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

(Re-Accredited NAAC with "B" Grade)

KAKINADA, EAST GODAVARI, A.P, 533002.

DEPARTMENT OF ZOOLOGY AND AQUACULTURE TECHNOLOGY

2019-2020

AQUACULTURE TECHNOLOGY

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

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AQUACULTURE TECHNOLOGY BOARD OF STUDIES: 2019-2020

SEMESTER-I – PAPER-I (Paper Code: AQ1308)

BASIC PRINCIPLES OF AQUACULTURE

Periods: 60 **Max. Marks: 100**

UNIT-I: INTRODUCTION

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

UNIT-II: POND ECOSYSTEM

2-1 1 General Concepts of Ecology, CarryingCapacityandFoodChains2-2Loticand lentic systems, streams and springs
2-2 2 Nutrient Cycles in Culture Ponds– Phosphorus, Carbon and Nitrogen
2-3 Importance of Plankton and Benthos in culture ponds, nutrient dynamics and algalblooms2-4Concepts of Productivity, estimation and improvement of productivity

UNIT-III: TYPES OF FISH PONDS

3-1 1 Classification of ponds based on water resources– spring, rainwater, 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 Layout 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: PONDMANAGEMENTFACTORS

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

PRESCRIBED BOOK(S):

1. Jhingran VG1998.Fish and Fisheries of India. Hindusthan Publishing Corporation, New Delhi
2. Pillay TVR, 1996. Aquaculture Principles and Practices, Fishing News Books Ltd.,London

REFERENCES:

1. Pillay TVR &M.A. Dill, 1979. Advances in Aquaculture. Fishing News Books Ltd.,London
2. Stickney RR 1979. Principles of Warm Water Aquaculture. John Wiley & SonsInc. 1981
3. Boyd CE 1982. Water Quality Management for Pond Fish Culture .Elsivier Scientific Publishing
4. Bose ANet.al., 1991.Costal Aquaculture Engineering. Oxford &IBH Publishing Company

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AQUACULTURE TECHNOLOGY BOARD OF STUDIES: 2019-2020

SEMESTER-I PAPER-I (Course code: AQ1308P)

BASIC PRINCIPLES OF AQUACULTURE

PRACTICAL SYLLABUS

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

PRACTICALS: (Any 8as per the local Industry needs)

1. Estimation of Carbonates, Bicarbonates in water samples
2. Estimation of Chlorides in water samples
3. Estimation of dissolved oxygen
4. Estimation of ammonia in water
5. Field visit to nursery, rearing and stocking ponds of aqua farms
6. Field visit to hatchery
7. Study of algal blooms and their control
8. Collection &identification of zooplankton and phytoplankton
9. Study of aeration devices
10. Determination of soil nitrogen and phosphorus
11. Collection and study of aquatic weeds
12. Filed survey of nearby habitat for dietary dependency on and requirement of aqua products

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AQUACULTURE TECHNOLOGY BOARD OF STUDIES: 2019-2020

SEMESTER– II PAPER-II (Course Code: AQ2308)

TITLE- BIOLOGY OF FINFISH& SHELL FISH

Periods: 60 **Max. Marks: 100**

UNIT-I: GENERAL CHARACTERS & CLASSIFICATION OF CULTIVABLE FIN & SHELLFISH

1-1General Characters and classification of fishes, crustaceans and molluscs up to the level of Class.
1-2Fish, Crustaceans and Molluscs of commercial importance
1-3 3 Sense organs of fishes, crustaceans and molluscs
1-4 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 1 Natural fish food, feeding habits, feeding intensity, stimuli for feeding, utilization of food, gut content analysis, structural modifications in relation to feeding habits, for age ratio and food selectivity index
2-2 2 Principles of Age and growth determination; growth regulation, Growth rate measurement–scale method, otolith method, skeletal parts as age indicators
2-3 3 Genetic, biotic &ecological factors in determining he 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
3-4Breedingin shrimp, oysters, mussels, clams, pearl oyster, pila, fresh water mussel and cephalopods

UNIT– IV: DEVELOPMENT

4-1Parental care in fishes, ovo-viviparity, oviparity, viviparity, nest building and brooding
4-2Embryonic and larval development of fishes
4-3Embryonic and larval development of shrimp, crabs and molluscs of commercial importance
4.4Environmental factor saffecting reproduction and development of cultivable aquatic fin & shellfish

UNIT-V: HORMONES & GROWTH

5-1 1 Endocrine system in fishes
5-2 Neuro secretary cells, androgenic gland, ovary, Y- organ, chromatophores, pericardial glands and cuticle.
5-3Molting, molting stages, metamorphosis in crustacean shell fish

PRESCRIBED BOOK(S):

1. Bone Qet al., 1995. Biology of fishes, Blackie academic &professional, LONDON
2. SaxenaAB1996.Life of Crustaceans. Anmol Publications Pvt.Ltd., New Delhi

REFERENCES:

1. Tandon KK & Johal MS1996. Age and Growth in Indian Fresh Water Fishes. Narendra Publishing
2. Raymond T etal., 1990. Crustacean Sexual Biology, Columbia University Press, New York
3. Guil and J.A (ed) 1984. Penaeid shrimps- Their Biology and Management.
4. Barrington FJW1971.Invertebrates: Structure and Function. ELBS
5. Parker F& Haswell 1992. The text book of Zoology, VolI. Invertebrates

