



## ANDHRA PRADESH STATE COUNCIL OF HIGHER EDUCATION

### MINOR

**Subject: Zoology**

**w.e.f. AY 2023-24**

### COURSE STRUCTURE

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
	II	1	Animal Diversity-I Biology of Non-Chordates	3	3
			Animal Diversity-I Biology of Non-Chordates Practical Course	2	1
II	III	2	Animal Diversity-II Biology of Chordates	3	3
			Animal Diversity-II Biology of Chordates Practical Course	2	1
	IV	3	Embryology	3	3
			Embryology Practical Course	2	1
		4	Animal Physiology: Life Sustaining Systems	3	3
			Animal Physiology: Life Sustaining Systems Practical Course	2	1
III	V	5	Poultry Management-I (Poultry Farming)	3	3
			Poultry Management-I (Poultry Farming) Practical Course	2	1
		6	Poultry Management-II (Poultry Production and Management)	3	3
			Poultry Management-II (Poultry Production and Management) Practical Course	2	1

## SEMESTER-II

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

Theory

Credits: 3

3hrs/week

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#### LEARNING OBJECTIVES:

- To understand the taxonomic position of protozoa to helminthes.
- To understand the general characteristics of animals belonging to protozoa to hemichordata.
- 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 the graduate should able to –

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

#### SYLLABUS:

##### UNIT-I

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

*Activity: Assignment /Seminar on the above*

*Evaluation: Marks to be awarded for written and oral presentations*

##### UNIT –II

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

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

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

### **UNIT – III**

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

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

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

### **UNIT – IV**

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

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

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

### **UNIT – V**

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

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

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

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

- 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

**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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## SEMESTER-II

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

Practical

Credits: 1

2 hrs/week

#### 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, labelled record of identified museum specimens

#### SYLLABUS:

Study of museum slides / specimens / models (Classification of animals up to orders)

- Protozoa: *Amoeba*, *Paramecium*, *Paramecium* Binary fission and Conjugation, *Vorticella*, *Entamoeba histolytica*, *Plasmodium vivax*
- Porifera: *Sycon*, *Spongilla*, *Euspongia*, *Sycon*- T.S & L.S, Spicules, Gemmule
- Coelenterata: *Obelia* – Colony & Medusa, *Aurelia*, *Physalia*, *Velella*, *Corallium*, *Gorgonia*, *Pennatula*
- Platyhelminthes: *Planaria*, *Fasciola hepatica*, *Fasciola* larval forms – Miracidium, Redia, Cercaria, *Echinococcus granulosus*, *Taenia solium*, *Schistosoma haematobium*
- Nematelminths: *Ascaris* (Male & Female), *Dracunculus*, *Ancylostoma*, *Wuchereria*
- Annelida: *Nereis*, *Aphrodite*, *Chaetopteurs*, *Hirudinaria*, Trochophore larva
- Arthropoda: *Cancer*, *Palaemon*, Scorpion, *Scolopendra*, *Sacculina*, *Limulus*, *Peripatus*, Larvae - Nauplius, Mysis, Zoa, Mouth parts of male & female *Anopheles* and *Culex*, Mouthparts of Housefly and Butterfly.
- Mollusca: *Chiton*, *Pila*, *Unio*, *Pteredo*, *Murex*, *Sepia*, *Loligo*, *Octopus*, *Nautilus*, Glochidium larva
- Echinodermata: *Asterias*, *Ophiothrix*, *Echinus*, *Clypeaster*, *Cucumaria*, *Antedon*, Bipinnaria larva
- 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 set 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/>
- <http://www.zoologyresources.com/uploadfiles/books/dc64b77d8769325515d17c945e461b45.pdf>

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### SEMESTER-III

## COURSE 2: ANIMAL DIVERSITY-II BIOLOGY OF CHORDATES

Theory

Credits: 3

3 hrs/week

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### 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 be able to –

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

### SYLLABUS:

#### UNIT - I

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

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

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

#### UNIT - II

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

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

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

### **UNIT - III**

3.1 General characters of Amphibia, General characters of Reptilia

3.2 *Rana hexadactyla*: External features, Respiratory system, Structure and function of Heart

3.3 *Rana hexadactyla* structure and functions of the Brain

3.4 *Calotes*: External features, Digestive system, structure and function of Brain

3.5 Identification of Poisonous snakes

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

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

### **UNIT - IV**

4.1 General characters of Aves

4.2 *Columba livia*: External features, Digestive system, Respiratory system

4.3 *Columba livia*: Structure and function of Heart, structure and function of Brain

4.4 Migration in Birds, Flight adaptation in birds

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

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

### **UNIT - V**

5.1 General characters of Mammalia

5.2 Classification of Mammalia up to sub - classes with examples

5.3 Comparison of Prototherians, Metatherians and Eutherians

5.4 Dentition in mammals, Aquatic mammals Adaptations

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

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

### **Co-curricular activities (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). 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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### SEMESTER-III

## COURSE 2: ANIMAL DIVERSITY-II BIOLOGY OF CHORDATES

Practical

Credits: 1

2 hrs/week

### 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

### 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
  - Scoliodon* IX and X, Cranial nerves
  - Scoliodon* Brain
  - 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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**SEMESTER-IV**  
**COURSE 3: EMBRYOLOGY**

Theory

Credits: 3

3 hrs/week

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**LEARNING OBJECTIVES**

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

**LEARNING OUTCOMES:**

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

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

**SYLLABUS:**

**UNIT-I:**

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

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

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

**UNIT-II:**

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

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

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

### **UNIT-III:**

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

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

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

### **UNIT-IV:**

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

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

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

### **UNIT-V:**

- 5.1 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)

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

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

#### **Co-curricular activities (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*, 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*. 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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**SEMESTER-IV**  
**COURSE 3: EMBRYOLOGY**

Practical

Credits: 1

2 hrs/week

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**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

**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/dc64b77d8769325515d17c945e461b45.pdf>

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## SEMESTER-IV

### COURSE 4: ANIMAL PHYSIOLOGY: LIFE SUSTAINING SYSTEMS

Theory

Credits: 3

3 hrs/week

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#### 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.

