

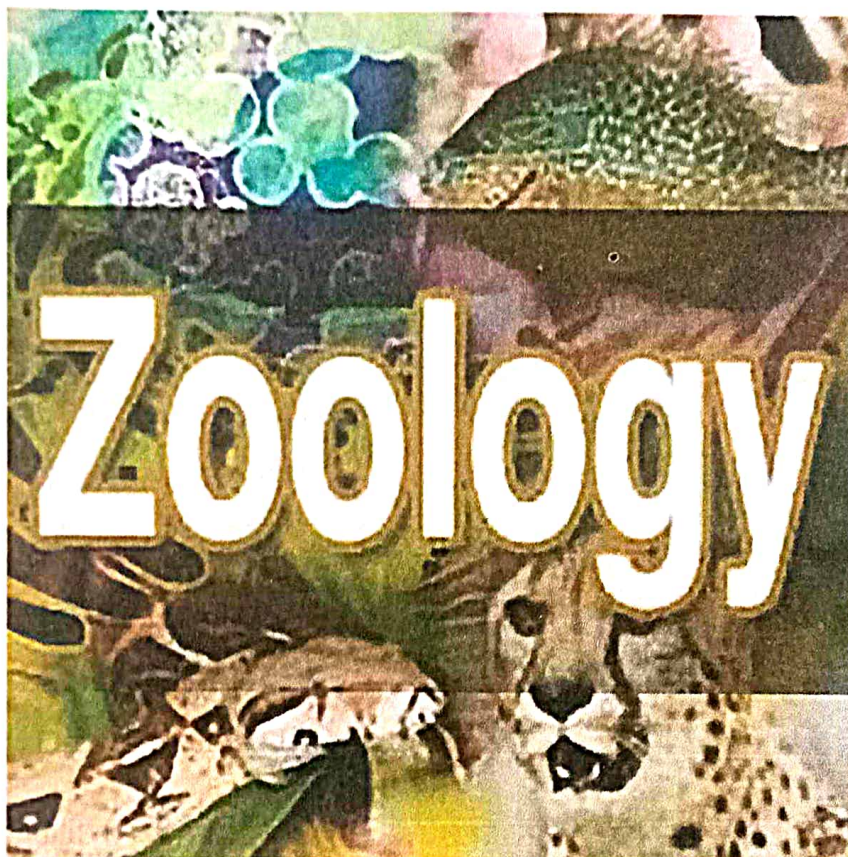


DODLA KOUSALYAMMA GOVERNMENT COLLEGE FOR WOMEN

Nellore, Andhra Pradesh - 524003

Autonomous College, College with Potential For Excellence

Re-accredited with 'A' Grade by UAC



BOARD OF STUDIES

2018-2019

DEPARTMENT OF ZOOLOGY

D.K.GOV.T.DEGREE COLLEGE (AUTONOMOUS), NELLORE

ZOOLOGY MODIFIED SYLLABUS FOR I SEMESTER

ZOOLOGY - PAPER - I

ANIMAL DIVERSITY - NONCHORDATES

Periods:60

1.4 Brief history, Significance of Diversity of Non Chordates
UNIT - I

1.5 Protozoa

1.2.1 General characters

1.2.2 Classification of Protozoa up to classes with examples

1.2.3 *Elphidium* (type study)

1.6 Porifera

1.3.6 General characters

1.3.7 Classification of Porifera up to classes with examples

1.3.8 *Sycon* – External Characters, Types of cells,

1.3.9 Skelton in Sponges

1.3.10 Canal system in sponges

Unit - II

2.3 Coelenterata

2.1.1 General characters

2.1.2 Classification of Coelenterata up to classes with examples

2.1.3 Polymorphism in coelenterates

2.1.4 Corals and types of corals

2.4 Platyhelminthes

2.1.1 General characters

2.1.2 Classification of Platyhelminthes upto classes with examples

2.1.3 *Fasciola hepatica* - External Characters, Excretory system, Reproductive System, Life History and pathogenicity

Unit - III

3.3 Nematelminthes

3.1.1 General characters

3.1.2 Classification of Nematelminthes up to classes with examples

3.4 Annelida

3.2.3 General characters

3.2.4 Classification of Annelida up to classes with examples, Metamerism and its significance in Annelids.

3.2.3 *Hirudinaria granulosa* - External Characters, Digestive System, Excretory System and Reproductive System.

3.2.4 Vermiculture - Scope, significance, earthworm species, processing. Vermicompost Economic importance of Vermicomposting

Unit - IV

4.3 Arthropoda

4.1.1 General characters

4.1.2 Classification of Arthropoda up to classes with examples

4.1.3 Prawn - External Characters, Appendages.

4.1.4 *Peripatus* - Structure and affinities

4.4 Mollusca

4.2.5 General characters

4.2.6 Classification of Mollusca up to classes with examples

4.2.7 Pearl formation in Pelecypoda, Torsion in Gastropods

4.2.8 Pila- External Structure, Digestive system

Unit - V

5.3 Echinodermata

5.1.1 General characters

5.1.2 Classification of Echinodermata up to classes with examples

5.1.3 Water vascular system in star fish

5.4 Hemichordata

5.2.4 General characters

5.2.5 *Balanoglossus* - Structure and affinities

5.4 Non-Chordata larval forms

5.3.1 Trochophore

5.3.2 Nauplius

5.3.3 Glochidium

5.3.4 Bipinnaria

D.K.GOV'T.DEGREE COLLEGE (AUTONOMOUS), NELLORE
ZOOLOGY MODIFIED SYLLABUS FOR II SEMESTER
ZOOLOGY - PAPER - II
ANIMAL DIVERSITY - CHORDATES

