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:

1. Learn the principles of classification and preservation of biodiversity
2. Understand the plant anatomical, physiological and reproductive processes.
3. Knowledge on animal classification, physiology, embryonic development and their economic importance.
4. Outline the cell components, cell processes like cell division, heredity and molecular processes.
5. Comprehend the chemical principles in shaping and driving the macromolecules and lifeprocesses.

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

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

BSC 1502 (4) **INTRODUCTION TO APPLIED BIOLOGY** Marks:100

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

Learning objectives:

The student will be able to learn the foundations and principles of microbiology, immunology, biochemistry, biotechnology, analytical tools, quantitative methods, and bioinformatics.

Learning Outcomes:

1. Learn the history, ultrastructure, diversity and importance of microorganisms.
2. Understand the structure and functions of macromolecules.
3. Knowledge on biotechnology principles and its applications in food and medicine.
4. Outline the techniques, tools and their uses in diagnosis and therapy.
5. Demonstrate the bioinformatics and statistical tools in comprehending the complex biological data.

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, Archaea and Virus.

1.3. Applications of microorganisms in – Food, Agriculture, Environment, and Industry.

1.4. Immune system – Immunity, types of immunity, cells and organs of immune system.

UNIT – 2: Essentials of Biochemistry

2.1. Biomolecules I – Carbohydrates, Lipids.

2.2. Biomolecules II – Amino acids & Proteins.

2.3. Biomolecules III – Nucleic acids -DNA and RNA.

2.4. Basics of Metabolism – Anabolism and catabolism.

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. Probability and tests of significance.

5.3. Introduction, Genomics, Proteomics, types of Biological data, biological databases NCBI, EBI, Gen Bank; Protein 3D structures, Sequence alignment

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 (A), VISAKHAPATNAM

III SEMESTER **ZOOLOGY** Time:4 HRS./WEEK

Z 3503(3) **CELL BIOLOGY, GENETICS, MOLECULAR BIOLOGY AND EVOLUTION** MARKS:100

w.e.f. 2020-2021 (20AH) **SYLLABUS**

OBJECTIVES: To enable the students to:

- Understand the origin of cell and distinguish between prokaryotic and eukaryotic cell
- Describe the role of different cell organelles in maintenance of life activities
- Appraise the basic concepts of heredity, variations and gene interaction
- Gain knowledge on polygenic, sex-linked, and multiple all elic modes of inheritance.
- Acquaint with basic concepts of molecular biology's to how characters are expressed with a co-ordinated functioning of replication, transcription and translation in all living beings.
- Describe the origin of life, the ories and forces of evolution and understand. The role of variation sand mutations in evolution of organisms.

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

- **CO1:** Understand the basic unit of the living organisms and to differentiate the organisms by their cell structure.
- **CO2:** Correlate the structure of animal cell organelles to their functions in eukaryotic cells.
- **CO3:** Understand the history of origin of branch of genetics, gain knowledge on heredity, interaction of genes, various types of inheritance patterns existing in animals
- **CO4:** Acquire in depth knowledge on various of aspects of genetics involved in sex determination, human karyo typing and mutations of chromosomes resulting in variousdisorders.
- **CO5:** Describe the central dogma of molecular biology and flow of genetic information from DNA to proteins.
- **CO6:** Summarize the principles and forces of evolution of life on earth, the process of evolution of new species and apply the same to develop new and advanced varieties of animals for the benefit of the society.

UNIT–I: CELL BIOLOGY:

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

1.2 Plasma membrane–Models and functions of plasma membrane.

1.4 Structure and functions of Golgi complex, Endo plasmic Reticulum and Lysosomes

1.5 Structure and functions of Ribosomes, Mitochondria, Nucleus, Chromosomes

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

2. Need not study cellular respiration under mitochondrial functions)

UNIT–II: GENETICS –I:

2.1 Mendel'swork ontransmission oftraits

2.2 GeneInteraction –Incomplete Dominance, Codominance, Lethal Genes

2.3 Polygenic inheritance (General Characteristics & examples); Multiple Alleles (General Characteristics and Blood group inheritance.)

2.4 Sex determination (Chromosomal, Genic Balance, Hormonal, Environmental and Haplo – diploidy types of sex determination)

2.5 Sex linked inheritance (X-linked, Y-linked & XY-linked inheritance)

UNIT–III: GENETICS–II:

3.1 Mutations&Mutagenesis

3.2 Chromosomal Disorders (Autosomal and Allosomal)

3.3 HumanGenetics – Karyotyping,PedigreeAnalysis(basics)

3.4 BasicsonGenomicsandProteomics

UNIT-IV: MOLECULAR BIOLOGY:

4.1 Central Dogma of Molecular Biology

4.2 Basic concepts of –

a. DNA replication – Overview (Semi-conservative mechanism, Semi-discontinuousmode,Origin &Propagation ofreplicationfork)

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

c. Translation– Initiation, Elongation and Termination

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

UNIT-V: EVOLUTION

5.1 Origin of life

5.2 Theories of Evolution: Lamarckism, Darwinism, Germ Plasm Theory, Mutation Theory

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

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

CO-CURRICULAR ACTIVITIES (Suggested):

- Model of animal cell
- Working model of mitochondria to encourage creativity among students
- Photo album of scientists of cell biology
- Charts on plasma membrane models/cell organelles
- Observation of Mendelian / Non-Mendelian inheritance in the plants of college botanicalgardenor local villageasastudentstudy projectactivity
- Observation of blood group inheritance in students, from their parents and grand parents
- Karyo typing and preparation of pedigree charts for identifying diseases in family history
- Charts on chromosomal disorders
- Charts on central dogma/lacoperon/ genetic code
- Modelofsemi-conservativemodelofDNAreplication
- ModelofRNAandtranslationmechanism
- Powerpoint presentationof transcription or any other topic bystudents
- Drawgeologicaltimescaleandhighlightimportanteventsalongthetimeline
- 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:

1. Lodish, Berk, Zipursky, Matsudaria, Baltimore, Darnell„ Molecular Cell Biology' W.H.Free man and company New York.
2. Cell Biology by DeRobertis
3. Bruce Alberts, Molecular Biology of the Cell
4. Rastogi, Cytology
5. Varma & Aggarwal, CellBiology
6. C.B.Pawar,CellBiology
7. Gardner,E.J.,Simmons,M.J.,Snustad,D.P.(2008).PrinciplesofGenetics.VIIIEdition.WileyIndia .
8. Snustad,D.P.,Simmons,M.J.(2009).PrinciplesofGenetics.VEdition.JohnWileyandSonsInc.
9. Klug,W.S.,Cummings,M.R.,Spencer,C.A.(2012).ConceptsofGenetics.XEdition.BenjaminCu mmings.
10. Russell,P.J.(2009).Genetics-A Molecular Approach. III Edition. Benjamin Cummings.
11. Griffiths,A.J.F.,Wessler,S.R.,Lewontin,R.C.andCarroll,S.B.Introduction to Genetic Analysis. IXEdition. W. H. Freeman andCo.
12. Ridley,M.(2004).Evolution.III Edition. Blackwell Publishing
13. Molecular Biology by freifielder
14. Instant Notes in Molecular Biology by Bios scientific publishers and Viva Books Private Limited
15. Hall,B.K.andHallgrimsson,B.(2008).Evolution.IVEdition.JonesandBartlettPublishers
16. Campbell, N.A. and ReeceJ.B. (2011). Biology. IX Edition, Pearson, Benjamin, Cummings.
17. Douglas,J.Futuyma(1997). EvolutionaryBiology.SinauerAssociates.
18. Minkoff,E.(1983).EvolutionaryBiology.Addison-Wesley.
19. JamesD. Watson,NancyH.Hopkins „MolecularBiologyoftheGene'
20. JanM. Savage. Evolution, 2nded, Oxford and IBH Publishing Co., New Delhi.
21. Gupta P.K.,„ Genetics.

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

III SEMESTER **ZOOLOGY** Time:2 hrs/week

Z 3553 (2) **CELL BIOLOGY, GENETICS, MOLECULAR BIOLOGY AND EVOLUTION**

w.e.f. 20-21 ("AH") **PRACTICAL SYLLABUS** MARKS:50

LEARNING OBJECTIVES: To enable the students to

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

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

- CO1. Examine and differentiate various types of cells and their structure.
- CO2. Observe the various stagesof mitotic divisions by using microscopy technique.
- CO3. Solve various genetic problems related to sex-linked inheritance and blood grouping.
- CO4. Identify and summarise chromosomal abnormalities
- CO5. Compare and contrast homologous and analogous organs with reference to their evolutionary origin.

I. CELLBIOLOGY:

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

II. GENETICS:

1. Study of Mendelian inheritance using suitable examples and problems
2. Problems on blood group inheritance and sex linked inheritance
3. Study of human abnormal karyo types (Down's syndrome, Edwards, syndrome, Patausyndrome,Turner's syndrome and Klinefeltersyndrome)

III. EVOLUTION:

1. Study of fossil evidences
2. Study of homology and analogy from suitable specimens and pictures
3. Evolution of Man with pictures
4. Phylogeny of horse with pictures
5. Study of Genetic Drift by using examples of Darwin's finches(pictures)
6. Visit to any Zoological Museum/park /sanctuary and submission of report.

