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

2020-2021

AQUACULTURE TECHNOLOGY

A.S.D GOVT.DEGREE COLLEGE FOR WOMEN (A)
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AQUACULTURE TECHNOLOGY BOARD OF STUDIES: 2020-2021

SEMESTER-I – PAPER-I

BASIC PRINCIPLES OF AQUACULTURE

(Course Code: AQ201308)

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

UNIT-I: INTRODUCTION

1-1Concept of Blue Revolution-History and definition of Aquaculture Scope of Aquaculture at global Level, India and Andhra Pradesh

1.2 Different Aquaculture systems– Pond, Cage, Pen, Running water, Extensive, Intensive &Semi-Intensive Systems and their significance.

1.3 Monoculture, Polyculture and Mono sex culture systems

UNIT-II: POND ECOSYSTEM

2.1 General Concepts of Ecology, Carrying Capacity and food chains

2.2 Lotic and lentic systems, streams and springs

2.3 Nutrient Cycles in Culture Ponds– Phosphorus, Carbon and Nitrogen

2.4 Importance of Plankton and Benthos in culture ponds, nutrient dynamics and algal blooms

2.5 Concepts 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 Fish Hatchery design

UNIT- IV: POND PREPARATION

4.1 Important factors in the construction of an ideal fish pond– site selection, topography,

4.2 Important factors in the construction of an ideal fish pond -Nature of the soil, water resources

4.3 Layout and arrangements of ponds in a fish farm

4-1 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;

5-2 Role of nutrients; NPK contents of different fertilizers and manures used in aquaculture; and precautions in their application

5-3 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 sulfide in culture ponds; correction of PH

5-4 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. Hindustan 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 NewsBooksLtd.,London
2. StickneyRR 1979. Principles ofWarm WaterAquaculture. John Wiley&SonsInc. 1981
3. Boyd CE 1982. Water QualityManagement forPond Fish Culture.ElsivierScientific Publishing
4. BoseANet.al., 1991.Costal Aquaculture Engineering.Oxford&IBH PublishingCompany

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AQUACULTURE TECHNOLOGY BOARD OF STUDIES: 2020-2021
SEMESTER-I PAPER-I
BASIC PRINCIPLES OFAQUACULTURE
(Course Code: AQ201308P)
PRACTICAL SYLLABUS

Periods: 24 **Max. marks: 50**

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

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: 2020-2021

SEMESTER– II PAPER-II

BIOLOGY OF FINFISH & SHELLFISH

(Course Code: AQ202308)

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.

1-2 Fish, Crustaceans and Molluscs of commercial importance

1. 3 Sense organs of fishes, crustaceans and molluscs

1.4 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, for age 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 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,

3.2 Breeding in natural environment and in artificial ponds, courtship, and reproductive cycles

3.3 Induced breeding in fishes

3.4 Breeding in shrimp, oysters, mussels, clams, pearl oysters, Pila, freshwater mussels, and cephalopods

UNIT– IV: DEVELOPMENT

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

4-2Embryonicand larval development of fishes

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

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

UNIT-V: HORMONES & GROWTH

5.1 Endocrine system in fishes

5.2 Neuro secretary cells, androgenic gland, ovary,

5.3 Y- organ, chromatophores, pericardial glands and cuticle.

5.4 Molting, molting stages, metamorphosis in crustacean shell fish

PRESCRIBED BOOK(S):

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

REFERENCES:

1. Tandon KK&Johal MS1996. Ageand Growth in Indian Fresh WaterFishes. 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: 2020-2021

SEMESTER– II PAPER-II

BIOLOGY OF FINFISH & SHELLFISH

(Course Code: AQ202308P)

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: 2020-2021

SEMESTER III– PAPER-III

TITLE- FISH NUTRITION &FEEDTECHNOLOGY

(Course Code: AQ3308)

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 adeaqua 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 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: 2020-2021

SEMESTER III– PAPER-III

TITLE- FISH NUTRITION &FEEDTECHNOLOGY

(Course Code: AQ3308P)

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: 2020-2021

SEMESTER IV– PAPER-IV

FRESH WATER & BRACKISH WATER AQUACULTURE

(Course Code: AQ4308)

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

2-1MajorcultivableIndiancarps– 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

PRESCRIBEDBOOK(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: 2020-2021

SEMESTER IV– PAPER-IV

FRESH WATER & BRACKISH WATER AQUACULTURE

(Course Code: AQ4308P)

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– Panulirus polyphagus, 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.