#### LEARNING OUTCOMES:

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

- Understand the physiology of digestion and hormonal control of digestion
- Develop a comprehensive picture of respiratory physiology
- Acquire knowledge on the Renal physiology
- Understand the physiology of Nerve and muscle
- Understand 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.

*Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above /Chart preparation on the hormonal control of secretion of enzymes*

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

##### 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

*Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above /Group discussion on the CO poisoning/Debate on the dissociation curves*

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

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

- 3.1 Structure of kidney and its functional unit
- 3.2 Mechanism of urine formation
- 3.3 Regulation of water balance
- 3.4 Regulation of acid-base balance

***Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above /Group discussion on the Urine formation/Working model of Kidney***

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

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

- 4.1 Neuron structure and types
- 4.2 Nerve impulse transmission-(Myelinated, Non-myelinated, synaptic)
- 4.3 Ultra structure of muscle
- 4.4 Molecular and chemical basis of muscle contraction

***Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above /Group discussion on the impulse transmission/Debate on the dissociation curves***

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

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

- 5.1 Structure of mammalian heart, Coronary circulation;
- 5.2 Structure and working of conducting myocardial fibers. Origin and conduction of cardiac impulses
- 5.3 Cardiac Cycle-Cardiac output and its regulation
- 5.4 Nervous and chemical regulation of heart rate. Blood pressure and its regulation

***Activity: Assignment /Students Seminar/Quiz/Project/Peer teaching/Report writing after watching any video on the above /Group discussion on the phases of Cardiac output /case study on the Blood Pressure***

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

### **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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## SEMESTER-IV

### COURSE 4: ANIMAL PHYSIOLOGY: LIFE SUSTAINING SYSTEMS

Practical

Credits: 1

2 hrs/week

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#### 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

#### SYLLABUS:

1. Examination of sections of mammalian oesophagus, stomach, duodenum, ileum, rectum liver, trachea, lung, kidney
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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**SEMESTER-V**  
**COURSE 5: POULTRY MANAGEMENT-I (POULTRY FARMING)**

Theory

Credits: 3

3 hrs/week

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**LEARNING OUTCOMES:**

Students at the successful completion of the course will be able to

- Evaluate the status of Indian Poultry Industry
- Explain the Scientific Poultry keeping
- Compare the diversified Poultry practices
- Inspect the different breeds of chicken

**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

**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 Ducks and Geese-classification- rearing system-classification-advantages
- 3.2 Guinea fowls - guinea fowl farming in India-Production-varieties
- 3.3 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-Kadakhnath-Bursa
- 4.3 Improved varieties in India – Giriraja-Vanaraja-Girirani-Kalinga brown, Gramapriya,Swarnandhra

**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, Nandanm-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.drvt.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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**SEMESTER-V**  
**COURSE 5: POULTRY MANAGEMENT-I (POULTRY FARMING)**

Practical

Credits: 1

2 hrs/week

**LEARNING OUTCOMES:**

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

- Identify different types of Poultry rearing practices
- Evaluate the efficacy of different types of poultry practices in maximizing yield
- Understand the importance of different hybrid breeds in poultry

**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 images/charts/ Models (Observation of characters)
4. Types of broilers images/charts/ Models (Identification of important Characters)
5. CARI breeds characters –images/charts
6. Nandanam breeds- images/charts (Identification of characters)  
\*\*\* (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)

**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-brojlernyh-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, detailsof 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.tanuvas.ac.in/ippmmadhavaram\\_tech.html](http://www.tanuvas.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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**SEMESTER-V**  
**COURSE 6: POULTRY MANAGEMENT-II**  
**(POULTRY PRODUCTION AND MANAGEMENT)**

Theory

Credits: 3

3 hrs/week

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**LEARNING OUTCOMES:**

Students at the successful completion of the course will be able to

- Suggest measure for Health care in Poultry
- Evaluate the economics of poultry production
- Elaborate the poultry Breeder flock management
- Differentiate the poultry hatchery practices

**SYLLABUS:**

**Unit-1 HEALTH CARE**

- 1.1 Common poultry diseases: bacterial, viral, fungal, parasitic and nutritional deficiencies.
- 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 Projects reports in different systems of rearing for layer & broilers.
- 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 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 Importance of hatchery records, break even analysis of 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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**SEMESTER-V**  
**COURSE 6: POULTRY MANAGEMENT-II**  
**(POULTRY PRODUCTION AND MANAGEMENT)**

Practical

Credits: 1

2 hrs/week

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**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
2. Poultry Fungal Diseases- Observation of histopathological slides
3. Poultry Bacterial Diseases-Observation of histopathological slides
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

**REFERENCES:**

1. HVS Chauhan, S. Roy, Poultry Diseases, Diagnosis and Treatment, New Age International Publishers-2018
2. Flow chart hatchery : <http://lms.tanuvas.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, detailsof 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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