REFERENCEBOOKS:

1. Burns GW. 1972. The Science of Genetics. An Introduction to Heredity. Mac MillanPubl.Co.Inc.
2. Gardner EF.1975.Principlesof Genetics. John Wiley& Sons, Inc.New York.
3. Harth and Jones EW. 1998. Genetics – Principles and Analysis. Jones and BarHettPubl. Boston.
4. LevineL.1969.BiologyoftheGene.Toppan.
5. Pedder IJ.1972. Genetics asaBasicGuide.W.Norton &Company,Inc.
6. Rastogi VB. 1991. A Text Book of Genetics.KedarNath Ram Nath Publications, Meerut, Uttar Pradesh, India.
7. Rastogi VB. 1991. Organic Evolution. Kedar Nath Ram Nath Publications, Meerut, Uttar Pradesh, India.
8. StahlFW.1965.MechanicsofInheritance.Prentice-Hall.
9. WhiteMJD.1973. Animal Cytology and Evolution. Cambridge Univ. Press

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

IVSEMESTER **ZOOLOGY** TIME:5HRS/WEEK

Z 4503 (3) **ANIMAL PHYSIOLOGY, CELLULAR METABOLISM AND EMBRYOLOGY** MAX. MARKS:100

w.e.f. 2020-2021 (20AH) **SYLLABUS**

LEARNING OBJECTIVES: To enable the students to

- Understand the various aspects of physiological systems and their functioning in animals.
- Instill the concept of hormonal regulation of physiology, metabolism and reproduction in animals.
- Gain insight on the disorders associated with the deficiency of hormones
- Gaininsightfulknowledgeonthestructureandclassificationofcarbohydrates,proteins, lipids and enzymes
- Demonstrate an understanding of fundamental biochemical principles such as the function of biomolecules, metabolic pathways and the regulation of biochemical processes.
- Gain comprehensive knowledge on the concepts of vertebrate embryonic development.

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

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

CO2 Gain insight into the muscular system and the neuro -endocrine regulation of animal growth, development and metabolism with a special knowledge of hormonal control of human reproduction.

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

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

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

UNIT I ANIMALPHYSIOLOGY -I

1.1 Process of digestion and assimilation

1.2 Respiration - Pulmonary ventilation, transport of oxygen and CO_2 (Note: Need not study cellular respiration here)

1.3 Circulation-Structure and functioning of heart, Cardiac cycle

1.4 Excretion - Structure and functions of kidney urine formation, counter current Mechanism

UNIT II ANIMALPHYSIOLOGY-II

2.1 Nerve impulse transmission –Resting membrane potential, origin and propagation of action potentials along myelinated and non-myelinated nerve fibers, Synaptic transmission.

2.2 Muscle contraction - Ultra structure of skeletal muscle, molecular and chemical basis of muscle contraction.

2.3 Endocrine glands - Structure, functions of hormones of pituitary, thyroid, parathyroid, adrenal glands and pancreas

2.4 Hormonal control of reproduction in a mammal

UNIT III CELLULARMETABOLISM–I (BIOMOLECULES)

3.1 Carbohydrates-Classification of carbohydrates. Structure of glucose

3.2 Proteins-Classification of proteins. General properties of amino acids

3.3 Lipids-Classification of lipids

3.4 Enzymes: Classification and Mechanism of Action

UNIT IV CELLULARMETABOLISM –II

4.1 Carbohydrate Metabolism - Glycolysis, Krebs cycle, Electron Transport Chain,Glycogen metabolism, Gluconeo genesis

4.2 Lipid Metabolism–β-oxidation of palmitic acid

4.3 Protein metabolism-Transamination, Deamination and Urea Cycle

UNIT–V EMBRYOLOGY

5.1 Gametogenesis

5.2 Fertilization

5.3 Typesofeggs

5.4 Typesofcleavages

5.5DevelopmentofFrog upto formation of primary germlayers

CO-CURRICULAR ACTIVITIES (SUGGESTED):

- Charton cardiac cycle, human lung, kidney / nephron structure etc.
- Working modelof human/any mammali an heart.
- Chart of sarcomere /location of endocrine glands in human body
- Chart affixing of photos of people suffering from hormonal disorders
- Student study projects such as identification of incidence of hormonal disorders in the local primary health centre, studying the reasons there of and measures to curbor any other as the lecturer feels good in nurturing health awareness among students
- Charton structures of biomolecules / types of amino acids (essential land non-essential) Chart preparation by students on Glycolysis / kreb "scycle / urea cycle etc.
- Model of electron transport chain
- Preparation of models of different types of eggs in animals
- Charton frog embryonic development, fate map of frog blastula, cleavage etc.

REFERENCE BOOKS:

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

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

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

Z 4554 (2) **IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY** MAX.MARKS:50

w.e.f. 2020-2021 (20AH) **PRACTICALS**

LEARNING OBJECTIVES: To enable the students to

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

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

CO1: Identify and demonstrate the understanding different lymphoid organs.
CO2: Acquire skills in determination of different immunological test like blood group, Rh typing.
CO3: Acquire skills in careful handling of glass ware and maintaining laboratory equipments.
CO4: Explain the function of autoclave and importance of sterilization.
CO5: Able to summarize the separation of compounds using paper chromatography
CO6: Apply standardized procedures using safety measures in the laboratory.

I. IMMUNOLOGY

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

II. ANIMALBIOTECHNOLOGY

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

REFERENCE BOOKS

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

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

Four Year – B.Sc. (Hons), Semester – VII

ZOOLOGY

HUMAN HEALTH AND INFECTIOUS DISEASES

TIME:4HRS/WEEK

Code: Z 7501(3) **Max Marks:100**

- **Learning Objectives**: Enable the students to

1. Develop an understanding of the pathogenesis, transmission, and life cycle of various infectious agents, including bacteria, viruses, fungi, and protozoa.
2. Gain insights into the epidemiology of major infectious diseases.
3. Acquire Knowledge about the Sexually transmitted diseases.
4. Understand the transmission mechanism and the immune response.
5. Learn the importance of prevention, control, and surveillance measures to minimize disease burden.

Learning Outcomes:

Students will be able to:

1. Develop an overview of the pathophysiology of infectious diseases.
2. Apply the knowledge of pathogenesis, transmission, and epidemiology to identify and differentiate between various infectious agents, their life cycles, and modes of spread.
3. Understand the broader public health implications of infectious diseases, recognizing their significance in shaping healthcare policies and strategies.
4. Critically analyze the interaction between infectious agents, their hosts, and the environment, considering factors that contribute to disease emergence, transmission, and potential outbreaks.
5. Summarize the anti-retroviral therapy of viral diseases.

- **Syllabus**

Unit-1

1.1 Introduction to Infectious Diseases:

1.2 Basic concepts in pathophysiology of infectious diseases

1.3 Outline of physiological mechanisms leading to diseased state, Infectious disease transmission, Infection and immunity, Acute and Chronic Infections Major infectious and non-infectious diseases in Humans with two examples.

Unit-2: Bacterial Infections

2.1 Pathogenesis, mechanisms of pathogenesis; transmission, epidemiology, public health implications, diagnosis, prophylaxis and treatment of major human infections **-Tuberculosis**

2.2 Pathogenesis, mechanisms of pathogenesis; transmission, epidemiology, public health implications, diagnosis, prophylaxis and treatment of major human infections- **Cholera**

2.3 Pathogenesis, mechanisms of pathogenesis; transmission, epidemiology, public health implications, diagnosis, prophylaxis and treatment of major human infections - **Typhoid.**

Unit-3: Viral Diseases

3.1 Pathogenesis, mechanisms of pathogenesis; transmission, life cycle, epidemiology, public health implications, diagnosis, prophylaxis and anti-retroviral therapy of Human immunodeficiency virus (HIV/AIDS)

3.2 Pathogenesis, mechanisms of pathogenesis; transmission, life cycle, epidemiology, public health implications, diagnosis, prophylaxis and anti-retroviral therapy of Sexually transmitteddiseases Gonorrhea and Herpes.

Unit-4: Fungal Diseases

4.1 Pathogenesis, mechanisms of pathogenesis; transmission, life cycle, epidemiology, public health implications, diagnosis, prophylaxis and treatment of major Fungal human pathogens- Dermatophytes

4.2 Pathogenesis, mechanisms of pathogenesis; transmission, life cycle, epidemiology, public health implications, diagnosis, prophylaxis and treatment of major Fungal human pathogens: -Candida

4.3 Pathogenesis, mechanisms of pathogenesis; transmission, life cycle, epidemiology, public health implications, diagnosis, prophylaxis and treatment of major Fungal human pathogens: -Aspergillus

Unit-5: Protozoan Diseases

5.1 Pathogenesis, mechanisms of pathogenesis; transmission, life cycle, epidemiology, public health implications, diagnosis, prophylaxis and treatment of Protozoan human pathogen- *Trypanosoma.*

5.2 Pathogenesis, mechanisms of pathogenesis; transmission, life cycle, epidemiology, public health implications, diagnosis, prophylaxis and treatment of Protozoan human pathogen- *Giardia intestinalis*.

5.3 Pathogenesis, mechanisms of pathogenesis; transmission, life cycle, epidemiology, public health implications, diagnosis, prophylaxis and treatment of Protozoan human pathogen- *Leishmania* donovani.

