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

I SEMESTER **PATHWAY - PAPER – 1** Time:5hrs/week

BSC 1501(4) **INTRODUCTION TO CLASSICAL BIOLOGY** Marks:100

w.e.f AK 2023-2024 (Admitted batch)

LEARNING OBJECTIVES:

The student will be able to learn the diversity and classification of living organisms and understand their chemical, cytological, evolutionary and genetic principles.

LEARNING OUTCOMES:

Students will be able to

CO 1: Apply the principles of classification and propose conservation strategies to mitigate threats to biodiversity at local and global scales. and preservation of biodiversity.

CO 2: Discuss the plant anatomical, physiological and reproductive processes.

CO 3: Develop knowledge on animal classification, physiology, embryonic development and their economic importance.

CO 4: Outline the cell components, cell processes like cell division, heredity and molecular processes.

CO 5: Comprehend the chemical principles in shaping and driving the macromolecules and life processes

UNIT - 1: INTRODUCTION TO SYSTEMATICS, TAXONOMY AND ECOLOGY

1.1. Systematics – Definition and concept, Taxonomy – Definition and hierarchy.

1.2. Nomenclature – ICBN and ICZN, Binomial and trinomial nomenclature.

1.3. Ecology – Concept of ecosystem, Biodiversity and conservation.

1.4. Pollution and climate change.

UNIT - 2: ESSENTIALS OF BOTANY

2.1. The classification of plant kingdom.

2.2 Plant physiological processes (Photosynthesis, Respiration, Transpiration, phytohormones).

2.2. Structure of flower – Micro and macro sporogenesis, pollination, fertilization and structure of mono and dicot embryos.

2.4 Mushroom cultivation, floriculture and landscaping.

UNIT 3: ESSENTIALS OF ZOOLOGY

3.1. The classification of Kingdom Animalia and Chordata (Important General Characters of Phylum and Classification upto Order level with examples).

3.2 Animal Physiology – Basics of Organ Systems (Digestive, Respiratory, Circulation, Excretion, Muscle, Nervous, Immune & Reproductive*) & their functions, Hormones and Disorders.

* **Major Organs of that system & Functions they Perform**

3.3 Developmental Biology – Basic process of development (Gametogenesis, Fertilization, Cleavage and Organogenesis)

3.4 Economic Zoology – Sericulture, Apiculture, Aquaculture

UNIT 4: CELL BIOLOGY, GENETICS AND EVOLUTION

4.1. Cell theory, Ultra structure of prokaryotic and eukaryotic cell, cell cycle.

4.2. Chromosomes and heredity – Structure of chromosomes, concept of gene (Fine Structure of gene)

4.3 Central Dogma of Molecular Biology.

4.4 Origin of life

UNIT 5: ESSENTIALS OF CHEMISTRY

5.1. Definition and scope of chemistry, applications of chemistry in daily life.

5.2. Branches of chemistry

5.3. Chemical bonds – ionic, covalent, noncovalent – Vander Waals, hydrophobic, hydrogenbonds.

5.4 Green chemistry

REFERENCES:

1. Sharma O.P., 1993. Plant taxonomy. 2nd Edition. McGraw Hill publishers.
2. Pandey B.P., 2001. The textbook of botany Angiosperms. 4th edition. S. Chand publishers,New Delhi, India.
3. Jordan E.L., Verma P.S., 2018. Chordate Zoology. S. Chand publishers, New Delhi, India.
4. Rastogi, S.C., 2019. Essentials of animal physiology. 4th Edition. New Age International Publishers.
5. Verma P.S., Agarwal V.K., 2006. Cell biology, genetics, Molecular Biology, Evolution and Ecology. S. Chand publishers, New Delhi, India.
6. Sathyanarayana U., Chakrapani, U., 2013. Biochemistry. 4th Edition. Elsevier publishers.
7. Jain J.L., Sunjay Jain, Nitin Jain, 2000. Fundamentals of Biochemistry. S. Chand publishers,New Delhi, India.
8. Karen Timberlake, William Timberlake, 2019. Basic chemistry. 5th Edition. Pearson publishers.
9. Subrata Sen Gupta, 2014. Organic chemistry. 1st Edition. Oxford publishers.

ACTIVITIES:

1. Make a display chart of life cycle of non flowering plants.
2. Make a display chart of life cycle of flowering plants.
3. Study of stomata
4. Activity to prove that chlorophyll is essential for photosynthesis
5. Study of pollen grains.
6. Observation of pollen germination.
7. Ikebana.
8. Differentiate between edible and poisonous mushrooms.
9. Visit a nearby mushroom cultivation unit and know the economics of mushroom cultivation.

10. Draw the Ultra structure of Prokaryotic and Eukaryotic Cell
11. Visit to Zoology Lab and observe different types of preservation of specimens
12. Hands-on experience of various equipment – Microscopes, Centrifuge, pH Meter, Electronic Weighing Balance, Laminar Air Flow
13. Visit to Zoo / Sericulture / Apiculture / Aquaculture unit
14. List out different hormonal, genetic and physiological disorders from the society

St. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM
Pathway 2 Course
w.e.f. AY 2023-24
I Semester
INTRODUCTION TO APPLIED BIOLOGY

Code- BSC 1502
Credits: 4 Hours/Week: 5

Course Objectives: By the end of this course the learner can:
1. Narrate the basics of Microbiology and Immunology
2. Illustrate outlines of Biomolecules and their physiological role
3. Explain contributions of Biotechnology in various fields
4. Describe the principles of advanced Immunotechniques
5. Perform Data collection, basic concepts of data interpretations, retrieval of biological data from few databases and their interpretation.

Course Outcomes: On completion of this course students will be able to:
1. Comprehend characteristics of the classes of microorganism and their importance and learn outline concepts of immunology and the defence system
2. Learn importance of biomolecules and identify few of them
3. Recognize the role of Biotechnology in various fields
4. Identify the applications of immunotechniques in diagnostics
5. Collect data, interpret it and also perform retrieval of biological data from listed sources

Unit 1: Essentials of Microbiology and Immunology
1.1. History and Major Milestones of Microbiology; Contributions of Edward Jenner, Louis Pasteur, Robert Koch and Joseph Lister.
1.2. Groups of Microorganisms – Structure and characteristics of Bacteria, Fungi and Virus.
1.3. Applications of microorganisms in – Food, Agriculture, Environment, and Industry.
1.4. Immune system – Immunity, types of immunity, outlines of immune cells and organs of immune system.

