ASD GOVT. DEGREE COLLEGE FOR WOMEN (A)

(Re-Accredited by NAAC with B Grade)

Jagannaickpur, Kakinada, East Godavari, AP – 533002

DEPARTMENT OF ZOOLOGY & AQUACULTURE TECHNOLOGY

2022-2023

ZOOLOGY

A.S.D.GOVERNMENT DEGREE COLLEGE FOR WOMEN (A)
(Re-Accredited NAAC with "B" Grade)
KAKINADA, EAST GODAVARI, A.P, 533002.
ZOOLOGY – SEMESTER --I

PAPER – I: ANIMAL DIVERSITY – BIOLOGY OF NON-CHORDATES

(Course Code: ZOO201306)

HOURS: 60 (5X12) **Max. Marks: 100**

Course Outcomes: By the completion of the course the graduate should able to –

CO1 Describe general taxonomic rules on animal classification

CO2 Classify Protozoa to Coelenterata with taxonomic keys

CO3 Classify Phylum Platyhelminthes to Annelida phylum using examples from parasitic adaptation and vermin composting

CO4 Describe Phylum Arthropoda to Mollusca using examples and importance of insects and Molluscans

CO5 Describe Echinodermata to Hemi chordata with suitable examples and larval stages in relation to the phylogeny

Learning objectives

1. To understand the taxonomic position of protozoa to helminthes.
2. To understand the general characteristics of animals belonging to protozoa to hemichordata.
3. To understand the structural organization of animals phylum from protozoa to hemichordata.
4. To understand the origin and evolutionary relationship of different phyla from protozoa to hemichordata.
5. To understand the origin and evolutionary relationship of different phylum from annelids to hemichordates.

Syllabus
UNIT I

1. Principles of Taxonomy – Binomial nomenclature – Rules of nomenclature
2. Whittaeker's five kingdom concept and classification of Animal Kingdom.
   Phylum Protozoa
3. General Characters and classification of protozoa up to classes with suitable examples
4. Locomotion, nutrition and reproduction in Protozoans
5. Elphidium (type study)

UNIT –II

Phylum Porifera

1. General characters and classification up to classes with suitable examples

2. Skelton in Sponges

3. Canal system in sponges

Phylum Coelenterata

4. General characters and classification up to classes with suitable examples

5. Metagenesis in *Obelia*

6. Polymorphism in coelenterates

7. Corals and coral reefs

Phylum Ctenophora:

8. General Characters and Evolutionary significance (affinities)

Unit – III

Phylum Platyhelminthes

1. General characters and classification up to classes with suitable examples
2. Life cycle and pathogenicity of *Fasciola hepatica*
3. Parasitic Adaptations in Helminthes

Phylum Nemathelminthes

4. General characters and classification up to classes with suitable examples

5. Life cycle and pathogenicity of *Ascaris lumbricoides*

Unit – IV

Phylum Annelida

1. General characters and classification up to classes with suitable examples
2. Evolution of Coelom and Coelomoducts
3. Vermiculture - Scope, significance, earthworm species, processing, Vermicompost, economic importance of vermicompost.

Phylum Arthropoda

4. General characters and classification up to classes with suitable examples

5. Vision and respiration in Arthropoda

6. Metamorphosis in Insects

7. *Peripatus* - Structure and affinities

8. Social Life in Bees and Termites

Unit – V

Phylum Mollusca

1. General characters and classification up to classes with suitable examples
2. Pearl formation in Pelecypoda
3. Sense organs in Mollusca

Phylum Echinodermata

4. General characters and classification up to classes with suitable examples

5. Water vascular system in star fish

6. Larval forms of Echinodermata

Phylum Hemichordata:

7. General characters and classification up to classes with suitable examples

8. *Balanoglossus* - Structure and affinities

Co-curricular activities (suggested)

- Preparation of chart/model of phylogenic tree of life, 5-kingdom classification, *Elphidium* life cycle etc.
- Visit to Zoology museum or Coral island as part of Zoological tour
- Charts on life cycle of *Obelia*, polymorphism, sponge spicules
- Clay models of canal system in sponges
- Preparation of charts on life cycles of *Fasciola* and *Ascaris*
- Visit to adopted village and conducting awareness campaign on diseases, to people as part of Social Responsibility.
- Plaster-of-paris or Thermocol model of *Peripatus*
- Construction of a vermicompost in each college, manufacture of manure by students and donating to local farmers
- Models of compound eye, bee hive and terminarium (termitaria) by students
- Visit to apiculture centre and short-term training as part of apprenticeship programme of the govt. Of Andhra Pradesh
- Chart on pearl forming layers using clay or Thermocol
- Visit to a pearl culture rearing industry/institute
- Live model of water vascular system
- Phylogeny chart on echinoderm larvae and their evolutionary significance
- Preparation of charts depicting the feeding mechanism, 3 coeloms, tornaria larva etc., of *Balanoglossus*

REFERENCE BOOKS

1. **L.H. Hyman** „*The Invertebrates' Vol I, II and V*. – M.C. Graw Hill Company Ltd.

2. **Kotpal, R.L. 1988 - 1992** Protozoa, Porifera, Coelenterata, Helminthes, Arthropoda, Mollusca, Echinodermata. Rastogi Publications, Meerut.

3. **E.L. Jordan and P.S**. Verma „*Invertebrate Zoology'* S. Chand and Company.

4. **R.D. Barnes** „*Invertebrate Zoology'* by: W.B. Saunders CO., 1986.

5. **Barrington. E.J.W**., „*Invertebrate structure and Function'* by ELBS.

6 P.S. Dhami and J.K. Dhami. Invertebrate Zoology. S. Chand and Co. New Delhi.

7. **Parker, T.J. and Haswell**„*A text book of Zoology'* by, W.A., Mac Millan Co. London.
8. **Barnes, R.D. (1982).** *Invertebrate Zoology*, V Edition"

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KAKINADA, EAST GODAVARI, A.P, 533002.

ZOOLOGY PRACTICAL SYLLABUS FOR I SEMESTER

ANIMAL DIVERSITY - BIOLOGY OF NON-CHORDATES

(Course Code: ZOO201306 P)

Periods: 24 **Max. Marks: 50**

Learning Outcomes:

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

Protozoa: Amoeba, *Paramoecium, Paramoecium 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*v.