Reference Books

1. Environmental Microbiology, Pepper, I. L., Gerba, C. P. and Gentry, T. J. (2015), 3rdedition, Academia Press, Elsevier
2. Textbook of Environmental Microbiology, Mohapatra, P. K. (2008), I.K. International(P)Ltd.
    a. Basic Biotechnology, Ratledge, C. and Kristiansen, B. (2003), 2nd edition, CambridgeUniversity Press
3. Pocket Guide to Bacterial Infections – K. Balamurugan and Prithika Udayakumar (2019).CRC Press.

Recommended activities

- Report preparation on community health
- Awareness on Viral diseases in the Student Community
- Collect paper clippings related to human health and discuss in the class
- Visit to PHC and know about TB treatment and HIV treatment and collect pamphlets and charts

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

Four Year – B.Sc. (Hons), Semester – VII

ZOOLOGY

BIODIVERSITY AND SYSTEMATICS

Code: Z 7502(3)

TIME:4HRS/WEEK
Max Marks:100

Learning Objectives:

Enable the students to

1. Develop a comprehensive understanding of biodiversity, its definition, significance, and distribution at global, national, and local levels.
2. Gain insights into the biogeographic realms of the world and biogeographic zones of India.
3. Comprehend the conservation strategies.
4. Analyze the causes of biodiversity loss and extinction, including anthropogenic impacts.
5. Be familiar with the concepts of systematics.
6. Be familiar with the traditional and modern taxonomical methods.

Learning Outcomes:

Students will be able to:

1. Develop an overview of the concept of biodiversity, its global and local significance, and the diverse patterns it exhibits across different geographical scales.
2. Understand the biogeographic realms, zones, and hotspots, and recognize the interplay between geographical factors and species distribution.
3. Comprehend the components of biodiversity – species diversity, genetic diversity, and ecosystem diversity – and appreciate their roles in maintaining ecological balance.
4. Gain insight into the threats to biodiversity and strategies of conservation.
5. Acquire knowledge on systematics, taxonomy and its components.

I. Syllabus

UNIT-1

1.1 Biodiversity: Definition and significance; biodiversity at global, national and local levels; magnitude and distribution of biodiversity.
1.2 Patterns of biodiversity: Latitudinal and altitudinal gradients; species area relationship.
1.3 Biogeographic realms of the world.

UNIT-2

2.1 Biogeographic zones of India and faunal diversity; Hotspots in the world and in India.
2.2 Hierarchical components of biodiversity: Species diversity, genetic diversity and ecosystem diversity.
2.3 Biodiversity values: Direct values and indirect values.

UNIT-3

3.1 Biodiversity in peril: Causes of biodiversity losses and extinction; anthropogenic impact on biodiversity.
3.2 Biodiversity and biotechnology: DNA based wildlife forensics; genetically modified organisms and Bioremediation.
3.3 Biodiversity management and conservation

UNIT – 4

4.1 IUCN classification of wildlife.
4.2 Biodiversity threats; In-situ conservation and Ex-situ conservation. Gene banks; conservation of genetic resource; cryopreservation, Endemic sps.
4.3 Wildlife protection acts; organizations involved in protection of Biodiversity.

UNIT – 5

5.1 Systematics: Species concept. Taxonomy and its components –classification and phylogeny, cladistic classification.
5.2 Identification: Keys, biodiversity documentation, species identification and identification tools.Nomenclature: International Code of Zoological Nomenclature (ICZN);
5.3 Types: Holotype, Paratype, Neotype, Lectotype, Syntype, Homonymy and Synonymy.Molecular taxonomy: DNA fingerprinting.

II. Text Books

- Prabodh K. Maiti and Paulami Maiti. 2011. Biodiversity: Perception, Peril and Preservation.
- Saharia VV. 1982.Wildlife in India.Natraco Publishers, Dehradun.
- TandonRK.1999. Biodiversity, Taxonomy & Ecology. Prithipal singh Scientific Publishers, Jodhpur.

III. Reference Books

- Agarwal KC. 1998. Biodiversity. India.
- International Code of Zoological Nomenclature. 1985. Third edition adopted by XX General assembly of the International Union of Biological Sciences, University of California Press, Berkeley and Los Angeles Edition.
- Kormondy EJ. 1996. Concepts of Ecology. Eastern Economy Edition.
- Oliver S & Owen Mc. Natural Resource Conservation: An Ecological Approach. Macmillan Publ. Co. New York.
- Peggy I. Fieldler and Perer M. Kareiva. 1997. Conservation Biology.

IV. Recommended Activities

- Preparation of Biodiversity chart of India
- Preparation of Local area Biodiversity chart

- Visit to BMC at village level
- Acquittance/Awareness on Peoples Biodiversity Register of the local area
- Visit to near by Zoo/ Sanctuary/National park/wetland/Mangrove/sea shore/river and observe fauna and take photos
- Take photos of birds/butterflys/moths/insects/fish..etc of your area.
- Prepare Fauna book of your village
- Celebrate World Biodiversity Day May 22

UNIT – 5

5.3 Systematics: Species concept. Taxonomy and its components –classification and phylogeny, cladistic classification.

5.4 Identification: Keys, biodiversity documentation, species identification and identification tools.Nomenclature: International Code of Zoological Nomenclature(ICZN);

5.5 Types: Holotype, Paratype, Neotype, Lectotype, Syntype, Homonymy and Synonymy.Molecular taxonomy: DNA fingerprinting.

V. Text Books

- Prabodh K. Maiti and Paulami Maiti. 2011. Biodiversity: Perception, Peril andPreservation.
- Saharia VV. 1982.Wildlife in India.Natraco Publishers, Dehradun.
- TandonRK.1999. Biodiversity, Taxonomy & Ecology. Prithipal singh ScientificPublishers, Jodhpur.

VI. Reference Books

- Agarwal KC. 1998. Biodiversity. India.
- International Code of Zoological Nomenclature. 1985. Third edition adopted by XXGeneral assembly of the International Union of Biological Sciences, University of California Press, Berkeley and Los Angeles Edition.
- Kormondy EJ. 1996. Concepts of Ecology. Eastern Economy Edition.
- Oliver S & Owen Mc. Natural Resource Conservation: An Ecological Approach.Macmillan Publ. Co. New York.
- Peggy I. Fieldler and Perer M. Kareiva. 1997. Conservation Biology.

VII. Recommended Activities

- Preparation of Biodiversity chart of India
- Preparation of Local area Biodiversity chart
- Visit to BMC at village level
- Acquittance/Awareness on Peoples Biodiversity Register of the local area
- Visit to near by Zoo/ Sanctuary/National park/wetland/Mangrove/sea shore/river andobserve fauna and take photos
- Take photos of birds/butterflys/moths/insects/fish..etc of your area.
- Prepare Fauna book of your village
- Celebrate World Biodiversity Day May 22

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

Four Year – B.Sc. (Hons), Semester – VII

ZOOLOGY

WILD LIFE AND CONSERVATION BIOLOGY

Code: Z 7503(3)

Time:4HRS/WEEK
Max Marks:100

Learning Objectives:

Enable the Students to

1. Understand the diverse wildlife wealth of India, recognize threatened species, and gain insight into wildlife conservation approaches.
2. Comprehend the concepts of protected areas such as National Parks, Sanctuaries, and Biosphere Reserves, and their core-buffer structures.
3. Understand the management of wildlife and conservation strategies.
4. Gain knowledge about the National and international efforts and organizations for conservation of wildlife.
5. To acquire knowledge on human-wildlife interactions and strategies to mitigate conflicts.

Learning Outcomes:

Students will be able to:

1. Develop an overview of India's wildlife diversity and the significance of wildlife conservation and management for ecological balance.
2. Gain insights into the factors leading to wildlife depletion and able to assess various approaches to wildlife conservation.
3. Comprehend the concepts of protected areas, including National Parks, Sanctuaries, and Biosphere Reserves.
4. Gain insight/ summarize the policies and laws in wildlife management.
5. Develop empathy towards animals.

I. Syllabus

Unit 1

1.1Wildlife in India- Wildlife wealth of India & threatened wildlife.
1.2 Reasons for wildlife depletion in India. Wildlife conservation approaches and limitations. National and State mammals and birds of India.
1.3 Wild life Habitat- Protected Area concept: National Parks, Sanctuaries and Biosphere Reserves, cores and Buffers, Nodes and corridors. Community Reserve and conservation Reserves.

Unit 2

2.1 Management of Wildlife- Red Data Book and Conservation status (endangered, vulnerable, rare, threatened and near threatened species)-definitions.

2.2 Distribution, status. Habitat utilization pattern, threats to survival of Slender Loris, Musk deer, Great Indian Bustard, Olive Ridley turtle.

2.3 Wild life Trade & legislation- Assessment, documentation, Prevention of trade. Policies and laws in Wild life management (national) and ethics.

Unit 3

3.1 Biodiversity extinction and conservation approaches- Perspectives and Expressions. Identification and prioritization of Ecologically sensitive area (ESA). Coarse filter and fine filter approaches. Regional and National approaches for biodiversity conservation.

3.2 Theory and analysis of Conservation of populations- Stochastic perturbations - Environmental, Demographic, spatial and genetic stochasticity.

3.3 Population viability analysis-conceptual foundation, uses of PVA models.

Unit 4

4.1 National and International efforts for conservation- Information on CITES, IUCN, CBD

4.2 International agreements for conserving marine life. Convention on wetlands of International Importance (Ramsar convention). Important projects for the conservation of endangered species in India (Project Tiger, Project Elephant, Gir Lion, Project Deer, Sea turtle project).