Unit 2: Essentials of Biochemistry
2.1. Biomolecules I – general introduction to Classification and biological role of carbohydrates and lipids
2.2. Biomolecules II – Amino acids- classification, Essential amino acids and importance & Proteins- Classification, basics of the levels of organization and biological importance
2.3. Biomolecules III – Nucleic acids -DNA and RNA- Types and importance
2.4. Basics of Metabolism – Anabolism and catabolism- Outlines

Unit 3: Essentials of Biotechnology
3.1. History, scope, and significance of biotechnology. Applications of biotechnology in Plant, Animal, Industrial and Pharmaceutical sciences.
3.2. Environmental Biotechnology – Bioremediation and Biofuels, Biofertilizers and Biopesticides.

3.3. Genetic engineering – Gene manipulation using restriction enzymes and cloning vectors; Physical, chemical, and biological methods of gene transfer.
3.4. Transgenic plants – Stress tolerant plants (biotic stress – BT cotton, abiotic stress – salt tolerance). Transgenic animals – Animal and disease models.

Unit 4: Analytical Tools and techniques in biology – Applications
4.1. Applications in forensics – PCR and DNA fingerprinting
4.2. Immunological techniques – Immunoblotting and ELISA.
4.3. Monoclonal antibodies – Applications in diagnosis and therapy.
4.4. Eugenics and Gene therapy

Unit 5: Biostatistics and Bioinformatics
5.1. Data collection and sampling. Measures of central tendency – Mean, Median, Mode.
5.2. Measures of dispersion – range, standard deviation and variance (definitions and Biological data applications). Probability and tests of significance (definition and Bioliogical applications).
5.3. Introduction, Genomics, Proteomics, types of Biological data, biological databases NCBI, EBI, Gen Bank; Protein 3D structures, Sequence alignment outlines.
5.4. Accessing Nucleic Acid and Protein databases, NCBI Genome Workbench

REFERENCES
1. Gerard J., Tortora, Berdell R. Funke, Christine L. Case., 2016. Microbiology: An Introduction. 11th Edition. Pearson publications, London, England.
2. Micale, J. Pelczar Jr., E.C.S. Chan., Noel R. Kraig., 2002. Pelczar Microbiology. 5th Edition. McGraw Education, New York, USA.
3. Sathyanarayana U., Chakrapani, U., 2013. Biochemistry. 4th Edition. Elsevier publishers.
4. Jain J.L., Sunjay Jain, Nitin Jain, 2000. Fundamentals of Biochemistry. S. Chand publishers, New Delhi, India.
5. R.C. Dubey, 2014. Advanced Biotechnology. S. Chand Publishers, New Delhi, India.
6. Colin Ratledge, Bjorn, Kristiansen, 2008. Basic Biotechnology. 3rd Edition. Cambridge Publishers.
7. U. Sathyanarayana, 2005. Biotechnology. 1st Edition. Books and Allied Publishers pvt. ltd., Kolkata.
8. Upadhyay, Upadhyay and Nath. 2016. Biophysical Chemistry, Principles and Techniques. Himalaya Publishing House.
9. Arthur M. Lesk. Introduction to Bioinformatics. 5th Edition. Oxford publishers.
10. AP Kulkarni, 2020. Basics of Biostatistics. 2nd Edition. CBS publishers.

ACTIVITIES
1. Identification of given organism as harmful or beneficial.
2. Observation of microorganisms from house dust under microscope.
3. Finding microorganism from pond water.
4. Visit to a microbiology industry or biotech company.
5. Visit to a waste water treatment plant.
6. Retrieving a DNA or protein sequence of a gene
7. Performing a BLAST analysis for DNA and protein.

8. Problems on biostatistics.
9. Field trip and awareness programs on environmental pollution by different types of wastes and hazardous materials.
10. Demonstration on basic biotechnology lab equipment.
11. Preparation of 3D models of genetic engineering techniques.
12. Preparation of 3D models of transgenic plants and animals.

[NOTE: In the colleges where there is availability of faculty for microbiology and biotechnology, those chapters need to be handled by microbiology and biotechnology faculty. In other colleges, the above topics shall be dealt by Botany and Zoology faculty

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

II SEMESTER **ZOOLOGY** TIME:3 Hrs/Week

Z-Ma1-2501(3) **ANIMAL DIVERSITY-I BIOLOGY OF NON-CHORDATES** Marks:100

w.e.f. 2023-24 admitted batch (23AK)

LEARNING OBJECTIVES:

- To understand the taxonomic position of protozoa to helminthes.
- To understand the general characteristics of animals belonging to protozoa to hemi chordata.
- 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 hemichordata.
- To understand the origin and evolutionary relationship of different phylum from annelids tohemichordates.

LEARNING OUTCOMES: By the completion of the course the graduate should able to –

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

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

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

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

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

UNIT – I:

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

UNIT –II:

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

UNIT – III:

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

UNIT – IV:

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

UNIT – V:

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

Co-curricular activities (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 anddonating 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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ST. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM

II SEMESTER **ZOOLOGY** TIME:2Hrs/Week

Z-Ma1-2551(1) **ANIMAL DIVERSITY-I BIOLOGY OF NON-CHORDATES** Marks:50

w.e.f. 2023-24 admitted batch (23AK)

PRACTICAL SYLLABUS

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

LEARNING OUTCOMES

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

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

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

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

CO 4: L3- Discuss the importance of preservation of museum specimens.

SYLLABUS:

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*
- Platyhelminthes: *Planaria, Fasciola hepatica, Fasciola* larval forms – Miracidium,Redia,Cercaria, *Echinococcus granulosus, Taenia solium, Schistosoma haematobium*
- Nemathelminths: *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,* Mouthpartsof 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 setsof students for this purpose

RFERENCE WEB LINKS:

- https://virtualmicroscopy.peabody.yale.edu/
- https://tnhm.in/category/assorted-gallery-for-vertebrates-and-invetebrates/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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ST. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM

II SEMESTER **ZOOLOGY** TIME:3Hrs/Week

Z-Ma2-2501(3) **CELL & MOLECULAR BIOLOGY** Marks:100

w.e.f. 2023-24 admitted batch (23AK)

LEARNING OBJECTIVES

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

LEARNING OUTCOMES:

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

CO 1: L2- Describe the basic unit of the living organisms and to differentiate the organisms by their cell structure.

CO 2: L3- Discuss the fine structure and function of plasma membrane and different cell organelles of eukaryotic cell.

CO 3: L5- Summarise the cell cycle and bioenergetics of the cell.