Platyhelminthes: *Planaria, Fasciola hepatica, Fasciola*larval forms – Miracidium, Redia, Cercaria, *Echinococcus granulosus, Taeniasolium, Schistosoma haematobium*.

Nemathelminthes: *Ascaris(Male & Female), Drancunculus, Ancylostoma, Wuchereria*

Annelida: *Nereis, Aphrodite, Chaetopteurs, Hirudinaria,* Trochophore larva **Arthropoda:** Cancer, Palaemon**,** Scorpion, *Scolopendra, Sacculina, Limulus, Peripatus,* Larvae - Nauplius, Mysis, Zoea, 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

2. Dissections:

1. **Prawn:** Appendages, Digestive system, Nervous system, Mounting of Statocyst
2. **Insect** Mouth Parts
3. Laboratory Record work shall be submitted at the time of practical examination
4. 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
5. Computer -aided techniques should be adopted or show virtual dissections

RFERENCE MANUALS:

1. Practical Zoology- Invertebrates S.S. Lal
2. Practical Zoology - Invertebrates P.S. Verma

3. Practical Zoology - Invertebrates K.P. Kurl
4. Ruppert and Barnes (2006) Invertebrate Zoology,8th Edition, Holt Saunders International Edition

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ZOOLOGY –SEMESTER II

PAPER – II: ANIMAL DIVERSITY – BIOLOGY OF CHORDATES

(Course Code: ZOO202306)

Hours:60 (5x12) Max. Marks: 100

Course Outcomes: By the completion of the course the graduate should able to -

CO1 Describe general taxonomic rules on animal classification of chordates

CO2 Classify Protochordata to Mammalia with taxonomic keys

CO3 Understand Mammals with specific structural adaptaions

CO4 Understand the significance of dentition and evolutionary significance

CO5 Understand the origin and evolutionary relationship of different phyla from Prochordata to mammalia.

Learning objectives

1. To understand the animal kingdom.
2. To understand the taxonomic position of Protochordata to Mammalia.
3. To understand the general characteristics of animals belonging to Fishes to Reptilians.
4. To understand the body organization of Chordata.
5. To understand the taxonomic position of Protherian mammals.

Unit - I

1. General characters and classification of Chordata upto classes
2. Protochordata- Salient features of Cephalochordata , Affinities of Cephalochordata.
3. Salient features of Urochordata
4. Structure and life history of *Herdmania*
5. Retrogressive metamorphosis –Process and Significance

Unit - II

1. Cyclostomata, General characters, Comparison of *Petromyzon* and *Myxine*
2. Pisces : General characters of Fishes
3. *Scoliodon*: External features, Digestive system, Respiratory system, Structure and function of Heart, Structure and functions of the Brain.
4. Migration in Fishes

5. Types of Scales
6. Dipnoi

Unit - III

1. General characters of Amphibia
2. Classification of Amphibia up to orders with examples.
3. *Rana hexadactyla*: External features, Digestive system, Respiratory system, Structure and function of Heart, structure and functions of the Brain
4. Reptilia: General characters of Reptilia, Classification of Reptilia upto orders with examples
5. *Calotes*: External features, Digestive system, Respiratory system, Structure and function of Heart, structure and function of Brain
6. Identification of Poisonous snakes and Skull in reptiles

Unit - IV

1. Aves General characters of Aves
2. *Columba livia*: External features, Digestive system, Respiratory system, Structure and function of Heart, structure and function of Brain
3. Migration in Birds
4. Flight adaptation in birds

Unit – V:

1. General characters of Mammalia
2. Classification of Mammalia upto sub - classes with examples
3. Comparision of Prototherians, Metatherians and Eutherians
4. Dentition in mammals

Co-curricular activities (suggested)

- Preparation of charts on Chordate classification (with representative animal photos) and retrogressive metamorphosis
- Thermocol or Clay models of Herdmania and Amphioxus
- Visit to local fish market and identification of local cartilaginous and bony fishes
- Maintaining of aquarium by students
- Thermocol 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. SarasPlublication. 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. EkambaranathaAyyar, 1973. A manual of zoology. Part II. (S. ViswanathanPvt. Ltd., Madras).
- P.S. Dhami& J.K. Dhami, 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, 2000. 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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ZOOLOGY PRACTICAL SYLLABUS FOR II SEMESTER ZOOLOGY - PAPER - II

ANIMAL DIVERSITY - BIOLOGY OF CHORDATES

(Course Code: ZOO202306 P)

Periods: 24 **Max. Marks: 50**

Learning Outcomes:

- To understand the taxidermic and other methods of preservation of chordates
- To identify chordates based on special identifying characters
- To understand internal anatomy of animals through demo or virtual dissections, thus directing the student for "empathy towards the fellow living beings"
- To maintain a neat, labeled record of identified museum specimens

OBSERVATION OF THE FOLLOWING SLIDES / SPOTTERS / MODELS

1. Protochordata :*Herdmania, Amphioxus, Amphioxus* T.S through pharynx.
2. Cyclostomata :*Petromyzon and Myxine.*
3. Pisces : *Pristis, Torpedo, Hippocoampus ,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.*

Dissections-

1. *Scoliodon* IX and X, Cranial nerves
2. *Scoliodon* Brain
3. 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.

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ZOOLOGY – SEMESTER III

PAPER – III: CELL BIOLOGY, GENETICS, MOLECULAR BIOLOGY AND EVOLUTION

(Course Code: ZOO20306)

HOURS: 60(5X12) **Max. Marks:100**

Course Outcomes: The overall course outcome is that the student shall develop deeper understanding of what life is and how it functions at cellular level. This course will provide students with a deep knowledge in Cell Biology, Animal Biotechnology and Evolution and by the completion of the course the graduate shall able to –

CO1 To understand the basic unit of the living organisms and to differentiate the organisms by their cell structure.

CO2 Describe fine structure and function of plasma membrane and different cell organelles of eukaryotic cell.