Unit - I

- 1.1 General characters of Chordata
- 1.2 Protochordata
 - a. Salient features of Cephalochordata
 - b. Structure of *Branchiostoma*
 - c. Salient features of Urochordata
 - d. Structure and life history of *Herdmania*
 - e. Retrogressive metamorphosis in *Herdmania*

Unit - II

- 2.3 Cyclostomata
 - 2.1.1 General characters of Cyclostomata
 - 2.1.2 Comparison of the *Petromyzon* and *Myxine*
- 2.4 Pisces
 - 2.2.3 General characters of Fishes
 - 2.2.4 Classification of fishes up to Class level with examples
 - 2.2.3 *Scoliodon* - External features, Respiratory system, Heart.
 - 2.2.7 Migration in Fishes
 - 2.2.8 Types of Scales
 - 2.2.9 Dipnoi

Unit - III

- 3.3 Amphibia
 - 3.1.1 General characters of Amphibian
 - 3.1.2 Classification of Amphibia upto orders with examples.
 - 3.1.3 *Rana hexadactyla* - External features, Digestive system, Respiratory system, Heart.
 - 3.1.4 Parental care in Amphibia.
- 3.4 Reptilia
 - 3.2.5 General characters of Reptilia
 - 3.2.6 Classification of Reptilia upto orders with examples
 - 3.2.7 Calotes - External features, Digestive system, Respiratory system, Heart, Brain
 - 3.2.8 Identification of Poisonous snakes and Non Poisonous snakes
 - 3.2.9 Poison apparatus, composition of Venom and its effects. Biting mechanism in snakes

Unit - IV

4.2 Aves

4.1.1 General characters of Aves

4.1.2 Classification of Aves up to subclasses with examples.

4.1.3 *Columba livia* - External features, Digestive system, Respiratory system, Heart, Brain

4.1.6 Flight adaptation in birds

Unit - V

5.4 Mammalia

5.1.1 General characters of Mammalia

5.1.2 Classification of Mammalia up to classes with examples

5.5 Dentition in mammals, Origin of mammals

REFERENCES:

- Invertebrate Zoology - E. L. Jordan and Verma
- Modern text book of Zoology-Invertebrates- R. L. Kotpal
- Biology of Animals Vol-1- Ganguly, Sinha, Adhikari
- Zoology for degree students- Dr. V.K. Agarwal
- Modern text book of Zoology-Vertebrates - R. L. Kotpal

D.K.Govt. (A) Women's Degree College
ZOOLOGY REVISED SYLLABUS FOR III SEMESTER

ZOOLOGY - PAPER - III
CYTOLOGY, GENETICS AND EVOLUTION

Unit - I

1. Cytology– I

- 1.1 Definition, history, prokaryotic and eukaryotic cells, virus's characters and classification.
- 1.2 Electron microscopic structure of eukaryotic cell.
- 1.3 Plasma membrane – Fluid mosaic model (Singer & Nicholson 1972), Chemical composition of Plasma membrane, Functions of Plasma membrane: Exocytosis, Endocytosis, Phagocytosis, Pinocytosis, Active and Passive Transport.

Unit – II

2. Cell organelles

- 2.1 Structure and functions of Endoplasmic Reticulum
- 2.2 Structure and functions of Golgi apparatus
- 2.3 Structure and functions of Lysosomes
- 2.4 Structure and functions of Ribosomes
- 2.5 Structure and functions of Mitochondria
- 2.6 Structure and functions Nucleus
- 2.7 Chromosomes - Structure, types, functions

Unit - III

3. Genetics

- 3.1 Principles of inheritance, DiHybrid cross.
- 3.2 Incomplete dominance and Co- dominance
- 3.3 Lethal alleles, Epistasis- Dominant and Recessive ,Pleiotropy,Multiple Alleles(ABO Blood Grouping)

Unit – IV

4. Genetics – II

4.1 Sex determination – Chromosomal mechanisms-XX-XO, XX-XY, ZZ-ZW type, Genic balance theory of Bridges, Dosage compensation in Man.