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AQUACULTURE TECHNOLOGY BOARD OF STUDIES: 2020-2021
SEMESTER-V PAPER-V
FISH HEALTH MANGEMENT
(Course Code: AQ5315)

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

UNIT I: PATHOLOGYANDPARASITOLOGY

1-1 Introduction to fish diseases–Definition and categories of diseases– Disease and environment
1-2 Disturbance in cell structure – changes in cell metabolism, progressive and retrogressive tissue changes, types of degeneration, infiltration, necrosis, cell death, and causes
1-3 Atrophy, hypertrophy, neoplasms, inflammation, healing and repair

UNIT II: DISEASES OF FINFISH

2-1 Fungal diseases (both of shell and finfish)– Saprolegniosis, brachiomycosis, ichthyphorus diseases–Lagenidium diseases–Fusarium disease, prevention, and therapy
2-2 Viral diseases– Emerging viral diseases in fish, hemorrhagic septicemia, spring Viremia of carps, in infectious hematopoietic necrosis in trout, infectious pancreatic necrosis in salmonids, swim-bladder inflammation in cyprinids, channel catfish viral disease, prevention and therapy
2-3 Bacterial diseases– Emerging bacterial diseases, Aeromonas, pseudomonas, and vibrio infections, columnaris, furunculosis, epizootic ulcerative syndrome, infectious abdominal dropsy, bacterial gill disease, enteric red mouth, bacterial kidney disease.

UNIT III: DISEASES OF SHELL FISH

3-1 Major shrimp viral diseases– Bacculo virus penaeii, Monodon Bacculovirus, Bacculo viral mid-gut necrosis, Infectious hypodermal and hematopoietic necrosis virus, Hepatopancreatic parvo like virus, Yellowhead bacculo virus, white spot bacculo virus.
3-2 Bacterial diseases of shellfish– Aeromonas, pseudomonas, vibrio infections, luminous bacterial disease, filamentous bacterial disease. Prevention and therapy
3-3 Protozoan diseases-Ichthyophthiriasis, Costiasis, whirling diseases, trypanosomiasis. Prevention and therapy

UNIT IV: NUTRITIONAL DISEASES

4-1 Nutritional pathology– lipid liver degeneration, Vitamin and mineral deficiency diseases. Aflatoxin and dinoflagellates.
4-2 Antibiotic and chemotherapeutics. Nutritional cataract. Genetically and environmentally induced diseases.

UNIT-V: **FISH HEALTH MANAGEMENT**

5.1 Diagnostic tools– immune detection- DNA/RNA techniques, General preventive methods and prophylaxis. Application and development of vaccines,
5.2 Quarantine- significance, methods, and regulations for transplants.390
5.3 Production of disease -free seeds. Evaluation criteria of healthy seeds.
5.4 Good feed management for healthy organisms,
Zero water exchange, Probiotics in health management, issues of biosecurity.

Suggested Reading:
PRESCRIBED BOOK(S):

1. Shaperclaus W. 1991Fish Diseases-Vol.I&II. Oxonian Press Pvt.ltd
2. Roberts RJ1989. Fishpathology.BailliereTindall, NewYork
3. LydiaBrown 1993. Aquaculture for veterinarians- fish husbandrayandmedicine.PergamonPress. Oxford

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AQUACULTURE TECHNOLOGY BOARD OF STUDIES: 2020-2021
SEMESTER-V PAPER-V
FISH HEALTH MANGEMENT
(Course Code: AQ5315P)
PRACTICAL SYLLABUS

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

1. Enumeration of Bacteria by TPC Method
2. Enumeration of total Coliforms
3. Observation of gross pathology and external lesions of fish and prawns with reference to the common diseases in aquaculture.
4. Examination of pathological changes in gills and gut lumen, lymphoid organ, muscles and nerves of fish
5. Examination of pathological changes in gut lumen, hepatopancreas, lymphoid organ, muscles, and nerves of prawn and shrimp
6. Collection, processing, and analysis of data for epidemiological investigations of viral diseases
7. Bacterial pathogens– isolation, culture, and characterization
8. Identification of parasites in fishes: Protozoan, Helminths, Crustaceans
9. Antibiograms– preparation and evaluation
10. Molecular and immunological techniques; Biochemical tests; PCR; ELISA; Agglutination test; Challenge tests; Purification of virus for development of vaccines(Demonstration at institutes /labs)
11. Estimation of dose, calculation of concentration, methods of administration of various chemotherapeutics to fish and shellfish
12. Estimation of antibiotics used in aquaculture practices
13. Estimation of probiotics used in aquaculture
14. Field visit to farm for health monitoring and disease diagnosis