CO 4: L4- Outline the central dogma of molecular biology and flow of genetic information from DNA to proteins.

CO 5: L2- Explain gene expression phenomenon and biological importance of biomolecules.

SYLLABUS:

UNIT – I Cell Biology-I

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

UNIT – II Cell Biology-II

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

UNIT – III Cell Biology-III

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

UNIT IV: Molecular Biology-I

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

UNIT V: Molecular Biology-II

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

Co-curricular activities (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
- Charts on central dogma/lac operon/genetic code
- Model of semi-conservative model of DNA replication
- Power point presentation of any of the above topics by students

REFERENCES:

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

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

II SEMESTER **ZOOLOGY** TIME:2Hrs/Week

Z-Ma2-2551(2) **CELL & MOLECULAR BIOLOGY** Marks:50

w.e.f. 2023-24 admitted batch (23AK)

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.

LEARNING OUTCOMES

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

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

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

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

SYLLABUS:

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

RFERENCE WEB LINKS:

- https://cbi-au.vlabs.ac.in/
- https://www.youtube.com/watch?v=xhnUZAyNdQk
- https://www.youtube.com/watch?v=l8LXQq5_VL0
- https://www.labster.com/simulations
- https://www.sciencecourseware.org/BiologyLabsOnline/protected/TranslationLab/index.php
- https://virtual-labs.github.io/exp-analysis-of-carbohydrates-au/procedure.html
- https://www.labxchange.org/library/items/lb:LabXchange:f10fd7ad:lx_simulation:1
- http://www.zoologyresources.com/uploadfiles/books/dc64b77d8769325515d17c945e461b45.pdf
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ST. JOSEPH'S COLLEGE FOR WOMEN(A), VISAKHAPATNAM

COURSE 5: ANIMAL DIVERISTY-II BIOLOGY OF CHORDATES

Practical Credits: 1 2 hrs/week

Z-Ma1-3551(2)

LEARNING OBJECTIVES

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

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

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

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

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

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

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

SYLLABUS:

1. **Protochordata**: *Herdmania, Amphioxus, Amphioxus* T.S through pharynx.
2. **Cyclostomes**: *Petromyzon and Myxine.*
3. **Pisces**: *Pristis, Torpedo, Hippocampus, Exocoetus, Echeneis, Labeo, Catla, Clarius, Channa, Anguilla*
4. **Amphibia**: *Ichthyophis, Amblystoma, Axolotl larva, Hyla,*
5. **Reptilia**: *Draco, Chamaeleon, Uromastix, Testudo, Trionyx, Russels viper, Naja,* Krait, *Hydrophis, Crocodile.*
6. **Aves**: *Psittacula, Eudynamis, Bubo, Alcedo.*
7. **Mammalia**: *Ornithorhynchus*, *Pteropus, Funambulus.*
8. **Dissections**-As per UGC guidelines
9. *Scoliodon IX* and X, Cranial nerves
10. *Scoliodon* Brain
11. Scoliodon-Digestive system
12. Mounting of fish scales

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

RFERENCE WEB LINKS:

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

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

SEMESTER-III

Course 5-ANIMAL DIVERISTY-II BIOLOGY OF CHORDATES

Theory Credits: 3 3 hrs/week

Z Ma1-3501(3)

LEARNING OBJECTIVES

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

LEARNING OUTCOMES: By the completion of the course the graduate should able to –

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

SYLLABUS:

UNIT - I

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

UNIT - II

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

UNIT - III

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

UNIT - IV

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

UNIT - V

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

Co-curricular activities (suggested)

- Preparation of charts on Chordate classification (with representative animal photos) and retrogressive metamorphosis
- Clay models of *Herdmania* and *Amphioxus*
- Visit to local fish market and identification of local cartilaginous and bony fishes
- Maintaining of aquarium by students
- Model of fish heart and brain
- Preparation of slides of scales of fishes
- Visit to local/nearby river to identify migratory fishes and prepare study notes
- Preparation of Charts on above topics by students (Eg: comparative account of vertebrate heart/brain/lungs, identification of snakes etc.)
- Collecting and preparation of Museum specimens with dead frogs/snakes/lizards etc., and/or their skeletons.

- Additional input on types of snake poisons and their antidotes (student activity).
- Collection of bird feathers and submission of report on Plumology
- Taxidermic preparation of dead birds for Zoology Museum
- Map pointing of prototherian and metatherian mammals
- Chart preparation for dentition in mammals

REFERENCE BOOKS

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

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

SEMESTER-III

COURSE 7: ANIMAL BIOTECHNOLOGY

Practical | Credits: 1 | 2 hrs/week

Z-Ma3-3551(2)

LEARNING OBJECTIVES

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

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

LEARNING OUTCOMES

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

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

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

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

SYLLABUS:

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

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

RFERENCE WEB LINKS:

- https://vlab.amrita.edu/

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

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

SEMESTER-III

COURSE 7: ANIMAL BIOTECHNOLOGY

Z-Ma3-3501(3)

LEARNING OBJECTIVES:

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

LEARNING OUTCOMES:

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

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

SYLLABUS:

UNIT-I:

1.1 Functions of Enzymes and Definition of a vector and characteristics. Restriction modification systems: Types I, II and III.

1.2 Mode of action, nomenclature, applications of Type II restriction enzymes in genetic engineering.

1.3 **DNA modifying enzymes and their applications**: DNA polymerases, Knelow fragment, Terminal deoxynucleotidyl transferase, kinases, phosphatases, and DNA ligases

1.4 **Cloning Vectors**: Plasmid vectors (pBR and pUC series), Bacteriophage (lambda and M13 basedvectors), Cosmids, BACs, YACs, and shuttle vectors.