CO3 To understand the history of origin of branch of genetics, gain knowledge on heredity, interaction of genes, various types of inheritance patterns existing in animals

CO4 Acquiring in-depth knowledge on various of aspects of genetics involved in sex determination, human karyotyping and mutations of chromosomes resulting in various disorders

CO5 Understand the central dogma of molecular biology and flow of genetic information from DNA to proteins.

CO6 Understand the principles and forces of evolution of life on earth, the process of evolution of new species and apply the same to develop new and advanced varieties of animals for the benefit of the society

Learning Objectives

- To understand the origin of cell and distinguish between prokaryotic and eukaryotic cell
- To understand the role of different cell organelles in maintenance of life activities
- To provide the history and basic concepts of heredity, variations and gene interaction
- To enable the students distinguish between polygenic, sex-linked, and multiple allelic modes of inheritance.
- 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 provide knowledge on origin of life, theories and forces of evolution to understand the role of variations and mutations in evolution

Syllabus:

Unit – I Cell Biology

1. Definition, history, prokaryotic and eukaryotic cells, virus, viroids, mycoplasma
2. Electron microscopic structure of animal cell.

3. Plasma membrane –Models and transport functions of plasma membrane.

4. Structure and functions of Golgi complex, Endoplasmic Reticulum and ysosomes

5. Structure and functions of Ribosomes, Mitochondria, Nucleus, Chromosomes

(Note: 1. General pattern of study of each cell organelle – Discovery, Occurrence, Number, Origin, Structure and Functions with suitable diagrams**)**

2. Need not study cellular respiration under mitochondrial functions)

Unit – II Genetics - I

2. 1 Mendel's work on transmission of traits

2. 2 Gene Interaction – Incomplete Dominance, Dominance, Lethal Genes

2. 3 Polygenes (General Characteristics & examples); Multiple Alleles (General Characteristics and Blood group inheritance

2. 4 Sex determination (Chromosomal, Genic Balance, Hormonal, Environmental and Haplo-diploidy types of sex determination)

2. 5 Sex linked inheritance (X-linked, Y-linked & XY-linked inheritance)

Unit – III Genetics - II

1. Mutations & Mutagenesis

2. Chromosomal Disorders (Autosomal and Allosomal)

3. Human Genetics – Karyotyping, Pedigree Analysis (basics)

4. Basics on Genomics and Proteomics

UNIT IV: Molecular Biology

1. Central Dogma of Molecular Biology

2. Basic concepts of -

a. DNA replication – Overview (Semi-conservative mechanism, Semi- discontinuous mode, Origin & Propagation of replication fork)

b. Transcription in prokaryotes – Initiation, Elongation and Termination, Post- transcriptional modifications (basics)

c. Translation – Initiation, Elongation and Termination

3. Gene Expression in prokaryotes (Lac Operon); Gene Expression in eukaryotes

Unit - V

1. Origin of life

2. Theories of Evolution: Lamarckism, Darwinism, Germ Plasm Theory, Mutation Theory

3. Neo-Darwinism: Modern Synthetic Theory of Evolution, Hardy-Weinberg Equilibrium

4. Forces of Evolution: Isolating mechanisms, Genetic Drift, Natural Selection, Speciation

Co-curricular activities (Suggested):

- 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
- 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 grand parents
- Karyotyping and preparation of pedigree charts for identifying diseases in family history
- Charts on chromosomal disorders
- Charts on central dogma/lac operon/genetic code
- Model of semi-conservative model of DNA replication
- Model of tRNA and translation mechanism
- Power point presentation of transcription or any other topic by students
- Draw geological time scale and highlight important events along the time
- 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.
- 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:

1. Lodish, Berk, Zipursky, Matsudaria, Baltimore, Darnell „Molecular Cell Biology‟ W.H.Freeman and company New York.
2. Cell Biology by De Robertis
3. Bruce Alberts, Molecular Biology of the Cell
4. Rastogi, Cytology
5. Varma & Aggarwal, Cell Biology
6. C.B. Pawar, Cell Biology
7. Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008).Principles of Genetics. VIII Edition. Wiley India.
8. Snustad, D.P., Simmons, M.J. (2009). Principles of Genetics. V Edition. John Wiley and Sons Inc.
9. Klug, W.S., Cummings, M.R., Spencer, C.A. (2012). Concepts of Genetics. X Edition. Benjamin Cummings.
10. Russell, P. J. (2009). Genetics- A Molecular Approach. III Edition. Benjamin Cummings.
11. 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.
12. Ridley, M. (2004). Evolution. III Edition. Blackwell Publishing
13. Molecular Biology by freifielder

14. Instant Notes in Molecular Biology by Bios scientific publishers and Viva Books Private Limited
15. Hall, B. K. and Hallgrimsson, B. (2008). Evolution. IV Edition. Jones and Bartlett Publishers
16. Campbell, N. A. and Reece J. B. (2011). Biology. IX Edition, Pearson, Benjamin, Cummings.
17. Douglas, J. Futuyma (1997). Evolutionary Biology. Sinauer Associates.
18. Minkoff, E. (1983). Evolutionary Biology. Addison-Wesley.
19. James D. Watson, Nancy H. Hopkins „Molecular Biology of the Gene"
20. Jan M. Savage. Evolution, 2nd ed, Oxford and IBH Publishing Co., New Delhi.

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Zoology Practical Syllabus for III Semester

PAPER III - CELL BIOLOGY, GENETICS, MOLECULAR BIOLOGY AND EVOLUTION

(Course Code: ZOO20306P)

Periods: 24 **Max. Marks: 50**

Learning 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 ad geological history of origin & evolution of animals

I. Cell Biology

1. Preparation of temporary slides of Mitotic divisions with onion root tips
2. Observation of various stages of Mitosis and Meiosis with prepared slides
3. Mounting of salivary gland chromosomes of *Chironomous*

II. Genetics

1. Study of Mendelian inheritance using suitable examples and problems
2. Problems on blood group inheritance and sex linked inheritance
3. Study of human karyotypes (Downs syndrome, Edwards, syndrome, Patau syndrome, Turner's syndrome and Klinefelter syndrome)

III. Evolution

1. Study of fossil evidences
2. Study of homology and analogy from suitable specimens and pictures
3. Phylogeny of horse with pictures
4. Study of Genetic Drift by using examples of Darwin's finches (pictures)
5. Visit to Natural History Museum and submission of report