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AQUACULTURE TECHNOLOGY BOARD OF STUDIES: 2019-2020
SEMESTER– II PAPER-II (Course Code: AQ2308P)
BIOLOGY OF FINFISH& SHELL FISH
PRACTICAL SYLLABUS

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

PRACTICALS: (Any 8 as per the local Industry needs)

1. Study of mouth parts in herbivorous and carnivorous fishes.
2. Comparative study of digestive system of herbivorous and carnivorous fishes.
3. Length-weight relationship of fishes.
4. Gut content analysis in fishes and shrimp.
5. Mouth parts and appendages of cultivable prawns, shrimps and other crustaceans.
6. Study of eggs of fishes, shrimps, prawns and other crustaceans.
7. Study of oyster eggs.
8. Embryonic and larval development of fish.
9. Study of gonadal maturity and fecundity in fishes and shellfish.
10. Observation of crustacean larvae.
11. Observation of molluscan larvae.
12. Study of nest building and brooding of fishes.

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AQUACULTURE TECHNOLOGY BOARD OF STUDIES: 2019-2020
SEMESTER III– PAPER-III (Course Code: AQ3308)
FISH NUTRITION & FEEDTECHNOLOGY

Periods: 60 **Max. Marks: 100**

UNIT-I: NUTRITIONAL REQUIREMENTS OF CULTIVABLE FISH

1-1 Requirements for energy, proteins, carbohydrates, lipids, fiber, micro nutrients for different stages of cultivable fish and prawns
1-2 Essential amino acids 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 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 & 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 adequate 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, afflatoxins and fiber

UNIT-V: NUTRITIONAL DEFICIENCY INCULTIVABLEFISH

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

PRESCRIBEDBOOK(S):

1. HALVERJE 1989. Fish nutrition. Academic press, San diego

REFERENCES:

1. .Lovellrt 1998. Nutrition andfeedingoffishes,Chapmann&Hall, NewYork
2. Sena de silva,trevoraanderson 1995.Fish nutrition in aquaculture**.**Chapmann &Hall,
3. Guiland J.A (ed) 1984. Penaeid shrimps- TheirBiologyand Management.
4. Jhingran VG1998.Fish and Fisheries ofIndia.Hindusthan PublishingCorporation,NewDelhi

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AQUACULTURE TECHNOLOGY BOARD OF STUDIES: 2019-2020

SEMESTER III– PAPER-III (Course Code: AQ3308P)

TITLE- FISH NUTRITION &FEEDTECHNOLOGY

PRACTICAL SYLLABUS

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

PRACTICALS: (Any 8as per the local Industry needs and Requirement)

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.
11. Visit to a aqua-feed production unit.
12. Visit to a farm for studying feeding practices.

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AQUACULTURE TECHNOLOGY BOARD OF STUDIES: 2019-2020

SEMESTER IV– PAPER-IV (Course Code: AQ4308)

TITLE- FRESH WATER & BRACKISH WATER AQUACULTURE

Periods: 60 **Max. Marks: 100**

UNIT-1: INTRODUCTION TO FRESHWATERAQUACULTURE

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

UNIT-II: CARPCULTURE

2-1 MajorcultivableIndiancarps– Labeo, Catla and Cirrhinus &Minor carps
2-2 Exotic fish species introduced to India– Tilapia, Pangassius and Clariussp.
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 OFAIR-BREATHING ANDCOLDWATERFISH

3-1 Recent developments in the culture of clarius, anabas, murrels,
3-2 Advantages and constraints in the culture of air-breathing and coldwater 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,
4-3 pond preparation, stocking, management of nursery and grow-out ponds, feeding, morphotypes and harvesting

UNIT-V: CULTURE OF BRACKISH WATER SPECIES

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

PRESCRIBED BOOK(S):

1. Jhingran VG1998.Fish and Fisheries of India .Hindusthan PublishingCorporation,NewDelhi2.Sena de silva,trevoraanderson 1995.Fish nutrition in aquaculture**.** Chapmann &Hall,
3. Guil and J.A (ed) 1984. Penaeid shrimps- Their Biology and Management.
4. Barrington FJW1971.Invertebrates:Structure and Function.ELBS
5. ParkerF&Haswell 1992. Thetext book of Zoology,VolI.Invertebrates

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AQUACULTURE TECHNOLOGY BOARD OF STUDIES: 2019-2020

SEMESTER IV– PAPER-IV (Course Code: AQ4308P)

FRESH WATER & BRACKISH WATER AQUACULTURE

PRACTICALS SYLLABUS

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

PRACTICALS :(Any 8as per the local Industry needs)

1. Identification of important cultivable carps
2. Identification of important cultivable air-breathing fishes
3. Identification of important cultivable fresh water prawns
4. Identification of different life history stages of fish
5. Identification of different life history stages of fresh water prawn
6. Collection and study of weed fish
7. Identification of commercially viable crabs– Scyllacerrata, Portunuspelagicus,
    a. P.sanguinolentus, Neptunuspelagicus, N.Sanguinolentus
8. Identification of lobsters– Panuliruspolyphagus,P.ornatus,P.homarus,P.sewelli,*P.penicillatus*
9. Identification of oysters of nutritional significance– Crossostrea madrasensis, C.gryphoides, C.cucullata,C.rivularis , Picnodanta
10. Identification of mussels and clams
11. Identification of developmental stages of oysters
12. Field visit to aqua farm and study of different components like dykes etc.