UNIT- II:

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

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

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

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

UNIT-III:

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

3.2 Organ culture; Cryopreservation of cultures.

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

3.4 Stem cells: Types of stem cells, applications

UNIT-IV:

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

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

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

4.4 Transgenic - sheep, - fish; applications

UNIT-V:

5.1 DNA fingerprinting and its applications

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

5.3 **Gene therapy**-application

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

REFERENCES BOOKS:

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

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

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

Z-Ma4-3551(2)

LEARNING OBJECTIVES

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

LEARNING OUTCOMES

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

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

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

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

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

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

SYLLABUS:

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

RFERENCE WEB LINKS:

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

- https://www.youtube.com/watch?v=tXbmPhrS4eA
- https://www.studocu.com/en-us/document/temple-university/bioe-lab-2-biomaterials/1632834116536-zoogeography-assignment/17915777
- https://guides.library.tulsacc.edu/c.php?g=932434&p=6720765
- https://bio.libretexts.org/Courses/Butte_College/BC%3A_BIOL_2_-_Introduction_to_Human_Biology_%28Grewal%29/Text/09%3A_Biological_Evolution/9.3%3A_Evidence_for_Evolution
- https://www.coursehero.com/study-guides/boundless-biology/evidence-of-evolution/

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

Theory Credits: 3

3 hrs/week

Z-Ma4-3501(3)

LEARNING OBJECTIVES

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

LEARNING OUTCOMES:

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

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

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

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

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

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

SYLLABUS:

UNIT-I

1.1 Origin of life: different ancient concepts -Origin of Earth and Solar system: Big Bang theory, Primitive atmosphere, formation of macromolecules

1.2 Biological evolution: Coacervates, Microspheres, formation of Nucleic acids, Nucleoproteins

1.3 Formation of primary organisms, evolution of modes of nutrition, oxygen revolution, present day atmosphere, evolution of eukaryotes.

1.4 Experimental evidences in support of Biochemical origin of life (Miller and Urey experiment)

UNIT-II

2.1 Palaeontological and taxonomical evidences of evolution

2.2 Morphological and anatomical evidences of evolution

2.3 Embryological and physiological evidences of evolution

2.4 Evidences from connecting links, missing links and bio geographical distribution

UNIT -III

3.1 Lamarckism-Neo Lamarckism

3.2 Germplasm theory-August Weismann

3.3 Darwinism-Theory of Natural selection

3.4 Modern synthetic theory of evolution (Neo Darwinism)

UNIT-IV

4.1 Variations-types-sources of variations- importance in evolution

4.2 Mutations-classification-causes-significance in evolution

4.3 Isolation mechanisms-role in evolution

4.4 Sewall wright effect, Hardy Weinberg Principle

UNIT-V

5.1 Animal distribution and barriers of distribution

5.2 Zoogeographical realms – Palearctic & Nearctic regions

5.3 Zoogeographical realms – Neotropical & Ethiopian regions

5.4 Zoogeographical realms – Oriental & Australian regions

Co-curricular activities (Suggested)

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

REFERENCES BOOKS:

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

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

SEMESTER-IV
COURSE 9: EMBRYOLOGY

LEARNING OBJECTIVES

 The objective of this course is to provide a comprehensive practical knowledge on the embryology

 Must develop a critical understanding of the early embryological events

 Acquire knowledge on the developmental stages of chick

 Understand the histology of placenta

LEARNING OUTCOMES

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

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

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

SYLLABUS:

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

RFERENCE WEB LINKS:

 https://praxilabs.com/en/3d-simulations/cultivation-and-preparation-of-the-virus-in-chick-embryo-virtual-lab

 https://vlab.amrita.edu/

 https://www.vlab.co.in/

 https://www.youtube.com/watch?v=p_tx88He8Pk

 https://core.ac.uk/download/143957972.pdf

 https://egyankosh.ac.in/bitstream/123456789/57549/1/Exercise%207%20Chick%20Embryo.pdf

 http://www.macollege.in/app/webroot/uploads/department_materials/doc_501.pdf

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

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

SEMESTER-IV
COURSE 9: EMBRYOLOGY

Z-Ma1-4501(3)

LEARNING OBJECTIVES

The objective of this course is

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

Topics that will be discussed are organogenesis and regeneration.

LEARNING OUTCOMES:
by the completion of the course the graduate shall able to –

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

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

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

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

CO5-L4- Examine the process of organogenesis

SYLLABUS:

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

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

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

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

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

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

REFERENCES BOOKS:

- Developmental Biology by Balinksy
- Developmental Biology by Gerard Karp
- Chordate embryology by Varma and Agarwal
- Embryology by V.B. Rastogi

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

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

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

LEARNING OBJECTIVES

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

LEARNING OUTCOMES

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

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

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

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

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

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

SYLLABUS:

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

RFERENCE WEB LINKS:

- https://vlab.amrita.edu/?sub=3&brch=69
- https://ivl1-au.vlabs.ac.in/List%20of%20experiments.html

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

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

SEMESTER-IV
COURSE 11: IMMUNOLOGY

Z-Ma3-4501(3)

LEARNING OBJECTIVES

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

COURSE OUTCOMES:

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

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

SYLLABUS:

UNIT – I: Overview of Immune system

1.1 Introduction to basic concepts in Immunology

1.2 Innate and adaptive immunity

1.3 Cells of immune system

1.4 Organs of immune system

UNIT – II: **Antigens**

2.1 Basic properties of antigens

2.2 B and T cell epitopes, paratopes

2.3 Haptens and adjuvants

2.4 Factors influencing immunogenicity

UNIT – III: Antibodies

3.1 Structure of antibody

3.2 Classes of antibodies

3.3 Functions of antibodies

3.4 Monoclonal antibodies

UNIT – IV: Working of Immune system

4.1 Structure and functions of major histocompatibility complexes

4.2 Exogenous pathway of antigen presentation and processing

4.3 Endogenous pathway of antigen presentation and processing

4.4. Basic properties and functions of cytokines

UNIT – V: Immune system in health and disease

5.1 Gell and Coombs' classification and brief description of various types of hypersensitivities

5.2 Introduction to concepts of autoimmunity and immunodeficiency

5.3 General introduction to vaccines Types of vaccines, Immunization programme

5.4 Organ transplantation- Graft rejection, immune suppressors

Co-curricular activities (suggested)

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

REFERENCES BOOKS:

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

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

SEMESTER-III

COURSE 6-GENETICS- PRACTICAL

2 hrs/week

Code: Z-Ma2 -3551 (2)

LEARNING OBJECTIVES

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

COURSE OUTCOMES

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

SYLLABUS:

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

RFERENCE WEB LINKS:

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

tml

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

.pdf

- https://coabnau.in/uploads/1610707528_GPB3.2PracticalManual-Final.pdf

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

SEMESTER-III
COURSE 6: PRINCIPLES OF GENETICS

Theory Credits: 3 3hrs/week
Paper Code: Z-Ma2- 3501 (3)

LEARNING OBJECTIVES

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

COURSE OUTCOMES

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

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

SYLLABUS:

UNIT-I:

1.1 History of Genetics- Concepts of Phenotype, Genotype, Heredity, Variation, Pure lines andInbreed Lines, Laws of Inheritance

1.2 Mendelian Principles on Monohybrid cross, back cross and Test cross

1.3 Mendelian Principles on Dihybrid cross

UNIT-II:

2.1 Linkage - Definition, Types of linkage-complete linkage and incomplete linkage, Significanceof linkage.

2.2 Crossing over - definition; Mechanism of crossing over: Chiasma Interference andcoincidence

2.3 Gene Interactions: Incomplete dominance, codominance, Pleiotropy

2.4 Gene Interactions**:** Lethal alleles, Epistasis, Non- Epistasis.

UNIT-III:

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

UNIT-IV:

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

UNIT-V:

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

Co-curricular activities (Suggested)

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

REFERENCE BOOKS:

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

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

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

SEMESTER-IV

ANIMAL PHYSIOLOGY: LIFE SUSTAINING SYSTEMS

Practical

Code:Z-Ma2-4551(2)

LEARNING OBJECTIVES

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

COURSE OUTCOMES:

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

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

SYLLABUS:

1. Examination of sections of mammalian oesophagus, stomach, duodenum, ileum, rectum liver, trachea, lung, kidney and visit to Medical College to observe the preserved whole organs.

2. Study of activity of Salivary amylase under optimum condition

3. Qualitative tests for identification of Carbohydrates

4. Qualitative tests for identification of Proteins

5. Qualitative tests for identification of Fats

6. Urine test for sugar, albumin

7. Estimation of haemoglobin using Sahli's haemoglobinometer

8. Recording of blood pressure using a sphygmomanometer

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

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

RFERENCE 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

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

SEMESTER-IV

ANIMAL PHYSIOLOGY: LIFE SUSTAINING SYSTEMS

Paper code: Z-Ma2-4501(3)

LEARNING OBJECTIVES

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

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

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

SYLLABUS:

UNIT-I: Physiology of Digestion

1.1 Structural organization and functions of gastrointestinal tract and associated glands;

1.2 Vitamins & Mineral composition of food & Mechanical and chemical digestion of food;

1.3 Absorptions of carbohydrates, lipids, proteins, water, minerals and vitamins;

1.4 Hormonal control of secretion of enzymes in Gastrointestinal tract.

UNIT-II: Physiology of Respiration

2.1 Structural organization of Respiratory system, Mechanism of respiration, Control of respiration

2.2 Pulmonary ventilation; Respiratory volumes and capacities;

2.3 Transport of oxygen in blood and dissociation curves and the factors influencing it

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

UNIT-III: Renal Physiology `

3.1 Structure of kidney and its functional unit

3.2 Mechanism of urine formation, counter current mechanism

3.3 Regulation of water balance

3.4 Regulation of acid-base balance

UNIT-IV: Physiology of exciting tissues

4.1 Neuron structure and types

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

4.3 Types of muscles, Ultra structure of skeletal muscle

4.4 Molecular and chemical basis of muscle contraction

UNIT- V: Physiology of Heart

5.1 Structure of mammalian heart, Coronary circulation;

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

5.3 Cardiac Cycle-Cardiac output and its regulation

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

Co-curricular activities (Suggested)

· Chart on cardiac cycle, human lung, kidney/nephron structure etc.

· Working model of human / any mammalian heart.

· Working model of human / any mammalian urine formation

· Chart/model of sarcomere

· Chart/model on nerve impulse transmission

REFERENCES BOOKS:

· Eckert H. *Animal Physiology: Mechanisms and Adaptation.* W.H. Freeman & Company.

· Floray E. *An Introduction to General and Comparative Animal Physiology.* W.B. Saunders Co., Philadelphia.

· Goel KA and Satish KV. 1989. *A Text Book of Animal Physiology*, Rastogi Publications, Meerut, U.P.

· Hoar WS. *General and Comparative Physiology.* Prentice Hall of India, New Delhi.

· Lehninger AL. Nelson and Cox. *Principles of Biochemistry.* Lange Medical Publications, New Delhi.

· Prosser CL and Brown FA. *Comparative Animal Physiology.* W.B. Saunders Company, Philadelphia.

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Model Program Book

SEMESTER INTERNSHIP

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

SLI 6001 (12)
From AH Batch

12 Weeks
200 Marks

COVER PAGE

An Internship Report on

(Title of the Semester Internship Program)

Submitted in accordance with the requirement for the degree of

Under the Faculty Guideship of

(Name of the Faculty Guide)

Department of

(Name of the College)

Submitted by:

(Name of the Student)

Reg.No: _____

Class & Group _____

(Name of the College)

TITLE PAGE

An Internship Report on

_____

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Submitted by:

_____

(Name of the Student)

Reg.No: _____

Class & Group _____

_____

(Name of the College)

PROGRAM BOOK FOR

SEMESTER INTERNSHIP

Name of the Student:

Name of the College:

Registration Number:

Period of Internship: From: To:

Name & Address of the Intern Organization

_____SJCW(A)

YEAR

Instructions to Students

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

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

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

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Student's Declaration

I,_____a student of _____

Program, Reg. No._____of _____

College do hereby declare that I have completed the mandatory internship from_____to_____in_____(Name of the intern organization) under the Faculty Guideship of

_____ (Name of the Faculty Guide), Department of

_____,_____

(Name of the College)

(Signature and Date)

Official Certification

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

This is accepted for evaluation.

(Signatory with Date and Seal)

Endorsements

Faculty Guide

Head of the Department

Principal

Certificate from Intern Organization

This is to certify that_____ *(Name of the intern)* Reg. No_____of_____ *(Name of the College)* underwent internship in_____*(Name of the Intern Organization)* from_____to _____

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

Authorized Signatory with Date and Seal

Acknowledgements

Contents

CHAPTER 1: EXECUTIVE SUMMARY

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

CHAPTER 2: OVERVIEW OF THE ORGANIZATION

Suggestive contents

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

CHAPTER 3: INTERNSHIP PART

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

ACTIVITY LOG FOR THE FIRST WEEK

Day & Date	Brief description of the daily activity	Learning Outcome	Person In-Charge Signature
Day – 1			
Day - 2			
Day – 3			
Day – 4			
Day – 5			
Day –6			

WEEKLY REPORT

WEEK – 1 (From Dt…… to Dt……)

Objective of the Activity Done:
Detailed Report:

ACTIVITY LOG FOR THE SECOND WEEK

Day & Date	Brief description of the daily activity	Learning Outcome	Person In-Charge Signature
Day – 1			
Day - 2			
Day – 3			
Day – 4			
Day – 5			
Day –6			

WEEKLY REPORT

WEEK – 2 (From Dt…….. to Dt……)

Objective of the Activity Done:
Detailed Report:

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

ACTIVITY LOG FOR THE THIRD WEEK

Day & Date	Brief description of the daily activity	Learning Outcome	Person In-Charge Signature
Day – 1			
Day - 2			
Day – 3			
Day – 4			
Day – 5			
Day –6			

WEEKLY REPORT

WEEK – 3 (From Dt…… to Dt……)

Objective of the Activity Done:
Detailed Report:

ACTIVITY LOG FOR THE FORTH WEEK

Day & Date	Brief description of the daily activity	Learning Outcome	Person In-Charge Signature
Day – 1			
Day - 2			
Day – 3			
Day – 4			
Day – 5			
Day –6			

WEEKLY REPORT

WEEK – 4 (From Dt…… to Dt……)

Objective of the Activity Done:
Detailed Report:

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

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

ACTIVITY LOG FOR THE FIFTH WEEK

Day & Date	Brief description of the daily activity	Learning Outcome	Person In-Charge Signature
Day – 1			
Day - 2			
Day – 3			
Day – 4			
Day – 5			
Day –6			

WEEKLY REPORT

WEEK – 5 (From Dt…… to Dt……)

Objective of the Activity Done:
Detailed Report:

ACTIVITY LOG FOR THE SIXTH WEEK

Day & Date	Brief description of the daily activity	Learning Outcome	Person In-Charge Signature
Day – 1			
Day - 2			
Day – 3			
Day – 4			
Day – 5			
Day –6			

WEEKLY REPORT

WEEK – 6 (From Dt…… to Dt……)

Objective of the Activity Done:
Detailed Report:

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

ACTIVITY LOG FOR THE SEVEN WEEK

Day & Date	Brief description of the daily activity	Learning Outcome	Person In-Charge Signature
Day – 1			
Day - 2			
Day – 3			
Day – 4			
Day – 5			
Day –6			

WEEKLY REPORT

WEEK – 7 (From Dt…….. to Dt……)

Objective of the Activity Done:
Detailed Report:

ACTIVITY LOG FOR THE EIGTH WEEK

Day & Date	Brief description of the daily activity	Learning Outcome	Person In-Charge Signature
Day – 1			
Day - 2			
Day – 3			
Day – 4			
Day – 5			
Day –6			

WEEKLY REPORT

WEEK – 8 (From Dt…… to Dt : Dt ……)

Objective of the Activity Done:
Detailed Report:

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

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

ACTIVITY LOG FOR THE NINETH WEEK

Day & Date	Brief description of the daily activity	Learning Outcome	Person In-Charge Signature
Day – 1			
Day - 2			
Day – 3			
Day – 4			
Day – 5			
Day –6			

WEEKLY REPORT

WEEK – 9 (From Dt…….. to Dt ……)

Objective of the Activity Done:
Detailed Report:

ACTIVITY LOG FOR THE TENTH WEEK

Day & Date	Brief description of the daily activity	Learning Outcome	Person In-Charge Signature
Day – 1			
Day - 2			
Day – 3			
Day – 4			
Day – 5			
Day –6			

WEEKLY REPORT

WEEK – 10 (From Dt…… to Dt……)

Objective of the Activity Done:
Detailed Report:

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

ACTIVITY LOG FOR THE ELEVENTH WEEK

Day & Date	Brief description of the daily activity	Learning Outcome	Person In-Charge Signature
Day – 1			
Day - 2			
Day – 3			
Day – 4			
Day – 5			
Day –6			

WEEKLY REPORT

WEEK – 11 (From Dt…… to Dt……)

Objective of the Activity Done:
Detailed Report:

ACTIVITY LOG FOR THE TWELVETH WEEK

Day & Date	Brief description of the daily activity	Learning Outcome	Person In-Charge Signature
Day – 1			
Day - 2			
Day – 3			
Day – 4			
Day – 5			
Day –6			

WEEKLY REPORT

WEEK – 12 (From Dt…….. to Dt……)

Objective of the Activity Done:
Detailed Report:

Bi Weekly Report – 6
Hard copy to be submitted after Twelth week

Monthly Report – 3
Typed hard copy to be submitted after Twelth week

ACTIVITY LOG FOR THE THIRTEENTH WEEK

Day & Date	Brief description of the daily activity	Learning Outcome	Person In-Charge Signature
Day – 1			
Day - 2			
Day – 3			
Day – 4			
Day – 5			
Day –6			

WEEKLY REPORT

WEEK – 13 (From Dt…….. to Dt……)

Objective of the Activity Done:
Detailed Report:

ACTIVITY LOG FOR THE FOURTEENTH WEEK

Day & Date	Brief description of the daily activity	Learning Outcome	Person In-Charge Signature
Day – 1			
Day - 2			
Day – 3			
Day – 4			
Day – 5			
Day –6			

WEEKLY REPORT

WEEK – 14 (From Dt…….. to Dt……)

Objective of the Activity Done:
Detailed Report:

Bi-Weekly Report – 7
Hard copy to be submitted after 14th week

ACTIVITY LOG FOR THE FIFTEENTH WEEK

Day & Date	Brief description of the daily activity	Learning Outcome	Person In-Charge Signature
Day – 1			
Day - 2			
Day – 3			
Day – 4			
Day – 5			
Day –6			

WEEKLY REPORT

WEEK – 15 (From Dt…….. to Dt……)

Objective of the Activity Done:
Detailed Report:

Bi weekly Report – 8
Hard copy to be submitted at the end of 15th / 16th week

Monthly Report – 4
Typed hard copy to be submitted after 16th week

CHAPTER 4: PROJECT REPORT

OVERALL INTERNSHIP REPORT

CHAPTER 5: OUTCOMES DESCRIPTION

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

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

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

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

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

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

Student Self Evaluation of the Semester Internship

Student Name: **Registration No:**

Term of Internship: **From:** **To :**

Date of Evaluation:

Organization Name & Address:

Please rate your performance in the following areas:

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

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

Date: **Signature of the Student**

Evaluation by the Supervisor of the Intern Organization

Student Name: **Registration No:**

Term of Internship: **From:** **To :**

Date of Evaluation:

Organization Name & Address:

Name & Address of the Supervisor with Mobile Number

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

Rating Scale: 1 is lowest and 5 is highest rank

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

Date: **Signature of the Supervisor**

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

PHOTOS & VIDEO LINKS

Assessment

Assessment Component	Max Marks	Assessment method
1. Continuous Assessment	80	Internal
2. End semester Assessment	80	External
3. VivaVoce	40	External
TOTAL MARKS	**100**	