REFERENCE BOOKS

1. Burns GW. 1972. *The Science of Genetics. An Introduction to Heredity.* Mac Millan Publ. Co.Inc.
2. Gardner EF. 1975. *Principles of Genetics.* John Wiley & Sons, Inc. New York.
3. Harth and Jones EW. 1998. *Genetics – Principles and Analysis.* Jones and BarHett Publ. Boston.
4. Levine L. 1969. *Biology of the Gene.* Toppan.
5. Pedder IJ. 1972. *Genetics as a Basic Guide*. W. Norton & Company, Inc.
6. Rastogi VB. 1991. *A Text Book of Genetics.*KedarNath Ram Nath Publications, Meerut, Uttar Pradesh, India.
7. Rastogi VB. 1991. *Organic Evolution.*KedarNath Ram Nath Publications, Meerut,Uttar Pradesh, India.

8. Stahl FW. 1965. *Mechanics of Inheritance.* Prentice-Hall.

9. White MJD. 1973. *Animal Cytology and Evolution.* Cambridge Univ.Press.

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ZOOLOGY – SEMESTER-- IV

PAPER – IV: ANIMAL PHYSIOLOGY, CELLULAR METABOLISM AND EMBRYOLOGY

(Course Code: ZOO204311)

HOURS : 60 (5X12) **Max. Marks: 100**

Course Outcomes: This course will provide students with a deep knowledge in Physiology, Cellular metabolism and Molecular Biology and by the completion of the course the graduate shall able to –

CO1: Understand the functions of important animal physiological systems including digestion, cardio-respiratory and renal systems.

CO2: Understand the muscular system and the Neuro-endocrine regulation of animal growth, development and metabolism with a special knowledge of hormonal control of human reproduction.

CO3: Describe the structure, classification and chemistry of biomolecules and enzymes responsible for the sustenance of life in living organisms

CO4: Develop broad understanding of the basic metabolic activities pertaining to the catabolism and anabolism of various biomolecules

CO5: Describe the key events in early embryonic development starting from the formation of gametes upto gastrulation and formation of primary germ layers.

Learning Objectives:

- To achieve a thorough understanding of various aspects of physiological systems and their functioning in animals.
- To insist the concept of hormonal regulation of physiology, metabolism and reproduction in animals.
- To understand the disorders associated with the deficiency of hormones
- To demonstrate a thorough knowledge of the intersection between the disciplines of Biology and Chemistry.
- To provide insightful knowledge on the structure and classification of carbohydrates, proteins, lipids and enzymes
- To demonstrate an understanding of fundamental biochemical principles such as the function of biomolecules, metabolic pathways and the regulation of biochemical processes
- To make students gain proficiency in laboratory techniques in biochemistry and orient them to apply the scientific method to the processes of experimentation and hypothesis testing.

UNIT I Animal Physiology - I

1. Process of digestion and assimilation
2. Respiration - Pulmonary ventilation, transport of oxygen and CO2 (Note: Need not study cellular respiration here)

3. Circulation - Structure and functioning of heart, Cardiac cycle
4. Excretion - Structure and functions of kidney urine formation, counter current Mechanism

UN IT II Animal Physiology - II

1. Nerve impulse transmission - Resting membrane potential, origin and propagation of action potentials along myelinated and non-myelinated nerve fibers
2. Muscle contraction - Ultra structure of muscle, molecular and chemical basis of muscle contraction
3. Endocrine glands - Structure, functions of hormones of pituitary, thyroid, parathyroid, adrenal glands and pancreas
4. Hormonal control of reproduction in a mammal

UNIT III Cellular Metabolism – I (Biomolecules)

1. Carbohydrates - Classification of carbohydrates. Structure of glucose
2. Proteins - Classification of proteins. General properties of amino acids
3. Lipids - Classification of lipids
4. Enzymes: Classification and Mechanism of Action

UNIT--IV Cellular Metabolism – II

1. Carbohydrate Metabolism - Glycolysis, Krebs cycle, Electron Transport Chain, Glycogen metabolism, Gluconeogenesis
2. Lipid Metabolism – β-oxidation of palmitic acid
3. Protein metabolism - Transamination, Deamination and Urea Cycle

Unit – V Embryology

1. Gametogenesis
2. Fertilization
3. Types of eggs
4. Types of cleavages
5. Development of Frog upto formation of primary germ layers

Co-curricular activities (Suggested)

- Chart on cardiac cycle, human lung, kidney/nephron structure etc.
- Working model of human / any mammalian heart.
- Chart of sarcomere/location of endocrine glands in human body
- Chart affixing of photos of people suffering from hormonal disorders

- Student study projects such as identification of incidence of hormonal disorders in the local primary health centre, studying the reasons thereof and measures to curb or any other as the lecturer feels good in nurturing health awareness among students
- Chart on structures of biomolecules/types of amino acids (essential and non- essential)Chart preparation by students on Glycolysis / kreb's cycle / urea cycle etc.
- Model of electron transport chain
- Preparation of models of different types of eggs in animals
- Chart on frog embryonic development, fate map of frog blastula, cleavage etc.

REFERENCE BOOKS:

1. Eckert H. *Animal Physiology: Mechanisms and Adaptation.* W.H. Freeman & Company.
2. Floray E. *An Introduction to General and Comparative Animal Physiology.* W.B. Saunders Co., Philadelphia.
3. Goel KA and Satish KV. 1989. *A Text Book of Animal Physiology*, Rastogi Publications, Meerut, U.P.
4. Hoar WS. *General and Comparative Physiology.* Prentice Hall of India, New Delhi.
5. Lehninger AL. Nelson and Cox. *Principles of Biochemistry.* Lange Medical Publications, New Delhi.
6. Prosser CL and Brown FA. *Comparative Animal Physiology.* W.B. Saunders Company, Philadelphia.
7. Developmental Biology by Balinksy
8. Developmental Biology by Gerard Karp
9. Chordate embryology by Varma and Agarwal
10. Embryology by V.B. Rastogi
11. Austen CR and Short RV. 1980. *Reproduction in Mammals*. Cambridge University Press.
12. Gilbert SF. 2006. *Developmental Biology*, 8th Edition. Sinauer Associates Inc., Publishers,Sunderland, USA.
13. Longo FJ. 1987. *Fertilization.* Chapman & Hall, London.
14. Rastogi VB and Jayaraj MS. 1989. *Developmental Biology*.KedaraNath Ram Nath Publishers, Meerut, Uttar Pradesh.
15. Schatten H and Schatten G. 1989. *Molecular Biology of Fertilization.* Academic Press, New York.