4.2 Sex linked inheritance- Eye colour in Drosophila, Haemophilia, and Colour blindness in Man.

4.3 Extra chromosomal inheritance

4.4 Human karyotyping

Unit-V

5. Evolution

5.1 Major events in History of life- Geological Time Chart

5.2 Lamarckism, Darwinism, Neo – Darwinism, Hardy-Weinberg Equilibrium.

5.3 Mutations, Variations, Isolating mechanisms, natural selection

5.4 Types of natural selection (directional, stabilizing, disruptive)

5.5 Modes of Speciation (Allopatric and Sympatric)

5.6 Evidences of Evolution- Homologous and Analogous Organs.

D. K. GOVT. DEGREE COLLEGE FOR WOMEN (A), NELLORE.

ZOOLOGY MODIFIED SYLLABUS FOR IV SEMESTER

EMBRYOLOGY, PHYSIOLOGY AND ECOLOGY

Unit - I

1. Developmental Biology and Embryology

- 1.1 Gametogenesis (Spermatogenesis and Oogenesis)
- 1.2 Fertilization
- 1.3 Types of eggs
- 1.4 Types of cleavages
- 1.5 Formation and functions of Foetal membrane in chick embryo
- 1.6 Development, types and functions of Placenta in mammals

Unit - II

2. Physiology - I

- 2.1 Elementary study of process of digestion and absorption.
- 2.2 Respiration – Pulmonary ventilation, Transport of oxygen and carbon dioxide
- 2.3 Circulation - Structure and functioning of heart, Cardiac cycle
- 2.4 Excretion - Structure of nephron, urine formation, counter current mechanism

Unit - III

3. Physiology - II

- 3.1 Nerve impulse transmission - Resting membrane potential, origin and propagation of action potentials along myelinated neuron.
- 3.2 Muscle contraction - Types of Muscles, Ultra structure of muscle fibre, molecular and chemical basis of muscle contraction
- 3.3 Endocrine glands – Structure, secretions and the functions(of hormones of pituitary, thyroid, parathyroid, adrenal glands and pancreas)

Unit - IV

4. Ecology

- 4.1 Important Abiotic factors of Ecosystem - Temperature, light, water, oxygen.
- 4.2 Nutrient cycles - Nitrogen, carbon cycle.
- 4.3 Components of Ecosystem (Example: lake), food chains and food web, energy flow in ecosystem

Unit - V

5. Ecology - II

- 5.1 Habitat and ecological niche
- 5.2 Population studies(characteristics of Population, Growth Curves, Age Pyramids)

Zoogeography

- 5.3 Zoogeographical regions
- 5.4 Study of physical and faunal peculiarities of Oriental, Australian and Ethiopian regions.

D.K.GOV.T.DEGREE COLLEGE (AUTONOMOUS), NELLORE
ZOOLOGY MODIFIED SYLLABUS FOR V SEMESTER
ZOOLOGY - PAPER - V
ANIMAL BIOTECHNOLOGY

Periods:60

Max. Marks:70

Unit 1: Tools of Recombinant DNA technology - Enzymes and Vectors

Restriction modification systems: Types I, II and III. Mode of action, nomenclature, applications of Type II restriction enzymes in genetic engineering

DNA modifying enzymes and their applications: DNA polymerases, Terminal deoxynucleotidyl transferase, kinases and phosphatases, and DNA ligases

Cloning Vectors: Plasmid vectors:pBR and pUC series, Bacteriophage lambda

Unit 2 Techniques of Recombinant DNA technology

Cloning: Use of linkers and adaptors

Gene delivery: Microinjection, electroporation, biolistic method (gene gun), liposome and viral-mediated delivery

ELECTROPHORESIS: Gel electrophoresis,

PCR: Basics of PCR and its applications

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

Hybridization techniques: Southern, Northern and Western blotting,

Genomic and cDNA libraries: Preparation and uses

UNIT 3 Animal Cell Technology

Cell culture media: Natural and Synthetic

Cell cultures: primary culture, secondary culture, continuous cell lines; Protocols for Primary Cell Culture; Organ culture; Cryopreservation of cultures.

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

Stem cells: Types of stem cells, applications

Unit 4 Reproductive Technologies & Transgenic Animals

Manipulation of reproduction in animals: Artificial Insemination, *In vitro* fertilization, super ovulation, Embryo transfer, Embryo cloning

Transgenic Animals: Strategies of Gene transfer; Transgenic - sheep, fish; applications

Unit 5 Applied Biotechnology

Industry: Fermentation: Different types of Fermentation: Short notes on - Submerged & Solid state; batch, Fed batch & Continuous;

Agriculture: fisheries – Genetically modified fishes, polyploidy in fishes; DNA fingerprinting



D.K.GOV.T.DEGREE COLLEGE (AUTONOMOUS), NELLORE

ZOOLOGY SYLLABUS FOR VI SEMESTER

ZOOLOGY –ELECTIVE PAPER:VII-(A)

IMMUNOLOGY

Periods:60

Max. Marks:100

Unit - I

1.1 Overview of Immune system

1.1.1 Introduction to basic concepts in Immunology

1.1.2 Innate and adaptive immunity

1.2 Cells and organs of Immune system

1.2.1 Cells of immune system

(Lymphocytes, T lymphocyte, B lymphocyte, NK cell, K Cell, Macrophage, Dendritic cells, Eosinophil, Basophil, Neutrophil, APC and mast cell)

