Assessment method</b>
<b>Continuous assessment</b>		
1. Project Log	24	Internal
2. Project Implementation	16	Internal
3. Project Report	25	Internal
4. Presentation	15	Internal
<b>TOTAL MARKS</b>	<b>80</b>	
<b>Assessment Component</b>	<b>Max Marks</b>	<b>Assessment method</b>
<b>End Semester Assessment</b>		
1. Marks awarded by Industry/Organization	80	External
<b>TOTAL MARKS</b>	<b>80</b>	
<b>Assessment Component</b>	<b>Max Marks</b>	<b>Assessment method</b>
<b>Viva voce</b>		
1. Knowledge	10	External
2. Presentation	10	External
3. Viva voce	20	External
<b>TOTAL MARKS</b>	<b>40</b>	

### Marks awarded by Industry/Organization

1	Oral communication	1	2	3	4	5
2	Written communication	1	2	3	4	5
3	Proactiveness	1	2	3	4	5
4	Interaction ability with community	1	2	3	4	5
5	Positive Attitude	1	2	3	4	5
6	Self-confidence	1	2	3	4	5
7	Ability to learn	1	2	3	4	5
8	Work Plan and organization	1	2	3	4	5
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10	Creativity	1	2	3	4	5
11	Quality of work done	1	2	3	4	5
12	Time Management	1	2	3	4	5
13	Understanding the Community	1	2	3	4	5
14	Achievement of Desired Outcomes	1	2	3	4	5
15	Regularity	1	2	3	4	5
16	<b>OVERALL PERFORMANCE</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
	<b>Total Marks</b>					<b>80</b>





# **ANDHRA PRADESH STATE COUNCIL OF HIGHER EDUCATION**

**(A Statutory Body of the Government of Andhra Pradesh)**

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