A.S.D.GOVERNMENT DEGREE COLLEGE FOR WOMEN (A)

(Re-Accredited NAAC with "B" Grade)

KAKINADA, EAST GODAVARI, A.P, 533002.

ZOOLOGY PRACTICAL SYLLABUS FOR IV SEMESTER

PAPER – IV: ANIMAL PHYSIOLOGY, CELLULAR METABOLISM AND EMBRYOLOGY

(Course Code: ZOO204311P)

Periods: 24 **Max. Marks: 50**

Learning Objectives:

- Identification of an organ system with histological structure
- Deducing human health based on the information of composition of blood cells
- Demonstration of enzyme activity *in vitro*
- Identification of various biomolecules of tissues by simple colorimetric methods and also quantitative methods
- Identification of different stages of earl embryonic development in animals

I. ANIMAL PHYSIOLOGY

1. Qualitative tests for identification of carbohydrates, proteins and fats
2. Study of activity of salivary amylase under optimum conditions
3. T.S. of duodenum, liver, lung, kidney, spinal cord, bone and cartilage
4. Differential count of human blood

II. CELLULAR METABOLISM

1. Estimation of total proteins in given solutions by Lowry's method.
2. Estimation of total carbohydrate by Anthrone method.
3. Qualitative tests for identification of ammonia, urea and uric acid
4. Protocol for Isolation of DNA in animal cells

III. EMBRYOLOGY

1. Study of T.S. of testis, ovary of a mammal
2. Study of different stages of cleavages (2, 4, 8 cell stages)
3. Construction of fate map of frog blastula

REFERENCE BOOKS:

- Harper's Illustrated Biochemistry
- Cell and molecular biology: Concepts & experiments. VI Ed. John Wiley &sons. Inc.
- Lab Manual on Blood Analysis and Medical Diagnostics, S. Chand and Co. Ltd.
- Laboratory techniques by Plummer

A.S.D.GOVERNMENT DEGREE COLLEGE FOR WOMEN (A)
(Re-Accredited NAAC with "B" Grade)
KAKINADA, EAST GODAVARI, A.P, 533002.

ZOOLOGY – SEMESTER IV

Paper - V: IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY (Course Code: ZOO204312)

HOURS : 60 (5X12) **Max. Marks: 100**

Course Outcomes: This course will provide students with a deep knowledge in immunology, genetics, embryology and ecology and by the completion of the course the graduate shall able to –

CO1 To get knowledge of the organs of Immune system, types of immunity, cells and organs of immunity.
CO2 To describe immunological response as to how it is triggered (antigens) and regulated (antibodies)
CO3 Understand the applications of Biotechnology in the fields of industry and agriculture including animal cell/tissue culture, stem cell technology and genetic engineering.
CO4 Get familiar with the tools and techniques of animal biotechnology.

Learning Objectives

- To trace the history and development of immunology
- To provide students with a foundation in immunological processes
- To be able to compare and contrast the innate versus adaptive immune systems and humoral versus cell-mediated immune responses
- Understand the significance of the Major Histocompatibility Complex in terms of immune response and transplantation
- 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.

Unit – I **Immunology – I (Overview of Immune system)**

1. Introduction to basic concepts in Immunology
2. Innate and adaptive immunity, Vaccines and Immunization programme
3. Cells of immune system
4. Organs of immune system

Unit – II Immunology – II (Antigens, Antibodies, MHC and Hypersensitivity)

1. Antigens: Basic properties of antigens, B and T cell epitopes, haptens and adjuvants; Factors influencing immunogenicity
2. Antibodies: Structure of antibody, Classes and functions of antibodies
3. Structure and functions of major histo compatibility complexes
4. Exogenous and Endogenous pathways of antigen presentation and processing
5. Hypersensitivity – Classification and Types

Unit – III Techniques

1. Animal Cell, Tissue and Organ culture media: Natural and Synthetic media,
2. Cell cultures: Establishment of cell culture (primary culture, secondary culture, types of cell lines; Protocols for Primary Cell Culture); Established Cell lines (common examples such as MRC, HeLa, CHO, BHK, Vero); Organ culture; Cryopreservation of cultures
3. Stem cells: Types of stem cells and applications
4. Hybridoma Technology: Production & applications of Monoclonal antibodies (mAb)

Unit – IV Applications of Animal Biotechnology

1. Genetic Engineering: Basic concept, Vectors, Restriction Endonucleases and Recombinant DNA technology
2. Gene delivery: Microinjection, electroporation, biolistic method (gene gun),liposome and viral-mediated gene delivery
3. Transgenic Animals: Strategies of Gene transfer; Transgenic - sheep, - fish; applications
4. Manipulation of reproduction in animals: Artificial Insemination, *In vitro* fertilization, super ovulation, Embryo transfer, Embryo cloning

Unit - V

1. PCR: Basics of PCR.
2. DNA Sequencing: Sanger's method of DNA sequencing- traditional and automated sequencing (2 hrs)
3. Hybridization techniques: Southern, Northern and Western blotting
4. DNA fingerprinting: Procedure and applications
5. Applications in Industry and Agriculture: Fermentation: Different types of Fermentation and Downstream processing; Agriculture: Monoculture in fishes, polyploidy in fishes

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
- Visit to research laboratory in any University as part of Zoological tour and exposure and/ or hands-on training on animal cell culture.
- Visit to biotechnological laboratory in University or any central/state institutes and create awareness on PCR, DNA finger printing and blot techniques or Visit to a fermentation industry or Visit to a local culture pond and submit report on culture of fishes etc.

REFERENCE BOOKS

1. Immunology by Ivan M. Riott
2. Immunology by Kubey
3. Sreekrishna V. 2005. *Biotechnology –I, Cell Biology and Genetics.* New Age International Publ.New Delhi, India.