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AQUACULTURE TECHNOLOGY BOARD OF STUDIES: 2020-2021
SEMESTER-V PAPER-VI
FISHERIES EXTENSION, ECONOMICS & MARKETING
(Course Code: AQ5316)

UNIT – 1 INTRODUCTION

1-1 1 Meaning and scope of economics with reference to fisheries
1-2 Basic concepts of economics – goods, services, wants and utility, demand and supply, Value price, market demand and individual demand, elasticity of demand**,** law of diminishing marginal utility
1-3 3 Theory of production, production function in fisheries
1-4Various factors influencing the fishery product's price

UNIT– I1 FISHERIES MARKETING

2-1 Basic marketing functions, consumer behaviour and demand, fishery market survey and test marketing a product
2-2 Fish marketing– prices and price determination of fishes
2-3 Marketing institutions- primary (producer fishermen, fishermen cooperatives, and fisheries corporations) and secondary (merchant/ agent/ speculative middlemen)
2-4 Methods of economic analysis of business organizations
2-5 Preparation of project and project appraisal

UNIT-III FISHERIES ECONOMICS

3-1 Aquaculture economics- application of economics principles to aquaculture operations
3-2 Various inputs and production function. Assumptions of production function in aquaculture analysis, least cost combination of inputs, laws of variable proportions
3-3 Cost and earnings of aquaculture systems–carp culture, shrimp farming systems, hatcheries, Cost and earnings of fishing units and freezing plants
3-4 Socio-economic conditions of fishermen in Andhra Pradesh, Role of Matyafed and NABARD in uplifting fishermen's conditions, fisher men cooperatives
3-5 Contribution of fisheries to the national economy

UNIT-IV FISHERIES EXTENSION

4-1 Fisheries extension – scope and objectives, principles and features of fisheries extension Education; Fisheries extension methods and rural development
4-2 Adoption and diffusion of innovations

UNIT- V TRANSFER OF TECHNOLOGY

4-3 ICAR programs – salient features of ORP, NDS, LLP, IRDP, ITDA, KVK, FFDA, FCS, FTI, TRYSEM

4-4 3 Training– meaning, training vs. education and teaching

4-5 4 DAATT centres and their role in tot programs, video conferencing, education of farmers through print and electronic media

Project work/on-job training at industry

PRESCRIBEDBOOK(S):

1. Adivi Reddysv 1997.An introduction to extensioneducation.Oxford&IBH Co.Pvt.Ltd. New Delhi

2. Jayaraman R 1996. FisheriesEconomics. Tamilnadu VeterinaryandAnimal ScienceUniversity. Tuticorn

3. Subba Rao N 1986. Economics of Fisheries.Dayapublishinghouse, Delhi

REFERENCES:

1. Dewwett KK and Varma JD 1993. Elementaryeconomic theory. S.chand, NewDelhi

2. KorakandyR 1996. Economics of Fisheries Mangement. Daya PublishingHouse, Delhi

3. Tripathi SD 1992. Aquaculture Economics. Asian FisheriesSociety,Mangalore.

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AQUACULTURE TECHNOLOGY BOARD OF STUDIES: 2020-2021
SEMESTER-V PAPER-VI
FISHERIES EXTENSION, ECONOMICS & MARKETING
(Course Code: AQ5316P)

PRACTICAL SYLLABUS

Project work/on-job training at industry

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AQUACULTURE TECHNOLOGY BOARD OF STUDIES: 2020-2021
SEMESTER VI– ELECTIVE PAPER

ORNAMENTAL FISHERY

(Course Code: AQ6308)

UNIT I: INTRODUCTION

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

UNIT-II: FRESH WATER ORNAMENTALFISHES

1.1Live bearers, gold fish, koi, gourami, barbs and tetras, angel fish and cichlid fish
1.2 Brood stock development, breeding, larval rearing and grow out
1.3 Larval feeds and feeding