1.2.2 Organs of immune system-Primary and Secondary

Unit - II

2.1 Antigens

2.1.1 Basic properties of antigens

2.1.2 B and T cell epitopes, haptens and adjuvants

2.1.3 Factors influencing immunogenicity

Unit - III

3.1 Antibodies

3.1.1 Structure of antibody

3.1.2 Classes and functions of antibodies

3.1.3 Monoclonal antibodies

Unit - IV

4.1 Immune system in health and disease

4.1.1 Classification and brief description of various types of hyper sensitivities

4.1.2 Introduction to concepts of autoimmunity and immunodeficiency

4.2 Vaccines

4.2.1 General introduction to vaccines

5.2.2 Types of vaccines

Unit-V

5.1 Immunological Techniques

5.1.1 Precipitation, Agglutination, ABO blood grouping, Rh blood typing, Widal test

5.1.2 Simple double Immunodiffusion, Rocket Immuno-electrophoresis, ELISA

D.K.GOV.T.DEGREE COLLEGE (AUTONOMOUS), NELLORE

ZOOLOGY SYLLABUS FOR VI SEMESTER

ZOOLOGY - ELECTIVE PAPER: VII-(C)

BIOINFORMATICS

Periods: 60

Max. Marks: 100

UNIT I - HISTORY, SCOPE AND IMPORTANCE (10 hours)

Important contributions - aims and tasks of Bioinformatics - applications of Bioinformatics - challenges and opportunities - internet basics- HTML introduction to NCBI data model- Various file formats for biological sequences

UNIT II - DATABASES - TOOLS AND THEIR USES (15 hours)

Importance of databases - Biological databases-primary sequence databases; Composite sequence databases- Secondary databases- nucleic acid sequence databases - Protein sequence data bases - structure databases - bibliographic databases - specialized genomic resources- analysis packages

UNIT III - SEQUENCE ALIGNMENT METHODS (15 hours)

Sequence analysis of biological data-Significance of sequence alignment pair wise sequence alignment methods- Use of scoring matrices and gap penalties in sequence alignments- multiple sequence alignment methods - Tools and application of multiple sequence alignment.

UNIT IV - PREDICTIVE METHODS USING DNA AND PROTEIN SEQUENCES

(10 hours)

Gene predictions strategies - protein prediction strategies - molecular visualization tools- phylogenetic analysis: Concept of trees- phylogenetic trees and multiple alignments.

UNIT V - DRUG DISCOVERY PROCESS (10 hours)

Discovering a drug - target identification and validation - identifying the lead compound - optimization of lead compound - chemical libraries.

D.K.GOV'T.DEGREE COLLEGE (AUTONOMOUS), NELLORE

ZOOLOGY SYLLABUS FOR CLUSTER ELECTIVE VIII-A: VI SEMESTER

MEDICAL DIAGNOSTICS

Cluster Elective Paper: VIII-A-1

CLINICAL BIOCHEMISTRY

Hours 60

Marks 100

UNIT – I: Basic Medical Laboratory Principles and Procedures: 10 Hours

Introduction to clinical biochemistry. Glassware. Solutions and Reagents – Normal, Molar, percent, buffer solutions and indicators. Equipments and Instruments – Centrifuges, Hot air oven, Incubator, Water bath, Photometer, Spectrophotometer, Analyzers. Quality Control.

UNIT – II: Clinical Biochemistry of Carbohydrates, Proteins & Lipids: 20 Hours

Elementary classification and metabolism of carbohydrates. Properties of carbohydrates. Regulation of blood sugar and Diabetes. Glucose Tolerance Test. Glycosylated Haemoglobin. General classification of proteins. Structure of proteins. Summary of protein digestion and amino acid metabolism. Determination of serum proteins. General lipid metabolism. Primary and Secondary Dyslipoproteinemias.

UNIT – III: Clinical Biochemistry of Enzymes: 10 Hours

Enzymes as catalysts. Enzyme specificity. Factors which affect enzyme activity. Coenzymes and Isoenzymes. Enzymes classification and nomenclature. Enzymes in clinical diagnosis. Use of enzymes as reagents. Laboratory determinations of enzymes – Clinical significance of SGOT, SGPT, S.ALP, S.ACP, Serum Amylase.

UNIT- IV: Water & Mineral Metabolism and Acid-Base Balance: 10 Hours

Body fluid distribution. Factors which influence the distribution of body water. Mineral metabolism. Importance of the trace elements. Flame photometry. Action of buffer systems. Disturbances in acid-base balance

UNIT - V: Function Tests:

10 Hours

Diseases of the kidneys. Creatine metabolism. Bile pigment metabolism. Disordered Bilirubin metabolism. Hepatic Jaundice and Post hepatic jaundice. Ischemic heart disease. Clinical significance of gastric analysis.

SUGGESTED READINGS

- Park, K. (2007), Preventive and Social Medicine, B.B. Publishers
- Godkar P.B. and Godkar D.P. Textbook of Medical Laboratory Technology, II Edition, Bhalani Publishing House
- Cheesbrough M., A Laboratory Manual for Rural Tropical Hospitals, A Basis for Training Courses
- Guyton A.C. and Hall J.E. Textbook of Medical Physiology.
- Robbins and Cortan, Pathologic Basis of Disease, VIII Edition.
- Prakash, G. (2012), Lab Manual on Blood Analysis and Medical Diagnostics, S. Chand and Co. Ltd.