A.S.D.GOVERNMENT DEGREE COLLEGE FOR WOMEN (A)

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KAKINADA, EAST GODAVARI, A.P, 533002.

ZOOLOGY PRACTICAL SYLLABUS FOR V SEMESTER

Paper - V: IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY

(Course Code: ZOO204312P)

Periods: 24 **Max. Marks: 50**

Learning Objectives:

- Acquainting student with immunological techniques vis-à-vis theory taught in the class room
- Interconnect the theoretical and practical knowledge of immunity with the outer world for the development of a healthier life.
- Demonstrate basic laboratory skills necessary for Biotechnology research
- Promoting application of the lab techniques for taking up research in higher studies

I. IMMUNOLOGY:

1. Demonstration of lymphoid organs (as per UGC guidelines)
2. Histological study of spleen, thymus and lymph nodes (through prepared slides)
3. Blood group determination
4. Demonstration of
   a. ELISA
   b. Immuno electrophoresis

II. Animal biotechnology:

1. DNA quantification using DPA Method.
2. Techniques: Western Blot, Southern Hybridization, DNA Fingerprinting
3. Separation, Purification of biological compounds by paper, Thin-layer and Column chromatography
4. Cleaning and sterilization of glass and plastic wares for cell culture.
5. Preparation of culture media.

REFERENCE BOOKS

1. Immunology Lab Biology 477 Lab Manual; Spring 2016 Dr. Julie Jameson
2. Practical Immunology A Laboratory Manual; **LAP LAMBERT Academic Publishing**
3. Manual of laboratory experiments in cell biology by Edward, G
4. Laboratory Techniques by Plummer

ASD GOVT. DEGREE COLLEGE FOR WOMEN (A)

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Jagannaickpur, Kakinada, East Godavari, AP – 533002

ZOOLOGY- SEMESTER-V PAPER-6A (2022-2023)

SUSTAINABLE AQUACULTURE MANAGEMENT

(Course Code: ZOO205311-6A)

Credits: 4 **Hrs/Wk: 4**

Learning Outcomes:

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

- Evaluate the present status of aquaculture at the Global level and National level
- Classify different types of ponds used in aquaculture
- Demonstrate induced breeding of carps
- Acquire critical knowledge on commercial importance of shrimps
- Identify fin and shell fish diseases

Syllabus

UNIT I:

1.1 Present status of Aquaculture – Global and National scenario.

1.2 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 II:

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_2 and nutrients)

UNIT III:

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 IV:

4.1 Commercial importance of shrimp & prawn.

4.2 Macrobrachium rosenbergii- biology, seed production.

4.3 Culture of L. vannamei – hatchery technology and culture practices.

4.4 Mixed culture of fish and prawns.

UNIT V:

5.1 Viral diseases of Fin Fish & shell fish.

5.2 Fungal diseases of Fin & Shell fish..

5.3 Bacterial diseases of Finfish & Shell fish

5.4 Prophylaxis in aquaculture.

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 Scientific Publishing Company.
4. Bose AN et.al. 1991. Costal Aquaculture Engineering. Oxford & IBH Publishing Company Pvt. Ltd.

Web Links:

1. http://www.fao.org/fishery/docs/CDrom/FAO_Training/FAO_Training/General/x6708e/x6708e06.htm
2. http://aquaticcommons.org/1666/1/Better-Practice3_opt.pdf
3. https://www.notesonzoology.com/india/fishery/fish-diseases-symptoms-and-control-fishery/871

ASD GOVT. DEGREE COLLEGE FOR WOMEN (A)

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Jagannaickpur, Kakinada, East Godavari, AP – 533002

ZOOLOGY- PAPER-6A SEMESTER-V (2022-2023)

SUSTAINABLE AQUACULTURE MANAGEMENT

(Course Code: ZOO205311-6AP)

PRACTICAL SYLLABUS

Credits: 1 **Hrs/Wk: 2** **Max Marks: 50**

Learning Outcomes:

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

- Identify the characters of Fresh water cultivable species
- Estimate physico - chemical characteristics of water used for aquaculture
- Examine the diseases of fin and shell fish
- Suggest measures to prevent diseases in aquaculture

Syllabus:

1. Fresh water Cultivable species any (Fin & Shell Fish Specimens – Observation of morphological characters by observation and drawings)-5

2. Brackish water cultivable species (Fin &Shell fish- Specimens- Observation of Morphological Character by observing drawing) -5

3. 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)

4. Demonstration of Hypophysation (Procedure of hypophysation to be demonstrated in the practical lab with any edible fish as model)

5. 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)

6. 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)

7. 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)

LAB 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
3. http://aquaticcommons.org/1666/1/Better-Practice3_opt.pdf
4. https://www.notesonzoology.com/india/fishery/fish-diseases-symptoms-and-control-fishery/871

Web resources suggested by the teacher concerned and the college librarian including reading material

Co-Curricular Activities

a) Mandatory:(Student training by teacher in field skills: Total 15 hrs., Lab:10 + field 05)

1. For Teacher: Training of students by the teacher in laboratory/field fornotlessthan15 hours on Breeding- Induced breeding in carps -hatchery technology of L. vannamei- Farming techniques-disease diagnostic techniques—concepts –Demonstration @ any aqua laboratory
2. For Student: Students shall (individually) visit a Hatchery/Farm/ Aqua diagnostic center 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.

ASD GOVT. DEGREE COLLEGE FOR WOMEN (A)

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Jagannaickpur, Kakinada, East Godavari, AP – 533002

Semester: V (Skill Enhancement Course - Elective), Paper-7A (2022-2023)

POSTHARVEST TECHNOLOGY OF FISH AND FISHERIES

(Course Code: ZOO205312-7A)

Credits: 4 **Hrs/Wk: 4**

Learning Outcomes:

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

- Identify the types of preservation methods employed in aquaculture
- Choose the suitable Processing methods in aquaculture
- Maintain the standard quality control protocols laid down in aqua industry
- Identify the best Seafood quality assurance system

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

3.1 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.

3.2 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

5.1. 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 Aliment Arius.