4.3 Human impact on Terrestrial and Aquatic resources. Conservation of invertebrates with special reference to corals and butterflies. Overview of conservation of Forest &Grassland resources

Unit 5

5.1 Human – wildlife interactions

5.2 Strategies to reduce human-wildlife interactions

5.3 Role of Government and NGOs in controlling human-wildlife interactions Socio-economic issues related to human-wildlife interactions.

II. Reference Books

- M. Kato. The Biology of Biodiversity, Springer.
- J.C. Avise. Molecular Markers, Natural History and Evolution, Chapman & Hall, New York.
- E.O. Wilson. Biodiversity, Academic Press, Washington.
- G.G. Simpson. Principle of animal taxonomy, Oxford IBH Publishing Company.
- E. Mayer. Elements of Taxonomy.
- E.O. Wilson. The Diversity of Life (The College Edition), W.W. Northem & Co.
- B.K. Tikadar. Threatened Animals of India, ZSI Publication, Calcutta.

III. Suggested activities:

Visit to nearby biosphere reserve/Sanctury/National Park/ Sea Shore/Zoo

Visit to local Ramsar site and report preparation with pics

Celebrate World wetland Day February 2nd

Celebrate World Wildlife Day March 3rd

Celebrate World Sparrow Day March 20th

Celebrate Wildlife week from October 1st to October 7- Conduct Quiz, photo-exhibition, essay writing competitions ..to create awareness among students and public.

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

Four Year – B.Sc. (Hons), Semester – VII

Zoology

(Skill Enhancement Course- Aquaculture)

HATCHERY TECHNOLOGY IN AQUATIC ORGANISMS

Code: Z 7504(3) **Time:4hrs/week**

Max Marks:100

LEARNING OBJECTIVES: Enable the students

- To Gain knowledge about the importance of hatchery technology & hatchery operations.
- To Acquire knowledge in shrimp hatchery establishment and management
- To gain knowledge in seed production of crustaceans and Molluscs.
- Evaluate emerging trends and future directions in hatchery technology.
- To understand the importance of SPR & SPF seed.

LEARNING OUTCOMES: Students will be able to

- Gain knowledge of the construction and management of hatcheries.
- Summarise the brood stock management.
- Learn the essential criteria for hatchery design & management.
- Describe the various stages during operation of a hatchery
- Recognize the importance & necessity of hatchery system in aquaculture.

I. SYLLABUS

UNIT-1: INTRODUCTION TO HATCHERY TECHNOLOGY

1.1 Importance of hatchery technology in aquaculture
1.2 History and development of hatchery technology
1.3 Types of fish hatcheries.

UNIT-2 FISHES HATCHERY ESTABLISHMENT AND MANAGEMENT

2.1 Site selection, Facility design and construction
2.2 Broodstock management, Spawning induction-methods
2.3 Egg incubation, Larval rearing, Fry rearing, Grow-out production
2.4 Disease prevention and management, Record keeping

UNIT-3: SHRIMP HATCHERY ESTABLISHMENT AND MANAGEMENT

3.1. Site selection; Operation and management of maturation section.
3.2. Operation and management of larval section; Operation and management of postlarval section.
3.3. Live feed culture system (Artemia & Microalgae), Hatchery seawater filtration & treatment (Sand filtration, UV treatment, Ozone treatment).

UNIT-4: SEED PRODUCTION OF CRUSTACEANS AND MOLLUSCS

4.1. Seed production, seed packaging & transport and nursery rearing of Penaeus vannamei and Macrobrachium rosenbergii.
4.2 Hatchery operations of pearl oysters
4.3 Hatchery operations of lobster.

UNIT-5 ADVANCES IN HATCHERY TECHNOLOGY

5.1 Automated and computer-controlled systems in aquaculture hatcheries
5.2 Biotechnology and genetics in hatcheries- disease management, Quarantine methods, Production of SPF & SPR feed.
5.3 Emerging trends and future directions of hatcheries- Sustainable practices,

Alternative species and systems, Traceability and transparency, collaboration andpartnerships

II. REFERENCE BOOKS

- Hatchery Management by B. C. Rath
- Aquaculture: Farming Aquatic Animals and Plants by John S. Lucas and Paul C.Southgate
- Fish Hatchery Management by Frank W. Wheaton and David L. Keller
- Principles of Fishery Science by R. J. Welcomme
- Hatchery Technology for Tropical Species by Patrick Lavens and Patrick Sorgeloos
- Fish Hatchery Management, Second Edition by Gary Wedemeyer
- Aquaculture Engineering by Odd-Ivar Lekang
- Introduction to Aquaculture by J. R. Tomasso

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

Four Year – B.Sc. (Hons), Semester – VII

ZOOLOGY

(Skill Enhancement Course -Aquaculture)

FISH NUTRITION AND FEED TECHNOLOGY

Code: Z 7505 (3) **Time:4hrs/week**
Max Marks:100

LEARNING OBJECTIVES:

Enable the students to

- To understand the nutritional requirements for different stages of cultivable fish and prawns.
- To Gain knowledge about different forms of feeds and feeding methods of cultivable fish and prawns.
- To Suggest about different ingredients used for feed manufacturing.
- To study about Feed formulation and storage methods
- To analyze different feed additives & non-nutrient ingredients used in feedpreparation.

LEARNING OUTCOMES

By the successful completion of the course the students shall be able to

- Gain knowledge about the nutritional requirements for different stages of cultivable fish and prawns.
- List the different forms of feeds and feeding methods of cultivable fish andprawns.
- Identify different ingredients used for feed manufacturing.
- Select the feed ingredients and their selection and Feed formulation.
- Gain knowledge about different nutritional deficiency diseases in cultivable fish.

SYLLABUS

UNIT-1: NUTRITIONAL REQUIREMENTS OF CULTIVABLE FISH

1.1 Requirements for energy, proteins, carbohydrates, lipids, fiber, micronutrients fordifferent stages of cultivable fish and prawns

1.2 Essential amino acids and fatty acids, protein to energy ratio, nutrient interactions andprotein sparing effect

1.3 Dietary sources of energy, effect of ration on growth, determination of feeding rate,check tray

1.4 Factors affecting energy partitioning and feeding

UNIT-2: FORMS OF FEEDS & FEEDING METHODS

2.1 Feed conversion efficiency, feed conversion ratio and protein efficiency ratio

2.2 Wet feeds, moist feeds, dry feeds, mashes, pelleted feeds, floating and sinking pellets,advantages of pelletization

2.3 Manual feeding, demand feeders, automatic feeders, surface spraying, bag feeding andtray feeding

2.4 Frequency of feeding.

UNIT-3: FEED MANUFACTURE & STORAGE

3.1 Feed ingredients and their selection, nutrient composition and nutrient availability of feedingredients

3.2 Feed formulation – extrusion processing and steam pelleting, grinding, mixing anddrying, palletization, and packing

3.3 Water stability of feeds, farm made aqua feeds, micro-coated feeds, micro-encapsulatedfeeds and micro-bound diets

3.4 Microbial, insect and rodent damage of feed, chemical spoilage during storage period andproper storage methods, aflatoxins testing.

UNIT-4: FEED ADDITIVES & NON-NUTRIENT INGREDIENTS

4.1 Binders, anti-oxidants, probiotics

4.2 Feed attractants and feed stimulants

4.3 Enzymes, hormones, growth promoters and pigments

4.4 Anti-metabolites and fiber

UNIT-5 NUTRITIONAL DEFICIENCY IN CULTIVABLE FISH

5.1 Protein deficiency, vitamin and mineral deficiency symptoms

5.2 Nutritional pathology and ant-nutrients

5.3 Importance of natural and supplementary feeds, balanced diet

REFERENCE BOOKS

1. Fish Nutrition, Third Edition by John E. Halver and Ronald W. Hardy
2. Fish Feeding in Aquaculture by David G. Allan
3. Aquafeed Formulation by Sergio F. Nates
4. Nutrient Requirements and Feeding of Finfish for Aquaculture by Carl D. Websterand Chhorn Lim
5. Fish Nutrition by Chhorn Lim and Carl D. Webster
6. Fish Feed Technology, Second Edition by C. Venkataramanaiah
7. Fish Nutrition and Feed Technology by A.K. Datta, N. Gupta, and D.K. De
8. Aquafeed Technology by N. Rajendran and N. Gopalakrishnan
9. Aquaculture Nutrition: Gut Health, Probiotics and Prebiotics by S.K. Nayak, J.Mukherjee, and S. Prusty
10. Fish Feed Preparation and Management by K. Santhanam and S. Viswanathan
11. Fish Nutrition and Feed Technology: A Practical Approach by K. Gopakumar and R.Shankar
12. Aquatic Animal Nutrition: Principles and Practices by N. Gupta and D.K. De

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

Four Year – B.Sc. (Hons), Semester – VII

ZOOLOGY

HUMAN HEALTH AND INFECTIOUS DISEASES

Code: Z 7551(2) **Practical** **TIME:2HRS/WEEK**

Max Marks:50

Learning Objectives:

Enable the students to

1. Develop a comprehensive understanding of the epidemiological aspects of a wide range of infectious diseases, including their prevalence, incidence, distribution, and risk factors, supported by visual aids such as images and photographs.
2. Compare and contrast the epidemiological characteristics of different infectious diseases, using visual aids.
3. Evaluate the health implications of each infectious disease, utilizing visual representations to control strategies at local levels.