D.K.GOV.T.DEGREE COLLEGE (AUTONOMOUS), NELLORE

Cluster Elective Paper: VIII-B-2

AQUACULTURE MANAGEMENT

Periods : 60

Max.Marks : 100

Unit – I

1.1 Breeding and Hatchery Management

- 1.1.1 Bundh Breeding and Induced breeding of carp by Hypophysation; and use of synthetic hormones
- 1.1.2 Types of fish hatcheries; Hatchery management of Indian major carps
- 1.1.3 Breeding and Hatchery management of *Litopenaeus vannamei*
- 1.1.4 Breeding and Hatchery management of giant freshwater prawn.

Unit – II

2.1 Water quality Management

- 2.1.1 Water quality and soil characteristics suitable for fish and shrimp culture
- 2.1.2 Identification of oxygen depletion problems and control mechanisms in culture ponds
- 2.1.3 Aeration: Principles of aeration and Emergency aeration
- 2.1.4 Liming materials, Organic manures and Inorganic fertilizers commonly used and their implications in fish ponds

Unit – III

3.1 Feed Management

- 3.1.1 Live Foods and their role in shrimp larval nutrition.
- 3.1.2 Supplementary feeds: Principal foods in artificial diets; Types of feeds; Feed additives and Preservatives; role of probiotics.
- 3.1.3 Feed formulation and manufacturing; Feed storage
- 3.1.4 Feeding strategies: Feeding devices, feeding schedules and ration size; Feed evaluation- feed conversion efficiencies and ratios

Unit – IV

4.1 Disease Management

- 4.1.1 Principles of disease diagnosis and health management;
- 4.1.2 Prophylaxis, Hygiene and Therapy of fish diseases
- 4.1.3 Specific and non-specific defense systems in fish; Fish immunization and vaccination
- 4.1.4 Etiology, Symptoms, prophylaxis and therapy of common fish diseases in fish ponds
- 4.1.5 Etiology, Symptoms, prophylaxis and therapy of common shrimp diseases in shrimp ponds

Unit – V

5.1 Economics and Marketing

- 5.1.1 Principles of aquaculture economics – Capital costs, variable costs, cost-benefit analysis
- 5.1.2 Fish marketing methods in India; Basic concepts in demand and price analysis

5.2 Fisheries Extension

- 5.1.3 Fisheries Training and Education in India; Role of extension in community development.

REFERENCE BOOKS

4. Boyd CE. 1979. *Water Quality in Warm Water Fish Ponds*. Auburn University
5. Boyd, CE. 1982. *Water Quality Management for Pond Fish Culture*. Elsevier Sci. Publ. Co.
6. Chakraborty C & Sadhu AK. 2000. *Biology Hatchery and Culture Technology of Tiger Prawn and Giant Freshwater Prawn*. Daya Publ. House
4. Conroy CA and Herman RL. 1968. *Text book of Fish Diseases*. TFH (Great Britain) Ltd, England.
- 5 Halver J & Hardy RW. 2002. *Fish Nutrition*. Academic Press.
6. Ian C. 1984. *Marketing in Fisheries and Aquaculture*. Fishing News Books.
7. ICAR. 2006. *Handbook of Fisheries and Aquaculture*. ICAR.
8. Jhingran VG. 2007. *Fish and Fisheries of India*. Hindustan Publishing Corporation, India.
9. Jhingran VG & Pullin RSV. 1985. *Hatchery Manual for the Common, Chinese and Indian Major Carps*. ICLARM, Philippines.
10. Kumar D. 1996. *Aquaculture Extension Services Review: India*. FAO Fisheries Circular No. 906, Rome.
11. Lavens P & Sorgeloos P. 1996. *Manual on the Production and Use of Live Food for Aquaculture*. FAO Fisheries Tech. Paper 361, FAO.
12. MPEDA. 1993. *Handbook on Aqua Farming - Live Feed. Micro Algal Culture*. MPEDA Publication
13. New MB. 1987. *Feed and Feeding of Fish and Shrimp. A Manual on the Preparation and Preservation of Compound Feeds for Shrimp and Fish in Aquaculture*. FAO – ADCP/REP/87/26
14. Pandian TJ, Strüssmann CA & Marian MP. 2005. *Fish Genetics and Aquaculture Biotechnology*. Science Publ.
15. Pilley, TVR & Dill, WMA. 1979. *Advances in Aquaculture*. Fishing News Books, Ltd. England.
16. Pillay TVR & Kutty MN. 2005. *Aquaculture- Principles and Practices*. Blackwell.
17. Ray GL. 2006. *Extension, Communication and Management*. 6th Ed. Kalyani Publ. Delhi.
18. Reddy PV GK, Ayyappan S, Thampy DM & Gopalakrishna 2005. *Text Book of Fish Genetics and Biotechnol.* ICAR
19. Reichenbach KH. 1965. *Fish Pathology*. TFH (Gt. Britain) Ltd, England.
20. Shang YC. 1990. *Aquaculture Economic Analysis - An Introduction*. World Aquaculture Society, USA.
21. Singh B. 2006. *Marine Biotechnology and Aquaculture Development*. Daya Publ. House
22. Stickney RR. 1979. *Principles of Warm water Aquaculture*. John-Wiley & sons Inc.
23. Swain P, Sahoo PK & Ayyappan S. 2005. *Fish and Shellfish Immunology: An Introduction*. Narendra Publ.
24. Thomas PC, Rath SC & Mohapatra KD. 2003. *Breeding and Seed Production of Finfish and Shellfish*. Daya Publ.