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
5. K.A Mahanthy, Innovations in Fishing and Fish Processing Technologies, January 2021

Web Resources:

1. http://ecoursesonline.iasri.res.in/mod/page/view.php?id=145743
2. https://ecourses.icar.gov.in/e-Leaarningdownload3_new.aspx?Degree_Id=03

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Jagannaickpur, Kakinada, East Godavari, AP – 533002

Semester: V (Skill Enhancement Course - Elective), Paper-7A (2022-2023)

POSTHARVEST TECHNOLOGY OF FISH AND FISHERIES

(Course Code: ZOO205312-7AP)

PRACTICALS

Credits: 1 **Hrs/Wk: 2**

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

- Identify the quality of aqua processed products.
- Determine the quality of fishery by products by observation
- Analyze the protocols of aqua processing methods

Practical (Laboratory) Syllabus:

1. Evaluation of fish/ fishery products for organoleptic, chemical and microbial quality.
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 isinglass, 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 practicals)

REFERENCES:

1. Dr Sunitha Rai, Fish Processing Technology, 2015, Random Publications
2. https://ecourses.icar.gov.in/e-Leaarningdownload3_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%2

0for%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
7. %20drying%20and%20packing%20of%20fish.pdf
8. https://krishi.icar.gov.in/jspui/bitstream/123456789/20770/1/Training%20Manual_Hygienic
9. %20drying%20and%20packing%20of%20fish.pdf
10. https://agritech.tnau.ac.in/fishery/fish_byproducts.html
11. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5352841/
12. http://www.fao.org/3/i1136e/i1136e.pdf
13. http://www.fao.org/3/x5989e/X5989e01.htm#What%20is%20sensory%20assessment)

Web resources suggested by the teacher concerned and the college librarian including reading material.

Co-Curricular Activities

a) **Mandatory:** *(Lab/field training of students by teacher (lab 10 + field 05):*

1. For Teacher: Training of students by the teacher in laboratory/fieldfornotlessthan15hourson 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 lecture, Video preparation etc.,

ASD GOVT. DEGREE COLLEGE FOR WOMEN (A)

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Jagannaickpur, Kakinada, East Godavari, AP – 533002

Zoology Semester-V Paper-6B (2022-2023)

LIVE STOCK MANAGEMENT-I (BIOLOGY OF DAIRY ANIMALS)

(Course Code: ZOO205311-6B)

Credits: 4 **Hrs/Wk: 4**

Learning Outcomes:

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

- Select the suitable breeds of livestock for rearing
- Relate the anatomy of udder with letdown of milk
- Identify and manipulate the reproductive behavior of cattle
- Inspect the economics of dairy farming
- Apprise the various breeding techniques employed in live stock

Syllabus: (Total Hours: 90 including Teaching, Lab, Field Skills Training, Unit tests etc.)

UNIT I: Livestock census; Breeds of Dairy cattle, Buffaloes and Goats. Indigenous, Exotic and Crossbred Cattle breeds.

UNIT II: Anatomy of Udder; Development of udder; Lactogenesis and Galactopoises; Letdown of milk.

UNIT III: Artificial insemination; Estrous cycle; Symptoms of heat in cows and buffaloes. Conception, Pregnancy diagnosis in cattle. Multi ovulation and embryo transfer technique. Cloning.

UNIT IV: Economic traits of Dairy cattle. Methods of selection of dairy animals.

UNIT V: Systems of Dairy cattle breeding. Inbreeding, out breeding, Cross breeding, Grading up. Breeding systems (Cross breeding of cattle and grading up of buffaloes).

REFERENCES:

1. Textbook of Animal Husbandry-GC Banerjee
2. Handbook of Animal Husbandry –ICAR Edition
3. Principles and practices of Dairy Farm–Jagdish Prasad

Web resources:

1. http://ecoursesonline.iasri.res.in/course/index.php?categoryid=42
2. https://vetsebooks.blogspot.com/p/e-books.html
3. https://www.basu.org.in/study-materials/veterinary-science/
4. https://vikaspedia.in/agriculture/livestock/cattle-buffalo/breeds-of-cattle-buffalo

ASD GOVT. DEGREE COLLEGE FOR WOMEN (A)

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Jagannaickpur, Kakinada, East Godavari, AP – 533002

Zoology Semester-V Paper-6B (2022-2023)

LIVE STOCK MANAGEMENT-I (BIOLOGY OF DAIRY ANIMALS)

PRACTICAL

(Course Code: ZOO205311-6BP)

Credits: 1 **Hrs/Wk: 2** **(Max.50Marks)**

Learning Outcomes:

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

1. Examine the points of dairy cow
2. Understand the behavioral changes of cow during the reproductive period
3. Differentiate the merits and demerits of cross breeds in cattle

Practical (Laboratory) Syllabus:(30hrs)

1. Points dairy cow. (Explanation with observation of charts- Model evaluation to be performed by the student in the laboratory)
2. Identification of different breeds of dairy cattle and buffaloes. (Observation of Charts of breeds in the laboratory- at least 3 breeds should be identified by the students in their locality with video, photo)
3. Male and female reproductive systems of cow – Model/ Chart (Student has to draw a labeled diagram of the male and female reproductive systems of cow – acquire skill to identify the parts).
4. Symptoms of heat in cow (Study and Understanding the physiological symptoms during heat).
5. Artificial in semi nation (Flow chart of implements – Procedure- precautions)
6. Pregnancy diagnosis in cattle.
7. Study comparative merits of cows and buffaloes; zebu and cross bred cows (Examination of merits

Lab References:

1. Principles and practices of Dairy Farm–Jadish Prasad
2. Dairy cow points: https://www.icar.org/Guidelines/05-Conformation-Recording.pdf
3. Pregnancy test protocol: https://cgspace.cgiar.org/bitstream/handle/10568/109408/Milk%20testing%20lab%20protoco l.pdf?sequence=1&isAllowed=y

Co-Curricular Activities

a) **Mandatory**:*(Lab/ field training of students by teacher :(lab:10 + filed: 05):*

1. For Teacher: Training of students by the teacher in laboratory/field fornotlessthan15hoursonprinciples and practices of dairy industry- breeds –artificial insemination- reproductive behavior of cows etc. as per the syllabus above.
2. For Student: Students shall individually visit to any of the nearby cattle rearing centers/ veterinary hospital/Raithu Bharosa Kendra and make observations of the procedure and quality enhancement activities and submit a handwritten Fieldwork/Project work Report in 10pages.
3. Max marks for Fieldwork/Project work Report: 05.
4. Suggested Format for Fieldwork/Project work Report: *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. Collection of various cattle breed images from the web to prepare a album
2. Visit the sites of Veterinary colleges in India and preparation of brief report on the videos and content/ employment details
3. Sketch a model dairy farm with details
4. Invited lecture and presentation on related topics by experts

Seminar, Assignment, Group discussion. Quiz, Collection of Material, invited lecture, Video preparation etc.