Learning Outcomes:

Students will be able to:

1. Develop an overview of the infectious diseases in the community.
2. Identify diseases with the help of visual aids, including images, photographs, maps, and graphs.
3. Compare and contrast the characteristics of different infectious diseases, critically evaluating factors such as transmission dynamics, geographical distribution, and the socio-economic impact on affected populations.
4. Gain insights into the epidemiology of various bacterial,viral, fungal and protozoan diseases.

I. Syllabus

Epidemiology of following infectious diseases with the images/photographs:

1. Tuberculosis
2. Cholera
3. Typhoid.
4. Human immunodeficiency virus (HIV/AIDS)
5. Sexually transmitted diseases.
6. Dermatophytes
7. Candida
8. Aspergillus
9. *Trypanosoma.*
10. *Giardia intestinalis,*
11. *Leishmania donovani*

II. Web resources for Lab

a. https://pubmed.ncbi.nlm.nih.gov/15520481/
b. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9279679/

ST. JOSEPH'S COLLEGE FOR WOMEN (A), VISAKHAPATNAM
Four Year – B.Sc. (Hons), Semester – VII
ZOOLOGY

BIODIVERSITY AND SYSTEMATICS

TIME:2HRS/WEEK

Code: Z 7552(2) **Practical**

Max. Marks- 50

Learning Objectives:
Enable the students to:

1. Develop proficiency in creating maps that illustrate biodiversity distribution, emphasizing key features and patterns within specific areas.
2. Gain knowledge on the diverse fauna & Compile a comprehensive list of both invertebrate and vertebrate species found within a designated region, showcasing understanding of local fauna diversity.
3. Acquire the ability to prepare reports on activities related to Biodiversity Management Committees (BMC).

Learning Outcomes:

Students will be able to:

1. Develop the ability to create accurate maps that visually represent biodiversity distribution.
2. Acquire skills in identifying and listing both invertebrate and vertebrate species within a specific area, showcasing a comprehensive understanding of local fauna diversity.
3. Gain insights into the diverse fauna present in man-made ecosystems.
4. Learn how to effectively prepare reports documenting Biodiversity Management Committee (BMC) activities, demonstrating clear communication of conservation efforts.

I. Syllabus

1. Biodiversity- Map Preparation
2. List of local fauna (invertebrates and vertebrates).
3. Faunal diversity of man-made ecosystem.
4. Report preparation on the BMC Activities
5. Preparation of Peoples Biodiversity Register at a given site
6. Using photographs / paintings / coloured drawings identify and study distribution andecological role of common bivalves and gastropods that occur along a sea-shore.

II. Web resources for the Lab

- http://biodiversitylab.ncbs.res.in/home

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

Four Year – B.Sc. (Hons), Semester – VII

ZOOLOGY

WILD LIFE AND CONSERVATION BIOLOGY

Practical **Time:2hrs/week**

Code: Z 7553(2) **Max Marks:50**

LEARNING OBJECTIVES:

Enable the students to

- Acquire skill in identifying the various biomes.
- Study and gain knowledge of animal architecture.
- To learn about endangered species of Indian sub-continent & suggest conservation measures.
- To compare and interpret sonograms of bird calls.

LEARNING OUTCOMES:

- Develop skill in observation of animals, their characteristic species.
- Able to identify the endangered species of Indian sub-continent.
- Identify major biomes & outline their characters.
- Map the major sanctuaries/ national parks.

Syllabus

1. Using photographs / paintings / coloured drawings identify and study ecological roleof characteristic animal species (major representative species only) of various Biomes.
2. Study of animal architecture (photographs / diagram / abandoned specimen) ; Hive ofhoney bee, nest of COURSE wasp, nest of potter wasp, Mount of termite, Nests of Weaver Bird and tailor bird.
3. Endangered species of Indian sub-continent
4. Compare and interpret given sonograms of bird calls (any two e.g. Courtship calls,Alarm calls or distress calls)
5. On a phytogeographic map of India locate & demarcate major sanctuaries / nationalparks

Web resources for lab https://www.naturepl.com/pictures/pdfs/NPL_Architecture.pdf
https://youtu.be/31PWjb7Do1s

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

Four Year – B.Sc. (Hons), Semester – VII

Zoology

(Skill Enhancement Course – Aquaculture)

HATCHERY TECHNOLOGY IN AQUATIC ORGANISMS

Code: Z 7554(2) **Time:2hrs/week**

Practical **Max. Marks- 50**

LEARNING OBJECTIVES: Enable the students to

- To gain skill in larval rearing, including water quality management,feeding and nutrition, and disease prevention and management.
- To acquire knowledge in juvenile rearing, including nursery systems, feeding and nutrition, and disease prevention and management.
- Understand the importance of high-quality seed and methods of stocking.
- To learn about brood-stock management, including selection, breeding

LEARNING OUTCOMES

By the successful completion of the course the student shall be able to –

- To demonstrate knowledge different phases in larval rearing, feeding and nutrition, and disease management.
- Identify the larval stages of shrimp.
- To develop high-quality seed and stock them in aquatic environments.
- Gain knowledge on sustainable practices in hatchery management.

SYLLABUS

1. Culture of Rotifers
2. Culture of Artemia
3. Culture & Enumeration of Microalgae.
4. Estimation of ammonia levels, salinity, DO, PH, Total alkalinity using a water testing kit.
5. Study on different types of tanks used in fish/shrimp hatchery.
6. Study on types of pumps, filters and aeration systems used in fish/shrimp hatchery
7. Slides of larval stages- Stages of Nauplius, Zoea, Mysis, PL-13, Egg of shrimp and fish.
8. Study on biosecurity measures and waste management in the hatchery at your vicinity

REFERENCE BOOKS

- Aquaculture Principles and Practices: Fishing News Books Series by T. V. R. Pillayand M. N. Kutty

- Hatchery Culture of Marine Finfishes: A Practical Guide by K. Nagabhushanam
- Manual of Fish Culture: Hatchery Methods and Management by P. V. Dehadrai
- Aquaculture Engineering by Odd-Ivar Lekang
- Introduction to Aquaculture by J. R. Tomasso
- Hatchery Management Guide for Fish and Shellfish Producers by J. A. Hargreaves
- Aquaculture: Farming Aquatic Animals and Plants by John S. Lucas and Paul C.Southgate
- Fish Hatchery Management by Frank W. Wheaton and David L. Keller

CO-CURRICULAR ACTIVITIES

- Visit to local hatcheries to gain practical experience on different techniques andmethods used in hatchery technology.
- Inviting guest speakers who are experts in the field of hatchery technology
- Workshops to teach students how to handle fish, water quality monitoring, feedpreparation.
- Competitions related to hatchery technology, such as fish breeding competitions oraquaponics competitions.
- Internships in hatcheries can provide students with hands-on experience

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

Four Year – B.Sc. (Hons), Semester – VII

ZOOLOGY

(Skill Enhancement Course -Aquaculture)

FISH NUTRITION AND FEED TECHNOLOGY

Time:2hrs/week

Code: Z 7555(2) **Practical** **Max Marks:50**

LEARNING OBJECTIVES

Enable the students to

- To acquire skill in estimation of different ingredients in the aqua feeds..
- Analyze and evaluate different binders used in feed preparation.
- Understand the need and care for storage of aqua feed.
- Skill in identification of physical characteristics of floating and sinking feeds.

LEARNING OUTCOMES

By the successful completion of the course the students shall be able to –

- Gain skill in identification of proteins, carbohydrates and lipids.
- Formulate feeds using various ingredients.
- Gain information on methods of feed storage.
- Analyze and evaluate different binders used in feed preparation.

SYLLABUS

1. Estimation of protein content in aquaculture feeds
2. Estimation of carbohydrate content in aquaculture feeds
3. Estimation of lipid content in aquaculture feeds
4. Estimation of ash in aquaculture feed
5. Study of water stability of pellet feeds
6. Feed formulation and preparation in the lab
7. Study of binders used in aquaculture feeds
8. Study of feed packing materials
9. Study of physical and chemical change during storage
10. Study on physical characteristics of floating and sinking feeds

REFERENCE BOOKS

1. Fish nutrition. Academic press, San diego, Halver Jr 1989
2. Nutrition and feeding of fishes, Chapmann & Hall, New York Lovell rt 1998.
3. Fish Nutrition and Feed Technology by A.K. Datta, N. Gupta, and D.K. De
4. Aquafeed Technology by N. Rajendran and N. Gopalakrishnan
5. Aquaculture Nutrition: Gut Health, Probiotics and Prebiotics by S.K. Nayak, J.Mukherjee, and S. Prusty
6. Fish Feed Preparation and Management by K. Santhanam and S.

Viswanathan
7. Fish Nutrition and Feed Technology: A Practical Approach by K. Gopakumar and R.Shankar
8. Aquatic Animal Nutrition: Principles and Practices by N. Gupta and D.K. De

CO-CURRICULAR ACTIVITIES

- Field visits to nearest feed production plant.
- Visit to a farm for studying feeding practices
- Guest lectures by industry experts and researchers in the field
- Formulating and producing their own fish feed
- Evaluating and analyzing different types of fish feed and supplements.