Assessment Component	Max Marks	Assessment method
Continuous assessment		
1. Project Log	24	Internal
2. Project Implementation	16	Internal
3. Project Report	25	Internal
4. Presentation	15	Internal
TOTAL MARKS	**80**	

Assessment Component	Max Marks	Assessment method
End Semester Assessment		
1. Marks awarded by Industry/Organization	80	External
TOTAL MARKS	**80**	

Assessment Component	Max Marks	Assessment method
Viva voce		
1. Knowledge	10	External
2. Presentation	10	External
3. Viva voce	20	External
TOTAL MARKS	**40**	

Marks awarded by Industry/Organization

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

ANDHRA PRADESH
STATE COUNCIL OF HIGHER EDUCATION

(A Statuory Body of the Government of Andhra Pradesh)

2nd, 3rd, 4th and 5th floors, Neeladri Towers, Sri Ram Nagar, 6th Battalion Road
Atmakur (V)Mangalagiri (M), Guntur, Andhra Pradesh, Pin - 522 503
www.apsche.ap.gov.in

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

V SEMESTER **ZOOLOGY** TIME: 2 HRS/WEEK

Z-E1-5554(2) **POST HARVEST TECHNOLOGY OF FISH & FISHERIES** Max MARKS: 50

w.e.f. 20AH Batch **ZOOLOGY PRACTICAL – IIIB**

SYLLABUS

OBJECTIVES: To enable the students to

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

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

CO1: Indicate proper ways of handling fish with minimal stress and methods of identifying a fresh fish.

CO2: Apply the techniques of fish preservation and be able to follow suitable procedures.

CO3: Demonstrate skill in preparation of value-added products from fishes.

CO4: Evaluate the situation for following safety and hygienic procedures according to National and International standards.

CO5: Analyze the protocols of aqua processing methods.

Practical (Laboratory) Syllabus:

1. Evaluation of freshness of fish/fishery products for organoleptic, characters and microbial quality (TPC).
2. Preparation of dried, cured and fermented fish products
   for detailed procedure method visit sites:
3. Determination of salt, protein, moisture in dried/ cured products in fish and shrimp muscle.
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-flowchart-worksheet preparation.
   (**Refer the following websites for complete procedure method and estimations of above listed practicals).
8. Process flow chart for Canning.
9. Determination of freezing point and freezing curve.

P.T.O

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%20for%20fish.pdf
5. http://jebas.org/00200620122014/Abujam%20et%20al%20JEBAS.pdf
6. https://krishi.icar.gov.in/jspui/bitstream/123456789/20770/1/Training%20Manual_Hygienic%20drying%20and%20packing%20of%20fish.pdf
7. https://krishi.icar.gov.in/jspui/bitstream/123456789/20770/1/Training%20Manual_Hygienic%20drying%20and%20packing%20of%20fish.pdf
8. https://agritech.tnau.ac.in/fishery/fish_byproducts.html
9. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5352841/
10. http://www.fao.org/3/i1136e/i1136e.pdf
11. http://www.fao.org/3/x5989e/X5989e01.htm#What%20is%20sensory%20assessment)

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

1. Co-Curricular Activities

a) Mandatory:(Lab/field training of students by teacher(lab10+field05):

1. For Teacher: Training of students by the teacher in laboratory /field for not less than 15hours on 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 hand written Field work/ Project work Report with pictures and data /survey in 10 pages.
3. Max marks for Field work/ 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) <u>Suggested Co-Curricular Activities</u>

1. Observation of fish/shrimp processing plants–visit websites 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.,

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

V SEMESTER **ZOOLOGY** TIME: 3 HRS/WEEK

Z-E1-5504(3) **POST HARVEST TECHNOLOGY OF FISH & FISHERIES** Max MARKS: 100

w.e.f. 20AH Batch **SYLLABUS**

Objectives: To enable the students to

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

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

CO1: Summarize the handling and principles of fish preservation.

CO2: Gain insight about the processing and preparation of commercially important products and by products of fish.

CO3: Choose the suitable processing methods in Aquaculture.

CO4: Establish Good laboratory practices, corrective procedures for sanitation in processing plants.

CO5: Recall the principles of HACCP and suggest corrective measures.

UNIT –I: Handling and Principles of fish Preservation:

1.1. Handling of fresh fish, storage and transport of fresh fish, postmortem changes (rigor mortis and spoil age), Microbial spoil age in marine fish and fresh water 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 cake, fish sauce, fish salads, fish powder, pet food from trash fish, fish manure.

3.2 Fish by-products –fish glue, Isin glass, chitosan, pearl essence, shark fins, fish Leather and fish maws.

P.T.O.

UNIT–IV: Sanitation and Quality control:

4.1 Sanitationinprocessingplants-EnvironmentalhygieneandPersonalhygieneinprocessingplants.

4.2 Quality Control of fish and fishery products–pre-processing control, control during processing and control after processing. Traceability issues.

UNIT – V: Quality Assurance, Management and Certification:

5.1. Sea food 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 sea food safety.

5.2 National and International standards–ISO9000:2000 Series of Quality Assurance System, *Codex Alimentarius*. FSSAI.

REFERENCES:

1. Balachandran KK. 2001. Post-harvest Technology of Fish and Fish Products. Daya Publ.
2. Santharam R, N Sukumaran and P Natarajan1987. Amanual of aquaculture, Oxford-IBH New Delhi.
3. Gopakumar K. (Ed.). 2002. Text Book of Fish Processing Technology. ICAR.
4. Govindan, TK.1985. Fish Processing Technology, Oxford-IBH.
5. Hall GM. (Ed). 1992. Fish Processing Technology. Blackie.
6. Lakshmi Prasad's, Fish ProcessingTechnology2012, Arjun Publishing House
7. Dr. Sunitha Rai, Fish Processing Technology, 2015, Random Publications.
8. Safety and Quality issues in Fish Processing (Wood head Publishing Series in Food Science, Technology and Nutrition) by H A Bremner.
9. K.A Mahanthy, Innovations in Fishing and Fish Processing Technologies, January 2021.

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

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

V SEMESTER **ZOOLOGY** TIME:3HRS/WEEK

Z-E1-5553(2) **SUSTAINABLE AQUACULTURE MANAGEMENT** Max MARKS:50

w.e.f. 20AH Batch **ZOOLOGY PRACTICAL – IIIA**

SYLLABUS

OBJECTIVES: To enable the students to

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

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

CO1: Identify the fresh water and brackish water species based on the morphological characters.

CO2: Acquire skill in estimating the physico chemical characteristics of water used for aquaculture.