D.K.GOV.T.DEGREE COLLEGE (AUTONOMOUS), NELLORE

Cluster Elective Paper: VIII-B-3

POSTHARVEST TECHNOLOGY

Periods: 60

Max.Marks : 100

Unit – I

1.1 Handling and Principles of fish Preservation

1.1.1 Handling of fresh fish, storage and transport of fresh fish, post mortem changes (rigor Mortis and spoilage), spoilage in marine fish and freshwater fish.

1.1.2 Principles of preservation– cleaning, lowering of temperature, rising of temperature, denudation, use of salt, use of fish preservatives, exposure to lowradiation of gamma rays.

Unit – II

2.1 Methods of fish Preservation

2.1.1 Traditional methods - sun drying, salt curing, pickling and smoking.

2.1.2 Advanced methods – chilling or icing, refrigerated sea water, freezing, canning, Irradiation and Accelerated Freeze drying (AFD).

Unit – III

3.1 Processing and preservation of fish and fish by-products

3.1.1 Fish products – fish minced meat, fish meal, fish oil, fish liquid (ensilage), fish protein concentrate, fish chowder, fish cake, fish sauce, fish salads, fish powder, pet food from trash fish, fish manure.

3.1.2 Fish by-products – fish glue, ising glass, chitosan, pearl essence, shark fins, fish leather and fish maws.

3.2 Seaweed Products

3.2.1 Preparation of agar, algin and carrageen. Use of seaweeds as food for human consumption, in disease treatment and preparation of therapeutic drugs.

Unit – IV

4.1 Sanitation and Quality control

4.2.1 Sanitation in processing plants - Environmental hygiene and Personal hygiene in processing plants.

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

Unit – V

5.1 Quality Assurance, Management and Certification

5.1.1 Seafood Quality Assurance and Systems: Good Manufacturing Practices (GMPs); Good Laboratory Practices (GLPs); Standard Operating Procedures (SOPs); Concept of Hazard Analysis and Critical Control Points (HACCP) in seafood safety.

5.1.2 National and International standards – ISO 9000: 2000 Series of Quality Assurance System,

D.K.GOV.T.DEGREE COLLEGE (AUTONOMOUS), NELLORE

**ZOOLOGY SYLLABUS FOR CLUSTER ELECTIVE: VIII-C
VI SEMESTER**

SERICULTURE

Cluster Elective Paper: VIII-C-1

GENERAL SERICULTURE, MULBERRY CULTIVATION AND MANAGEMENT

Hours 60

Marks 100

Unit - I : Introduction

- 1.1 Definition, history and present status of Sericulture
- 1.2 Types of silk worms and their food plants
- 1.3 Prospects of Sericulture in India - Sericulture industry in different states, employment, potential in mulberry and non mulberry Sericulture

Unit - II : Morphology of mulberry plant

- 2.1 Common varieties of mulberry used in India
- 2.2 Characters of root, stem and leaf
- 2.3 Anatomy of root, stem and leaf
- 2.4 Male and female reproductive organs, pollination, fertilization, development of seed.

Unit - III : Requirements for mulberry cultivation

- 3.1 Physical and chemical properties of soil and its nature
- 3.2 Soil moisture and water requirements
- 3.3 Climatic conditions - Temperature, photoperiod, humidity and rain fall

Unit - IV : Mulberry management

- 4.1 Land preparation - leveling and ploughing
- 4.2 Irrigation - drip, sprinkler or flood irrigation, weeding
- 4.3 Manuring - organic, inorganic and biofertilizers
- 4.4 Harvesting - leaf picking, shoot-leaf harvesting, branch cutting, leaf storage

Unit - V : Diseases and pests of mulberry

- 5.1 Fungal and bacterial diseases - Powdery mildew, red rust and leaf spot caused by fungi
Mulberry wilt caused by bacteria

D.K.GOVERNMENT COLLEGE FOR WOMEN (AUTONOMOUS), NELLORE

1st B.Sc (AQUACULTURE TECHNOLOGY)

SEMESTER – I

PAPER – I (Basics Principles of Aquaculture)

UNIT-I: INTRODUCTION

- 1-1 Concept of Blue Revolution - History and definition of Aquaculture
- 1-2 Scope of Aquaculture at global Level, India and Andhra Pradesh
- 1-3 Fresh water aquaculture, brackish water aquaculture and mariculture
- 1-4 Different Aquaculture systems – Pond, Cage, Pen, Running water, Extensive, Intensive and & Semi-Intensive Systems and their significance. Monoculture, Polyculture and Monosex culture systems
- 1-5 Aquaculture versus Agriculture; Present day needs with special reference to Andhra Pradesh

UNIT-II: POND ECOSYSTEM

- 2-1 General Concepts of Ecology, Carrying Capacity and Food Chains
- 2-2 Lotic and lentic systems, streams and springs
- 2-2 Nutrient Cycles in Culture Ponds – Phosphorus, Carbon and Nitrogen
- 2-3 Importance of Plankton and Benthos in culture ponds, nutrient dynamics and algal blooms
- 2-4 Concepts of Productivity, estimation and improvement of productivity