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ST. JOSEPH'S COLLEGE FOR WOMEN (A), VISAKHAPATNAM
Four Year – B.Sc. (Hons), Semester – VIII
ZOOLOGY

ENVIRONMENT BIOLOGY AND ENVIRONMENT PHYSIOLOGY

Time:4 hrs/week
Max. Marks-100

Code: Z 8501(3)

Learning objectives: Enable the students to

- Gain knowledge about the structure and components of the ecosystem
- Comprehend the dynamics of Ecosystem
- Understand the importance of adaptations in animals to different environments.
- Summarize the effects of environmental stress and stress physiology

Learning outcomes: students should be able to

- Gain knowledge of the structure and Components of Ecosystem
- Understand the Community dynamics
- Know the natural resources and their conservation
- Outline the basic concepts of Stress physiology
- Understand the importance of yoga and meditation in combating stress.

I. Syllabus

UNIT- 1

1.1 Structure and components of ecosystem. Types and functions of ecosystem. Ecologicalmodeling. Limiting factors
1.2 Energy flow, food chain, food web and trophic levels, ecological pyramids. Ecologicalsuccession
1.3 Biogeochemical cycles: water cycle, carbon, oxygen and nitrogen cycles.

UNIT-2

2.1 Population dynamics- Dynamics of population growth. Factors that increase or decreasepopulation.
2.2 Community dynamics- Characteristics and composition- Development and classificationof communities.
2.3 Renewable and non-renewable resources: Forest, water and mineral resources.Conservation of energy sources.

UNIT-3

3.1 Levels of adaptation. - Mechanisms of adaptation.
3.2. Adaptations to different environments. Terrestrial (arboreal, cursorial, fossorial, polar, Desert etc, Aerial, Aquatic (Pelagic, hadal).
3.3 Adaptations to different environments. Polar, Deep-Sea Environment-Wet land.

UNIT-4

4.1 Stress Physiology - Basic concepts of environmental stress and strain, Concept of elasticand plastic strain.
4.2. Stress avoidance, stress tolerance and stress resistance. Acclimatization.
4.3 Endothermic and physiological mechanism of regulation of body temperature.

UNIT-5

5.1 Stress physiology in different conditions
5.2 Physiological response to oxygen deficient stress. Physiological response to body exercise.
5.3 Effect of meditation and yoga

II. Suggested Text books

FUNDAMENTALS OF ECOLOGY Odum P.

III. Reference Books

- ECOLOGY with special reference to animal & man S. Charles, Kendeigh Prentice hall of India Pvt. Ltd. New Delhi
- ELEMENTS OF TROPICAL ECOLOGY- Yanney Ewusie (English language Book Society, Heine mann educational book publication)
- ANIMAL PHYSIOLOGY, MECHANISM AND ADAPTATION - Eckert, R., W,H, Freeman and Co.
- BIOCHEMICAL ADAPTATION- Hochachka, P.W, and Somero S.N, Princeton, New Jersey
- ANIMAL PHYSIOLOGY: ADAPTATION AND ENVIRONMENT. - Schiemidt Nielsen, Cambridge
- GENERAL & COMPARATIVE ANIMAL PHYSIOLOGY Hoar W.S. Princeton Hall of India

IV. Suggested activities

- Case study Meditation and yoga
- Collection of specimens from various environments

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UNIT-5

5.4 Stress physiology in different conditions
5.5 Physiological response to oxygen deficient stress.Physiological response to body exercise.
5.6 Effect of meditation and yoga

V. Suggested Text books

FUNDAMENTALS OF ECOLOGY Odum P.

VI. Reference Books

- ECOLOGY with special reference to animal& man S. Charles, Kendeigh Prentice hall ofIndia Pvt. Ltd. New Delhi
- ELEMENTS OF TROPICAL ECOLOGY- Yanney Ewusie (English language Book Society,Heine mann educational book publication)
- ANIMAL PHYSIOLOGY, MECHANISM AND ADAPTATION - Eckert, R., W,H, Freemanand Co.
- BIOCHEMICAL ADAPTATION- Hochachka, P.W, and Somero S.N, Princeton, New Jersey

- ANIMAL PHYSIOLOGY: ADAPTATION AND ENVIRONMENT. - Schiemidt Nielsen,Cambridge
- GENERAL & COMPARATIVE ANIMAL PHYSIOLOGY Hoar W.S. Princeton Hall ofIndia

VII. Suggested activities

- Case study Meditation and yoga
- Collection of specimens from various environments

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

Four Year – B.Sc. (Hons), Semester – VIII

ZOOLOGY

ANIMAL BEHAVIOUR AND CHRONOBIOLOGY

Code: Z 8502(3) **Time:4hrs/week**

Max. Marks-100

- **Learning objectives:** Enable the students to
- Gain knowledge on the patterns of behaviour.
- Understand / recognize social behaviour & sexual behaviour.
- Discuss the significance of biological clocks.
- Summarize the importance of various biological rhythm in nature.

- **Learning outcomes:** students will be able to
- Understand the concepts of ethology.
- Acquaint with the patterns of animal behaviour.
- Observe the adaptations in various animals.
- Develop an overview of the principles of chronobiology.

- **SYLLABUS**

UNIT-1

1.1 Introduction to Animal Behaviour
1.2 Origin and history of Ethology; Brief profiles of Karl Von Frish, Ivan Pavlov, KonradLorenz, Niko Tinbergen
1.3 Proximate and ultimate causes of behaviour Methods and recording of a behaviour

UNIT 2: **Patterns of Behaviour**

2.1 Stereotyped Behaviours (Orientation, Reflexes)
2.2 Individual Behavioural patterns; Instinct vs. Learnt Behaviour
2.3 Associative learning, classical and operant conditioning, Habituation, Imprinting.
2.4 Animal Bonds (parent-parent, Parent-Child) etc.

UNIT 3: Social and Sexual Behaviour

3.1 Social Behaviour: Concept of Society; Communication and the senses
3.2 Altruism; Insects' society with Honey bee as example; Foraging in honey bee andadvantages of the waggle dance.
3.3 Sexual Behaviour: Asymmetry of sex, Sexual dimorphism, Mate choice, Intra-sexualselection (male rivalry), Inter-sexual selection (female choice), Sexual conflict in parental care.

UNIT 4: Introduction to Chronobiology

4.1 Historical developments in chronobiology; Biological oscillation: the concept ofAverage, amplitude, phase and period.

4.2 Adaptive significance of biological clocks

4.3 Relevance of biological clocks; Chrono pharmacology, Chrono medicine,Chronotherapy.

UNIT 5: Biological Rhythm

5.1 Types and characteristics of biological rhythms: Short- and Long- term rhythms; Circadianrhythms; Tidal rhythms and Lunar rhythms

5.2 Concept of synchronization and masking; Photic and non-photic zeitgebers

5.3 Circannual rhythms; Photoperiod and regulation seasonal reproduction of vertebrates; Role ofmelatonin and serotonin.

- **Text Books**
- **Reference Books**

- David McFarland, Animal Behaviour, Pitman Publishing Limited, London, UK.
- Manning, A. and Dawkins, M. S, An Introduction to Animal Behaviour, Cambridge,University Press, UK.
- John Alcock, Animal Behaviour, Sinauer Associate Inc., USA.
- Paul W. Sherman and John Alcock, Exploring Animal Behaviour, Sinauer AssociateInc., Massachusetts, USA.
- Chronobiology Biological Timekeeping: Jay. C. Dunlap, Jennifer. J. Loros, Patricia J.De Coursey (ed). 2004, Sinauer Associates, Inc. Publishers, Sunderland, MA, USA
- Insect Clocks D.S. Saunders, C.G.H. Steel, X., Afopoulou (ed.) R.D. Lewis. (3rdEd)2002 Barens and Noble Inc. New York, USA
- Biological Rhythms: Vinod Kumar (2002) Narosa Publishing House, Delhi/ Springer-Verlag, Germany.

- **Suggested activities**
- Observation – recording of behavior pattern of pet animals /animals in thecommunity
- Observation of behavioural changes in Honey bees

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ST. JOSEPH'S COLLEGE FOR WOMEN (A), VISAKHAPATNAM
Four Year – B.Sc. (Hons), Semester – VIII
ZOOLOGY

BIOSYSTEMATICS & TAXONOMY
Code: Z 8503(3)

Max. Marks- 100
Time:4hrs/week

Learning objectives:

Enable the students to

- Obtain knowledge on the basic concepts of biosystematics & taxonomy.
- Learn about the trends in biosystematics.
- Know about species Concept.
- Gain knowledge on conservation of biodiversity.
- Learn about taxonomic procedures, keys & ICZN.

Learning Outcomes:

students shall be able to

- Classify animals on the basis of their relation to other animals by body structure,external characters, development and DNA.
- Apply the International rules of nomenclature to give a scientific name to animalswhich are found during research.
- Understand the gradual development and evolutionary history of different kinds ofliving organisms from earlier forms over several generations
- Understand and demonstrate various animals, biodiversity and related indices

I. Syllabus

UNIT-1

1.1 Definition and basic concepts of Biosystematics and taxonomy
1.2 Historical resume of systematic Stages in taxonomy
1.3 Importance of taxonomy Aims and tasks of a taxonomist

UNIT-2

2.1 Treads in Biosystematics-concepts of different conventional and newer aspects- Ecotaxomony-Behavioural taxonomy- Cytotaxonomy- Biochemical taxonomy- Numerical taxonomy, and Molecular taxonomy.
2.2 Dimension of speciation and species concept- Typological species concept-Biological speciesconcept.