CO3: Acquire knowledge on the technique of Hypophysation.

CO4: Summarise the symptoms associated with fish and shrimp diseases and suggest measures for prevention.

List of Practical:

1. Fresh water Cultivable species any (Fin & Shell Fish Specimens – Observation of morphological characters and drawings) - **5**
2. Brackish water cultivable species (Fin & Shellfish- Specimens-Observation of Morphological Character and drawing)-**3**
3. Marine water cultivable species (Fin &Shell fish- Specimens- Observation of Morphological Character and drawing) -4
4. Hands on training on the use of kits for determination of water quality in aquaculture (DO, Alkalinity, Ammonia, pH, Turbidity- Testing kits to be used for the estimation of various parameters/Standard procedure can be demonstrated for the same)
5. Demonstration of Hypophysation (Procedure of hypophysation to be demonstrated in the practical lab with any edible fish as model)
6. Viral diseases of Fin & Shell Fish (Observation of histopathological slides / Charts/Models of viral pathogens in fin/ shell fish.
7. Bacterial diseases of Fin & Shell Fish (Observation of histopathological slides / Charts/Models of Bacterial pathogens in fin/ shell fish.
8. Fungal diseases of Fin & Shell Fish (Observation of his to pathological slides / Charts/Models of Bacterial pathogens in fin/ shell fish.
9. Fish Biometric studies: descriptive, morphometric and meristic characteristics of a sample fish.

P.T.O

Lab References:

1. Boyd CE 1982. Water Quality Management for Pond Fish Culture. Elsevier Scientific Publishing Company.
2. Departmental repository of flash cards.
3. Manual of Vertebrate Zoology, S.S. Lal.
4. "Fishery Science & Indian Fisheries" by C.B.L.Srivastava – Kitab Mahal, Allahabad – Edition: 1988.
5. http://www.fao.org/fishery/docs/CDrom/FAO_Training/FAO_Training/General/x6708e/x6708e06.htm
6. http://aquaticcommons.org/1666/1/Better-Practice3_opt.pdf
7. 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:

Mandatory :*(Student training by teacher in field skills: Total 15hrs.,Lab:10 +field05)*

1. For Teacher: Training of students by the teacher in laboratory/field fornotlessthan15 hours onBreeding-Inducedbreedingincarps-hatcherytechnologyof*P.Vennami*-Farmingtechniques-diseasediagnostictechniques—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 Field work/Project work Report.
3. Max marks for Field work/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.

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/Shellfish Diseases with eco-friendly material.

Assignments, Group discussion, Seminar, Quiz, Collection of Material, Video preparation etc., Invited lecture.

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

V SEMESTER **ZOOLOGY** TIME: 3 HRS/WEEK

Z-E1-5503(3) **SUSTAINABLE AQUACULTURE MANAGEMENT** Max MARKS: 100

w.e.f. 20AH Batch **SYLLABUS**

OBJECTIVES: To enable the students to

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

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

CO1: Appraise about the culture practices, systems and selection of species for aquaculture.

CO2: Review and plan the layout, design and construction of a pond using theoretical knowledge.

CO3: Summarise the technique of induced breeding.

CO4: Develop insight into the prestocking, stocking and post stocking management of carp culture ponds.

CO5: Gain insight on the disease management of Fin fish and shell fishes.

UNIT: I

1.1 Present status of Aquaculture–Global and National scenario.

1.2 Criteria for selection of species for culture. Major cultivable species for aquaculture: fresh water, brackish water and marine.

1.3 **Culture Practices**: Traditional, extensive, modified extensive, semi-intensive and intensive culture of fish and shrimp.

1.4 Design and construction of fish and shrimpfarms

UNIT: II

2.1 **Culture systems in Aquaculture**: Ponds, Raceways, Cages, Pens and Rafts.

2.2 Functional classification of ponds -Nursery, Rearing, stocking and quarantine ponds

2.3 Need of fertilizer and manure application in culture ponds

2.4 Physio-chemical conditions of soil and water optima for culture (Temperature, depth, turbidity, PH, BOD, $CO_2$and nutrients (N,P,K and C/N ratio)

UNIT: III

3.1. Induced breeding in Carps and Shrimps.

3.2. Culture of Indian major carps: Pre-stocking management (Dewatering, drying, ploughing/ desilting; Predators, weeds and algalblooms 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

P.T.O.

UNIT: IV

4.1 Commercial importance of shrimp &prawn

4.2 *Macro brachiumrosenbergii*-biology, seed production.

4.3 Culture of *P.vannamei* – hatchery technology and culture practices

4.4 Mixed culture of fish and prawns, integrated fish farming.

UNIT: V

5.1 Viral diseases of Fin Fish & shellfish-Any 4

5.2 Fungal diseases of Fin & Shellfish- Any 4

5.3 Bacterial diseases of Fin fish &Shellfish-Any 4

5.4 Protozoan and Helminthic diseases (Trematodes and cestodes)- Any 2 each

REFERENCE BOOKS:

1. Pillay TVR&M.A.Dill, 1979. Advances in Aquaculture. Fishing News Books Ltd., London
2. Stickney RR 1979.Principles of Warm Water Aquaculture. JohnWiley&SonsInc.1981
3. BoydCE1982.Water Quality Management for Pond Fish Culture. Elsivier Scientific Publishing Company.
4. BoseANet.al.1991.CostalAquacultureEngineering.Oxford&IBHPublishingCompanyPvt.Ltd.
5. Chakraborty C & Sadhu AK. 2000. Biology Hatchery and Culture Technology of Tiger Prawn and Giant Freshwater Prawn. Daya Publ. House. FAO. 2007. Manual on Freshwater Prawn Farming.
6. Jhingran V.G. 2007. Fish and Fisheries of India. Hindustan Publ. Corporation, India.
7. MPEDA: Handbooks on culture of carp, shrimp, etc.
8. “Fishery Science & Indian Fisheries” by C.B.L.Srivastava – Kitab Mahal, Allahabad – Edition: 1988.
9. “An Introduction to Fishes” by S.S.Khanna – Central Book Depot, Allahabad –Edition: 1996.
10. “Prawn & Prawn Fisheries of India” by C.V.Kurrian & V O Sebastian –
11. Hindustan Publishing Corporation, Delhi – Edition: 1986.
12. “A Text book of Fish Biology & Indian Fisheries” by Parihar – Cenrral Publishing House, Allahabad.
13. “Hand Book of Fish Biology and Indian Fisheries by Parihar-Central Publishing House, Allahabad. (2003)

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

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