UNIT-III: TYPES OF FISH PONDS

- 3-1 Classification of ponds based on water resources – spring, rain water, flood water, well water and water course ponds
- 3-2 Functional classification of ponds – head pond, hatchery, nursery, rearing, production, stocking and quarantine ponds
- 3-3 Hatchery design

UNIT- IV: POND PREPARATION

- 4-1 Important factors in the construction of an ideal fish pond – site selection, topography, nature of the soil, water resources
- 4-2 Lay out and arrangements of ponds in a fish farm
- 4-3 Construction of an ideal fish pond – space allocation, structure and components of barrage pond

UNIT-V: POND MANAGEMENT FACTORS

- 5-1 Need of fertilizer and manure application in culture ponds; Role of nutrients; NPK contents of different fertilizers and manures used in aquaculture; and precautions in their application.
- 5-2 Physico-chemical conditions of soil and water optimum for culture –temperature, depth, turbidity, light, water and shore currents, PH, DOD, CO₂ and nutrients; measures to increase oxygen and reduce ammonia & hydrogen sulphide in culture ponds; correction of PH
- 5-3 Eradication of predators and weed control – advantages and disadvantages of weed, weed plants in culture ponds, aquatic weeds, weed fish, toxins used for weed control and control of predators

APSCHE SYLLABUS

SEMESTER – II

BIOLOGY OF FIN FISH & SHELL FISH

UNIT-I: GENERAL CHARACTERS & CLASSIFICATION OF CULTIVABLE FIN & SHELL FISH

- 1-1 General Characters and classification of fishes, crustaceans and molluscs up to the level of Class.
- 1-2 Fish, Crustaceans and Molluscs of commercial importance
- 1-3 Sense organs of fishes, crustaceans and molluscs
- 1-4 Specialized organs in fishes – electric organ, venom and toxins
- 1-5 Buoyancy in fishes- swim bladder and mechanism of gas secretion

UNIT-II: FOOD, FEEDING AND GROWTH

- 2-1 Natural fish food, feeding habits, feeding intensity, stimuli for feeding, utilization of food, gut content analysis, structural modifications in relation to feeding habits, forage ratio and food selectivity index
- 2-2 Principles of Age and growth determination; growth regulation, Growth rate measurement – scale method, otolith method, skeletal parts as age indicators
- 2-3 Genetic, biotic & ecological factors in determining the longevity of fishes, length-frequency method, age composition, age-length keys, absolute and specific growth, back calculation of length and growth, annual survival rate, asymptomatic length, fitting of growth curve
- 2-4 Length-weight relationship, condition factor/Ponderal index, relative condition factor

UNIT-III: REPRODUCTIVE BIOLOGY

- 3-1 Breeding in fishes, breeding places, breeding habits & places, breeding in natural environment and in artificial ponds, courtship and reproductive cycles
- 3-2 Induced breeding in fishes

3-4 Breeding in shrimp, oysters, mussels, clams, pearl oyster, pila, freshwater mussel and cephalopods

UNIT – IV: DEVELOPMENT

4-1 Parental care in fishes, ovo-viviparity, oviparity, viviparity, nest building and brooding

4-2 Embryonic and larval development of fishes

4-3 Embryonic and larval development of shrimp, crabs and molluscs of commercial importance

4-4 Environmental factors affecting reproduction and development of cultivable aquatic fin & shell fish

UNIT-V: HORMONES & GROWTH

5-1 Endocrine system in fishes

5-2 Neurosecretary cells, androgenic gland, ovary, Y-organ, chromatophores, pericardial glands and cuticle.

5-3 Molting, molting stages, metamorphosis in crustacean shell fis

PRACTICALS:

1.1 Study of mouth parts in herbivorous and carnivorous fishes

1.2 Comparative study of digestive system of herbivorous and carnivorous fishes

1.3 Length-weight relationship of fishes

1.4 Gut content analysis in fishes and shrimp

1.5 Mouth parts and appendages of cultivable prawns, shrimps and other crustaceans

1.6 Study of eggs of fishes, shrimps, prawns and other crustaceans

1.7 Study of oyster eggs

1.8 Embryonic and larval development of fish

1.9 Study of gonadal maturity and fecundity in fishes and shellfish

1.10 Observation of crustacean larvae

1.11 Observation of molluscan larvae

1.12 Study of nest building and brooding of fishes

APSCHE SYLLABUS
SEMESTER III – PAPER-III

FISH NUTRITION & FEED TECHNOLOGY

UNIT-I: NUTRITIONAL REQUIREMENTS OF CULTIVABLE FISH

- 1-1 Requirements for energy, proteins, carbohydrates, lipids, fiber, micronutrients for different stages of cultivable fish and prawns
- 1-2 Essential aminoacids and fatty acids, protein to energy ratio, nutrient interactions and protein 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-II: FORMS OF FEEDS & FEEDING METHODS

- 2-1 Fed conversion efficiency, feed conversion ratio and protein efficiency ratio
- 2-2 Wet feeds, moist feeds, dry feeds, mashs, pelleted feeds, floating and sinking pellets, advantages of pelletization
- 2-3 Manual feeding, demand feeders, automatic feeders, surface spraying, bag feeding and tray feeding
- 2-4 Frequency of feeding