UNIT-3

3.1 Evolutionary species concept- Polytypic & monotypic species, subspecies, infraspecific groups,super species and other kind of species.

3.2 Concept of zoological classification - Theories of biological classification Kinds & Component ofclassification-Phyletic Lineages-Linnaean hierarchy

UNIT-4

4. 1Taxonomic collections, methods & data recording-Collecting ways and data collection

4.2 Preservation of collected material and curating-Methods of identification and problemsencountered in identification

4.3 Taxonomic characters and taxonomic keys Preparation of taxonomic publication and taxonomicpaper.

UNIT-5

5.1 Zoological Nomenclature- International code of Zoological Nomenclature (ICZN)

5.2 Operative principles and important rules of nomenclature- Important Latin words & abbreviationsand Linnaean Signs.

II. Reference Books:

- M.Kato. The Biology of Biodiversity. Springer.
- E.O. Wilson, biodiversity. Academic Press, Washington.
- G.G. Simpson, Principle of animal taxonomy. Oxford IBH Publishing company.
- E. Mayer. Elements of Taxonomy. Oxford IBH Publishing company.
- E.O. Wilson. The diversity of Life (The College edition W.W. Northem & Co.
- B.K. Tikadar. Threatened Animal of India, ZSI publication Calcutta
- V.C. Kapoor. Theory and Practice of Animal Taxonomy. Oxford & IBH Publishing Co.
- J.c. Avise, Molecular Markers, Natural History and Evolution, Chapman & Hall, New York.

III. Suggested Activities:

- Project work on the Taxonomic key – with reference to local species
- Take photos of at least 20 varieties of butterflies from your mobile and observe them carefully and describe each species. Observe their size, colour of the wings,spots on the wings, colour pattern on the wings, number of colours on wings .
- Take photo of different Birds and try to identify them

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

Four Year – B.Sc. (Hons), Semester – VIII
ZOOLOGY
SKILL ENHANCEMENT COURSE (AQUACULTURE)

MARICULTURE

Code: Z 8504(3) **Time:4hrs/week**
Max. Marks-100

I. LEARNING Objectives:

Enable the students to

- Acquire knowledge about site selection & practices in Mariculture
- Evaluate the environment impact assessment and management.
- Develop insight into the design and construction of mariculture systems
- Understand the various steps involved in culture of Mud crab, Mussel etc.
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Learning Objectives:

By the successful completion of the course the students shall be able to –

- Understand the basic principles and objectives of mariculture.
- Learn the techniques of site selection and preparation for mariculture.
- Summarise the types of culture systems used in mariculture.
- Develop insight into the culture aspects of fin fish and crustaceans in mariculture.
- Understand the culture aspects of mussel farming, pearl oysters and seaweeds of mariculture.

SYLLABUS

UNIT-I:

1.1 Definition, history and scope of mariculture
1.2 Principles and objectives of mariculture
1.3 Status of mariculture in India.

UNIT-II:

2.1 Factors affecting site selection for mariculture
2.2 Techniques for site preparation
2.3 Environmental impact assessment and management

UNIT-III:

3.1 Types of mariculture systems: open sea culture, closed system, land-based tanks, and cages
3.2 Design and construction of mariculture systems (cages, pens, rafts)
3.3 Water quality monitoring in mariculture systems

UNIT-IV:

4.1 Culture of Grey mullets, Milk fish, Asian seabass, groupers.

4.2 Culture of Crustaceans- Mud crab

UNIT-V:

5.1 Mussel farming

5.2 Culture of abalone

5.3 Culture of seaweeds

II. REFERENCE BOOKS

1. Mariculture: Principles and Practices by John A. Hargreaves and James E. McVey
2. Aquaculture: Farming Aquatic Animals and Plants by John S. Lucas and Paul C. Southgate
3. Aquaculture Engineering by Odd-*Ivar Lekang*
4. Handbook of Mariculture: Aquaculture of Bivalve Molluscs by John W. Castello and C. D. D. Tacon
5. Marine Aquaculture: Opportunities for Growth by National Research Council
6. Aquaculture Production Systems by James E. McVey
7. Mariculture: Principles and Practices by B. Madhusoodana Kurup and K. K. Vijayan.
8. Marine Aquaculture: Principles and Practices by N. P. Kurup and K. K. Vijayan.
9. Marine Fisheries and Mariculture by R. B. Simha and S. S. Mishra.
10. Handbook of Fisheries and Aquaculture by B. C. Mahapatra.
11. Fishery Science and Aquaculture: Principles and Practices by R. K. Singh and P. C. Thomas.
12. Mariculture and Aquaculture Engineering by K. R. Gupta.

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

Four Year – B.Sc. (Hons), Semester – VIII

ZOOLOGY

SKILL ENHANCEMENT COURSE (AQUACULTURE)

ORNAMENTAL FISHERY

Code: Z 8505(3) **Time:4hrs/week**

Max. Marks-100

Learning Objectives: Enable the students to

- Gain knowledge about the basics of ornamental fishery.
- Apply proper management practices for water quality, disease prevention, and health management in ornamental fish farming
- Develop insight on the commercial production of ornamental fishes
- Acquire skill in setting up and management of an Aquarium.

Learning Outcomes:

By the successful completion of the course the student shall able to –

- Understand the basics of ornamental fishery and types of ornamental fishes.
- Summarize about marine & fresh water ornamental fishes' habitats, feeds and breeding units.
- Understand the principles of ornamental fish production techniques
- Apply proper management practices for water quality, disease prevention, and healthmanagement in ornamental fish farming
- Gain knowledge about the commercial production of aquarium fishes and plants.

II. SYLLABUS

UNIT-I: INTRODUCTION

1-1 Aquarium and ornamental fishes – introduction
1-2 Present status of Aquarium trade in the world and India
1-3 Aquarium accessories – aerators, filters, lighters and heaters
1-4 Water quality needs and different kinds of feeds

UNIT-II: FRESH WATER ORNAMENTAL FISHES

2-1 Live bearers, gold fish, koi, gourami, barbs abd tetras, angel fish and cichlid fish
2-2 Brood stock development, breeding, larval rearing and grow out
2-3 Larval feeds and feeding

UNIT- III: MARINE ORNAMENTAL FISHES

3-1 Varieties and habitat of marine ornamental fishes -
Sea goldy, Sea Horse, white tail dasylus, Yellow box fish

3-2 major marine ornamental fish
resources of India
3-3 Breeding of marine ornamental fish

3-4 Other aquarium animals – sea anemones, lobsters, eel, shrimps, octopus, starfish and turtle.

UNIT IV: AQUARIUM MANAGEMENT

4-1 Setting up fresh water, marine and reef aquariums
4-2 Water quality management for different types of
aquariums 4-3 Common diseases of aquarium fish,
diagnosis and treatment
4-4 Collection and transportation of live fish, use of anaesthetics, Temperature acclimatization and oxygen packing for aquarium fish

UNIT V: COMMERCIAL PRODUCTION OF AQUARIUM FISH AND PLANTS

5-1 Commercial production units of ornamental fish- requirements and design
5-2 Commercial production of ornamental fishes
5-3 Mass culture of aquarium plants
5-4 Retail marketing, economics and export of ornamental fish.

III. REFERENCE BOOKS

1. Jameson JD and Santhanan R 1996. Manual of ornamental fishes and farmingtechnologies, Fisheries College and research institute, Tuticorn
2. Stephen Spotte 1993. Marine aquarium keeping. John wiley and sons, USA
3. Dick Mills 1998. Aquarium fishes, Dorling Kindersly Ltd, London
4. Van Ramshort JD 1978. The complete aquarium encyclopaedia, Elseveir
5. Ornamental Fish Production and Management by A. K. Roy and N. K. Barman
6. Ornamental Fish Farming by F. C. Thomas and R. S. Liew
7. Ornamental Fish Culture and Aquarium Management by B. S. Bisht

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

Four Year – B.Sc. (Hons), Semester – VIII

ZOOLOGY

ENVIRONMENT BIOLOGY AND ENVIRONMENT PHYSIOLOGY

Practical **Time: 2hrs/week**

Code:Z 8551(2) Max. Marks-50

I. **Learning objectives:** Enable the students to

- Gain knowledge on the effect of toxicity in the fish.
- Adaptive modification in species.
- Conduct tests on water & soil analysis ideal for their growth.

Learning outcomes: Students should be able to

- Observe the opercular activity of a model fish
- Explain the adaptations in various animals.
- Comprehend the effects of toxicity tests.

Syllabus

1. Study of the effects of starvation / surfacing prevention on opercular activity in a teleostfish
2. Study of effect of fluoride toxicity on muscle protein in a fish.
3. Study of changes in chromatophores in fish kept against white and black backgrounds.
4. Toxicity test (LC 50)
5. Adaptive modification of feet or claws in birds.
6. Adaptive modification in mouth parts of insects.
7. Analysis of soil and water. (Fresh water-pond, river), Sea water – PH, Conductivity, NPK (Soil).
8. Study of biogeochemical cycles by way of models.