ASD GOVT. DEGREE COLLEGE FOR WOMEN (A)

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Zoology Semester-V Paper-7B (2022-2023)

LIVE STOCK MANAGEMENT -II (DAIRY PRODUCTION AND MANAGEMENT)

(Course Code: ZOO205312-7B)

Credits: 4 **Hrs/Wk: 4**

Learning Outcomes:

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

- Identify and suggest the suitable housing system for the dairy farming
- Understand management practices for the dairy farming
- Learn the process of milk pasteurization
- Prepare cream from milk

Syllabus: (Total Hours: 90 including Teaching, Lab, Field Skills Training, Unit tests etc.) UNIT I:

Systems of Housing of Dairy cattle- Loose Housing and Conventional Dairy Barns. Drawing of layouts for dairy cattle dwellings; Criteria for selecting site for establishing Dairy farm buildings; Water requirement of dairy animals.

UNIT II:

Management of different classes of Dairy animals- Milk producing animals, pregnant animals dry animals, heifers and calves. Management practices for Dairy farm; Identification, Dehorning, Castration, Deworming, Vaccination, Disinfection, and Milking.

UNIT III:

a. Pasteurization of milk: Definition, objects of pasteurization, objections to pasteurization, Principles of heat exchange. Methods of pasteurization: LTLT, HTST and Uperization.
b) Sterilization of milk. Homogenization: Factors influencing homogenization

UNIT IV:

Market milk: Toned milk, double toned milk, Reconstituted milk, Standardized milk and full cream milk– Standards and methods of manufacture.

UNIT V:

Cream: Types of cream, composition, methods of cream separation, gravity and centrifugal methods, types of cream separators, factors affecting fat losses in skim milk and fat percentage in cream.

REFERENCES:

1. Textbook of Animal Husbandry-G C Benarjee
2. Handbook of Animal Husbandry –ICAR Edition
3. Principles and practices of Dairy Farm–Jagdish Prasad
4. http://ecoursesonline.iasri.res.in/course/index.php?categoryid=42
5. https://vetsebooks.blogspot.com/p/e-books.html
6. https://www.basu.org.in/study-materials/veterinary-science/
7. https://vikaspedia.in/agriculture/livestock/cattle-buffalo/breeds-of-cattle-buffalo

ASD GOVT. DEGREE COLLEGE FOR WOMEN (A)

(Re- Accredited by NAAC with B Grade)

Jagannaickpur, Kakinada, East Godavari, AP – 533002

Zoology Semester-V Paper-7B (2022-2023)

LIVE STOCK MANAGEMENT -II (DAIRY PRODUCTION AND MANAGEMENT) PRACTICAL

(Course Code: ZOO205312-7BP)

Credits: 1 **Hrs/Wk: 2**

Learning Outcomes:

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

- Design a model dairy farm layout
- Understand procedure of milk pasteurization at milk processing centers
- Identify various important management practices in dairy farming

Practical (Laboratory) Syllabus : (30hrs) (Max.50Marks)

1. Dairy Farm layout (In the laboratory student has to sketch a dairy farm with all its components)
2. Identification of cows (students have to identify the breeds of cows form the images/charts – have to identify any two breeds in the vicinity of the college/ their locality).
3. Dehorning of calves: (Method - protocol- precautions)
4. Castration of bulls (Method – Apparatus- Time-importance)
5. Deworming of dairy cattle: (Schedule – method- benefits)
6. Pasteurization of milk (Batch Method- procedure- Observation)
7. Sterilization of milk (In bottle sterilization- procedure – protocol)
8. Cream separation (By gravity method- procedure- hands on experiment)

Lab References

1. Handbook of Animal Husbandry –ICAR Edition
2. Dairy farm layout : https://www.youtube.com/watch?v=dmukHUEUvKc
3. Dehorning procedure : http://www.omafra.gov.on.ca/english/livestock/dairy/facts/09-003.htm
4. Castration of bulls: https://vikaspedia.in/agriculture/livestock/general-management-practices- of-livestock/castration-of-ruminants

5. Deworming: https://kvk.icar.gov.in/API/Content/PPupload/k0347_10.pdf
6. Pasteurization of milk : http://www.jnkvv.org/PDF/08042020170652part%203.pdf
7. http://ecoursesonline.iasri.res.in/mod/page/view.php?id=1690
8. Cream separation: http://ecoursesonline.iasri.res.in/mod/page/view.php?id=147910

Web resources suggested by the teacher concerned and the college librarian including readingmaterial

Co-Curricular Activities

a) **Mandatory:** *(Lab/field training of students by teacher; lab 10+ field :05)*

1. For Teacher: Training of students by the teacher in laboratory and filed for not less than 15 hours on skills of dairy management – housing-management of dairy animals of various stages- procedure of preparation of marketable milk with procedures like sterilization, pasteurization and other techniques)
2. For Student: Student shall (individually) visit to nearby dairy farm- house hold cattle rearing – make observations on aspects like housing – management – feed- milk- revenue- breed selection- qualities of breed –etc. A handwritten Fieldwork/Project work Report to be submitted in the given format.
3. Max marks for Fieldwork/Project work Report: 05.
4. Suggested Format for Fieldwork/Project work Report: *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. Sketch model dairy house with details
2. Web resources on Protocols in the management of stages of cattle
3. Properties of varieties of milk from the market observation
4. Assignment, Seminar, invited lecture, Group discussion. Quiz, Collection of Material, Video preparation etc.