UNIT III: MARINEORNAMENTALFISHES

2-1Varieties and habitat of marine ornamental fishes
2-2 major marine ornamental fisher sources of India
2-3 Collection and transportation of live fish, use of an aesthetics
2-4 Breeding of marine ornamental fish
2-5Otheraquarium animals– sea anemones, lobsters, worms, shrimps, octopus and starfish

UNIT IV: AQUARIUM MANAGEMENT

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

UNIT V: COMMERCIALPRODUCTION OFAQUARIUM FISH ANDPLANTS

4-1 Commercial production units of ornamental fish- requirements and design
4-2 Commercial production of goldfish, live bearers, gouramies, barbs, angels and tetras
4-3Massproduction of aquarium plants
4-4 Retail marketing and export of ornamental fish

PRESCRIBEDBOOK(S):

1. Dick Mills 1998. Aquariumfishes,Dorling KinderslyLtd,London
2. Van Ramshort JD 1978. The complete aquarium encyclopaedia,Elseveir

REFERENCES:

1. JamesonJDandSanthanan R 1996. Manual ofornamental fishesand farmingtechnologies,FisheriesCollegeandresearch institute, Tuticorn
2. Stephen Spotte1993. Marineaquarium keeping. John wileyand sons, USA

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AQUACULTURE TECHNOLOGY BOARD OF STUDIES: 2020-2021
SEMESTER VI– ELECTIVE PAPER

ORNAMENTAL FISHERY

(Course Code: AQ6308P)

PRACTICAL SYLLABUS

1. Study of aerators and types of 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. Breeding of egg layers
7. Breeding of livebearers
8. Evaluation of significance of aquaria for commercial and domestic use

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AQUACULTURE TECHNOLOGY BOARD OF STUDIES: 2020-2021

SEMESTER VI– CLUSTER ELECTIVE IA
FISH PROCESSING TECHNOLOGY

(Course Code: AQCE20322)

UNIT 1: INTRODUCTION:

1-1 Principles of fish preservation. Importance of hygiene and sanitation in fish handling.
1-2 Quality of water and ice in fish handling and processing. Preparation of ice.
1-3 Different types of ice used in the seafood industry and their merits.
1-4 Preservation by refrigerated seawater and chilled sea water

UNIT 2: FREEZING AND CANNING:

2-1 Fundamental principles involved in chilling and freezing of fish and fishery products.
2-2 Various freezing methods. Freezing of shrimps and fishes.
2-3 Changes during the cold storage of fish and fishery products. Principles involved in canning of fish.
2-4 4 Different types of containers. Different stages of canning of Tuna. Retortable pouch processing.

UNIT 3: DRYING, SMOKING AND FREEZE-DRYING:

3-1 Principles of smoking, drying, and salting of fish, factors affecting drying. Traditional drying/ curing methods. Different types of drying.
3-2 2 Drying of fish and prawns. Packing and storage of dried products. Spoilage of dried products.
3-3 .3-3Preventive measures. Standards for dry fish products. Colds smoking. Principles of freeze drying.
3-4 Accelerated freeze-drying and packing of freeze-dried products. Modern methods of preservation by irradiation and modified atmospheric storage.

UNIT 4: PACKING, COLD STORAGE

4-1 Functions of packing different types of packing materials and its quality evaluation.
4-2 Packing requirements for frozen and cured products.
4-3 Statutory requirements for packing labeling requirements.
4-4 Different types of cold storages. Insulated and refrigerated vehicles

UNIT-5-EXPORT OF FISHERY PRODUCTS

5.1. Export of fishery products from India-major countries, important products, export documents and procedures
5.2 Prospects and constraints in export including tariff and non-tariff barriers, marine insurance, export incentives, registered exports

Text books:

1. K.Gopakumar, Fish Processing Technology, ICAR, NewDelhi
2. T.K.Govindan, Fish Processing Technology Oxfor & IBH Publication Co.
3. K.K.Balachandran Fish Canning– Principles &Practices.
4. Borgstrom, G.Fish asFood.
5. K.K.Balachandran, Postharvest Technologyin Fish and Fishery Products.
6. Moorjani, M.V.Fish ProcessinginIndia.
7. Connell,J.J. Advances in Fisheryscience andTechnology.
8. CIFT.Manualof QualityControl in Fish and FisheryProducts. 9. Gopakumar,K.FishPackagingTechnology