Visit to some natural habitats and man made habitats to study the human impact onenvironment.

Water analysis for fresh and waste water.

II. **Lab web resources:**

https://sites.google.com/site/cynthiajdowns/teaching https://www.scientistcindy.com/environmental-biology-laboratory.html

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

Four Year – B.Sc. (Hons), Semester – VIII

ZOOLOGY

ANIMAL BEHAVIOUR AND CHRONOBIOLOGY

Practical **Time:2hrs/week**

Code: Z 8552(2) **Max. Marks-50**

I. Learning objectives: Enable the students to

- Develop skills in observing the behavioural responses.
- Understand the geotaxis behavioural patterns
- Apply skill construction of actogram.

- **Learning outcomes:**
- Describe the various patterns of behaviour
- Demonstrate competence in reporting and oral presentation of the practical experiments.
- Explain analysis of behaviour (ethogram).

II. Syllabus

To study nests and nesting habits of the birds and social insects.

1. To study the behavioral responses of wood lice to dry and humid conditions.
2. To study geotaxis behaviour in earthworm.
3. To study the phototaxis behaviour in insect larvae.
4. Visit to Forest/ Wild life Sanctuary/Biodiversity Park/Zoological Park to studybehavioral activities of animals and prepare a short report.
5. Study and actogram construction of locomotor activity of suitable animal models.
6. Study of circadian functions in humans (daily eating, sleep and temperature patterns). Jetlag (graphical pattern).

III. Lab resources:

Biological Rhythms: Vinod Kumar (2002) Narosa Publishing House, Delhi/ SpringerVerlag, Germany.

- https://ccb.ucsd.edu/the-bioclock-studio/education-resources/basics/part2.html

https://ccb.ucsd.edu/the-bioclock-studio/education-resources/basics/index.html

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

Four Year – B.Sc. (Hons), Semester – VIII
ZOOLOGY

BIOSYSTEMATICS & TAXONOMY

Code: Z 8553(2) **Practical**
Time:2hrs/week

Max. Marks-50

Learning objectives:
Enable the students to

- Acquire knowledge about the about the assessment of biodiversity.
- Interpret the effects of climate on the biodiversity of the area.
- Be familiar with the collection and preservation techniques.

Learning Outcomes:

- Assess the Biosystematics and taxonomy at local area
- Understand the climate influence on the Taxonomic diversity
- Be able to follow suitable preservation techniques after collection.

II. Syllabus

1. Composition assessment of the taxonomic diversity / biodiversity in a habitat (e.g. grassland, arid land, wet land, etc.). – Detailed report
2. Influence of climatic conditions on taxonomic diversity in a given habitat.
3. Preparation of models showing the status of certain taxa or species in a particular habitat -project
4. Collection and preservation techniques
5. Taxidermi-Definition and methods (reptiles, birds and mammals)

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

Four Year – B.Sc. (Hons), Semester – VIII

ZOOLOGY

SKILL ENHANCEMENT COURSE (AQUACULTURE)

MARICULTURE

Code:Z 8554(2) **PRACTICAL**

Time :2hrs/week

Max marks:50

Learning Objectives: Enable the students to

- Identify the characters of cultivable finfish
- Understand the importance of monitoring the water quality parameters suitable for mariculture
- Gain knowledge in identifying the important sea weeds and their uses.

Learning Outcomes:

- Acquire Skill in water quality monitoring for mariculture systems
- Develop Skill in identification and characters of different marine cultivable fin fishes,
- Identify cultivable shrimps and crabs
- Gain Skill in identification and characters of different marine cultivable seaweeds

I. SYLLABUS

1. Techniques for water quality monitoring- Physico chemical parameters.
2. Identification of cultivable finfish-
   Mugil cephalus, Chanos chanos, Lates calcarifer,Cromileptes altivelis, Epinephelus areolatus.
3. Identification of cultivable shrimps and crabs-
   Penaeus indicus, Penaeus merguiensis, Penaeus monodon, Penaeaus vannamei, Scylla serrata, Scylla tranquibarica.
4. Identification of important bivalves- *Crossostrea madrasensis, Pinctada fucata, Pernaviridis, Perna indica, Anadara granosa*.
5. Identification of seaweeds Ulva, Sargassum, Gelidiella, Gracilaria, Hypnae

II. REFERENCE BOOKS

1. Marine Aquaculture: Opportunities for Growth edited by Sandra Shumway and GaryLoveridge
2. Seaweeds: Edible, Available, and Sustainable edited by Ole G. Mouritsen and Jonas DrotnerMouritsen
3. Marine Shrimp Culture: Principles and Practices by James M. Wyban

4. Mariculture: Principles and Practices by John A. Hargreaves and James E. McVey
5. Handbook of Mariculture: Aquaculture of Bivalve Molluscs by John W. Castello and C. D. D. Tacon
6. Marine Aquaculture: Opportunities for Growth by National Research Council
7. Mariculture: Principles and Practices by B. Madhusoodana Kurup and K. K. Vijayan.
8. Marine Fisheries and Mariculture by R. B. Simha and S. S. Mishra.
9. Handbook of Fisheries and Aquaculture by B. C. Mahapatra.
10. Mariculture and Aquaculture Engineering by K. R. Gupta.

III. CO-CURRICULAR ACTIVITIES

- Visit to a mariculture farm to observe site selection and practical techniques
- Interactions with industry experts
- Attending/ Conducting Seminars and workshops on mariculture
- Participate in mariculture-related competitions and quizzes

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

Four Year – B.Sc. (Hons), Semester – VIII
ZOOLOGY
SKILL ENHANCEMENT COURSE (AQUACULTURE)

ORNAMENTAL FISHERY
Practical

Code: Z 8555(2) **Time: 2hrs/week**
Max. Marks-50

OBJECTIVES: Enable the students to

- Develop skill on commercial production of ornamental fishes
- Understand the importance of aerators and their significance
- Gain knowledge in Aquarium keeping

LEARNING OUTCOMES

- Skill in identification of different types of aerators and their usages
- Skill in using different methods of water circulation methods in aquarium
- Skill in identification of aquarium plants, marine aquarium fishes, fresh water aquariumfishes and breeding of egg layers and live bearers.

II. SYLLABUS

1. Study of aerators – types and structures
2. Water circulation methods in aquarium and filtration
3. Collection and identification of aquarium plants
4. Identification of common marine aquarium fishes
5. Identification of common fresh water aquarium fishes
6. Common diseases of Aquarium fishes.
7. Breeding of egg layers
8. Breeding of live bearers
9. Evaluation of significance of aquaria for commercial and domestic use

III. REFERENCE BOOKS

1. Ornamental Fish Farming: Principles, Procedures, and Practices" by P.K. Panda and A.K.Jana
2. "Handbook of Ornamental Fish" by Dr. D. D. Sharma and Dr. M. N. Bhat
3. "Ornamental Fishes and Aquatic Invertebrates: Self-Assessment Color Review" by ChrisAndrews and Adrian Exell
4. "Ornamental Fishes and Aquatic Plants" by Dr. B. C. Jana
5. "Ornamental Fish Culture and Aquarium Management" by K. Gopalakrishnan and K. K.Vijayan

IV. CO-CURRICULAR ACTIVITIES

1. Visit to ornamental fish farms
2. Guest lectures by experts in the field
3. Participation in ornamental fish shows and exhibitions
4. Conducting water quality tests and monitoring parameters
5. Participating in a business plan competition for an ornamental fish farm.

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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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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 SanitationinprocessingplantsEnvironmentalhygieneandPersonalhygieneinprocessingplants.

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: 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
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

- Describe and place the invertebrates according to their taxonomic position
- Be versatile in identification of museum specimens
- Reinforcing the basic laboratory skills including microscopy, and careful observation.
- Develop insight about 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: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 to hemichordates.

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

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

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, economic importance of vermicompost
4.3 Arthropoda General characters and classification up to classes with suitable examples
4.4 *Peripatus* - Structure and affinities

UNIT – V:

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

Co-curricular activities (suggested)

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

REFERENCE BOOKS:

- L.H. Hyman „*The Invertebrates' Vol I, II and V*. – M.C. Graw Hill Company Ltd.Kotpal, R.L. 1988 - 1992 Protozoa, Porifera, Coelenterata, Helminthes, Arthropoda, Mollusca,Echinodermata. Rastogi Publications, Meerut.
- E.L. Jordan and P.S. Verma „*Invertebrate Zoology'* S. Chand and Company.
- R.D. Barnes „*Invertebrate Zoology'* by: W.B. Saunders CO., 1986.
- Barrington. E.J.W., „*Invertebrate structure and Function'* by ELBS.
- P.S. Dhami and J.K. Dhami. Invertebrate Zoology. S. Chand and Co. New Delhi.
- Parker, T.J. and Haswell„*A text book of Zoology'* by, W.A., Mac Millan Co.London.
- Barnes, R.D. (1982). *Invertebrate Zoology*, V Edition"

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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:

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

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

SYLLABUS:

UNIT – I Cell Biology-I

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

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 on observing different phases of cell division by experimentation.
- Develop skills on identification of salivary gland chromosomes.
- Be able to perform physiology experiments using standard protocol.

- **LEARNING OUTCOMES**
- Observe the various stages of mitotic divisions by using microscopy technique.
- Perform physiology experiments following standard protocol.
- Examine and be able to differentiate the different phases of cell division.

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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