UNIT-III: FEED MANUFACTURE & STORAGE

- 3-1 Feed ingredients and their selection, nutrient composition and nutrient availability of feed ingredients
- 3-2 Feed formulation – extrusion processing and steam pelleting, grinding, mixing and drying, pelletization, and packing

3-3 Water stability of feeds, farm made aqua feeds, micro-coated feeds, micro-encapsulated feeds and micro-bound diets

3-4 Microbial, insect and rodent damage of feed, chemical spoilage during storage period and proper storage methods

UNIT-IV: 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, aflatoxins and fiber

UNIT-V: 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

PRACTICALS:

- 1.1 Estimation of protein content in aquaculture feeds
- 1.2 Estimation of carbohydrate content in aquaculture feeds
- 1.3 Estimation of lipid content in aquaculture feeds
- 1.4 Estimation of ash in aquaculture feed
- 1.5 Study of water stability of pellet feeds
- 1.6 Feed formulation and preparation in the lab
- 1.7 Study of binders used in aquaculture feeds
- 1.8 Study of feed packing materials
- 1.9 Study of physical and chemical change during storage
- 1.10 Study on physical characteristics of floating and sinking feeds
- 1.11 Visit to a aqua-feed production unit
- 1.12 Visit to a farm for studying feeding practices

PRESCRIBED BOOK(S):

- 1.13 HALVER JE 1989. Fish nutrition. Academic press, San diego

APSCHE SYLLABUS
SEMESTER IV – PAPER-IV

FRESH WATER & BRACKISHWATER AQUACULTURE

UNIT-I: INTRODUCTION TO FRESHWATER AQUACULTURE

- 1-1.1 Status, scope and prospects of fresh water aquaculture in the world, India and AP
- 1-1.2 Different fresh water aquaculture systems

UNIT-II: CARP CULTURE

- 2-1 Major cultivable Indian carps – Labeo, Catla and Cirrhinus & Minor carps
- 2-2 Exotic fish species introduced to India – Tilapia, Pangassius and Clarius sp.
- 2-3 Composite fish culture system of Indian and exotic carps
- 2-4 Impact of exotic fish, Compatibility of Indian and exotic carps and competition among them

UNIT-III: CULTURE OF AIR-BREATHING AND COLD WATER FISH

- 3-1 Recent developments in the culture of clarius, anabas, murrels,
- 3-2 Advantages and constraints in the culture of air-breathing and cold water fishes- seed resources, feeding, management and production
- 3-3 Special systems of Aquaculture- brief study of culture in running water, re-circulatory systems, cages and pens, sewage-fed fish culture

UNIT-IV: CULTURE OF PRAWN

- 4-1 Fresh water prawns of India - commercial value
- 4-2 *Macrobrachium rosenbergii* and *M. Malcomsonii*– biology, seed production, pond preparation, stocking, management of nursery and grow-out ponds, feeding, morphotypes and harvesting

UNIT-V: CULTURE OF BRACKISHWATER SPECIES

- 5-1 Culture of *P. monodon* – Hatchery technology and Culture practices including feed and disease management
- 5-2 Culture of *L. vannamei* – hatchery technology and culture practices including feed and disease management.
- 5-3 Mixed culture of fish and prawns

PRACTICALS:

- 1.1 Identification of important cultivable carps
- 1.2 Identification of important cultivable air-breathing fishes
- 1.3 Identification of important cultivable fresh water prawns
- 1.4 Identification of different life history stages of fish
- 1.5 Identification of different life history stages of fresh water prawn

Collection and study of weed fish

- 1.6 Identification of commercially viable crabs – *Scylla cerrata*, *Portunus pelagicus*, *P. sanguinolentus*, *Neptunus pelagicus*, *N. Sanguinolentus*
- 1.7 Identification of lobsters – *Panulirus polyphagus*, *P. ornatus*, *P. homarus*, *P. sewelli*, *P. penicillatus*
- 1.8 Identification of oysters of nutritional significance – *Crossostrea madrasensis*, *C. gryphoides*, *C. cucullata*, *C. rivularis*, *Picnodonta*
- 1.9 Identification of mussels and clams
- 1.10 Identification of developmental stages of oysters
- 1.11 Field visit to aqua farm and study of different components like dykes etc.

PRESCRIBED BOOK(S):

- 1.12 Jhingran VG 1998. Fish and Fisheries of India. Hindusthan Publishing Corporation, New Delhi

REFERENCES:

- 1.13 Santharam R, N Sukumaran and P Natarajan 1987. A manual of aquaculture, Oxford-IBH, New Delhi
- 1.14 Srivatsava 1993. Fresh water aquaculture in India, Oxford-IBH, New Delhi
- Marcel H 1972. Text book of fish culture. Oxford fishing news books

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SEMESTER IV – PAPER-IV

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UNIT-IV: CULTURE OF PRAWN

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UNIT-V: CULTURE OF BRACKISHWATER SPECIES

- 5-1 Culture of *P. monodon* – Hatchery technology and Culture practices including feed and disease management
- 5-2 Culture of *L. vannamei* – hatchery technology and culture practices including feed and disease management.
- 5-3 Mixed culture of fish and prawns