Reference Books:

1. A.M.Martin,Fisheries– ProcessingChapman &Hall,Madras 2. Ed.G.M.Hall– Fish ProcessingTechnologyChopra &Hall. Madras.

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AQUACULTURE TECHNOLOGY BOARD OF STUDIES: 2020-2021
SEMESTER VI– CLUSTER ELECTIVE IA

(Course Code: AQCE20322P)

FISH PROCESSING TECHNOLOGY

PRACTICAL SYLLABUS

Title: Fish Processing Technology and Quality Control

Experiments:
1. Determination of moisture content in fish and fishery products
2. General description–freezing
3. Processing shrimp
4. Filleting of fish
5. Drying of fish
6. Organoleptic analysis of fish
7. Preparation of fishery by-products
8. Preparation of shark fin rays fish maws, chitin, fish wafer
9. Fish pickling
10. Value-added fishery products, fish curry, cutlets fish finger.
11. Preparation of surimi

Filed visit:
1. Visit to sea food pre-processing plants
2. Visit to fish processing plants

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AQUACULTURE TECHNOLOGY BOARD OF STUDIES: 2020-2021

SEMESTERVI– CLUSTER ELECTIVE IB

(Course Code: AQCE20323)
FISHERY MICROBIOLOGY AND FISHERY BYPRODUCTS

UNIT 1: INTRODUCTION:

1-1 History and development of microbiology–Different members of the microbial community – General characteristics of bacteria, fungi, viruses, algae and protozoans.

1-2 Ultra-structure of prokaryotic cell– structure and function of bacterial cell wall, plasma membrane, capsule, flagella and endospore. Structure of fungi and yeast cell.

1-3 Ultrastructure of virus–classification of viruses, Life cycle bacterio phages–lytic and lysogenic cycle.

UNIT 2: AQUATIC MICROBIOLOGY:

2-1 1 Microflora of the aquatic environment, Different culture techniques.

2-2 Nutrition and growth of bacteria–different types of media for isolation of bacteria and fungi. Isolation, enumeration, preservation, and maintenance of cultures.

2-3 Routine tests for identification of bacteria–morphological, cultural biochemical, and serological. Basics of mycological and virologial techniques.

UNIT 3: FISH MICROBIOLOGY:

3-1 Perishability of seafood– Fish as an excellent medium for growth of microorganisms.

3-2 Spoilage microflora of fish and shellfish.

3-3 Intrinsic and extrinsic factors affecting spoilage.

UNIT 4: FISHERY BY-PRODUCTS AND VALUE ADDED PRODUCTS

4-1 Fish meal, fish protein concentrate, shark fin rays, fish maws, isinglass, fish liver oil, fish body oil, fish hydrolysates, chitin, chitosan, glucosamine hydrochloride, squalene, pearl essence, ambergris, gelatin, fish silage, fish ensilage and seaweed products like agar, alginic acid, and carrageenan.

4-2 2 Advantages of value-addition. Fish mince and Surimi. Analog and fabricated products. Preparation of coated fishery products.

4-3 Preparation of products viz. fish/prawn pickle, fish wafers, prawn chutney powder, fish soup powder, fish protein hydrolysate, fish stacks, fillets, fish curry, mussel products, marinated products.

UNIT-V VALUE ADDED PRODUCTS:

5.1 Value addition in sea food. Different of value added products from fish and shell fish – status of value addition in Indian seafood sector. Advantages of value addition. Fish mince and Surimi.

5.2 Analog and fabricated products. Preparation of coated fishery products.

5.3 Preparation of products viz.fish/prawn pickle, fish wafers, prawn chutney powder, fish soup powder, fish protein hydrolysate, fish stacks, fillets, fish curry, mussel products, marinated products.

Text Books:

1. Pelzar,Reid&Chan–Microbiology
2. Prescolt, Harley&Klein– Microbiology
3. Adelogerg,Ingra&Wheates–Introduction to Microbial World
4. Windsor andBarlow.Introduction to FisheryByproducts.
5. CIFT.Proceedings onSummerInstitute on Non-traditional DiversifiedFish Products &Byproducts.
6. Anon. ProductivityinAquatic Bodies.
7. Chincheste,C.O.andGraham,H.D.MicrobialSafetyof FisheryProducts.
8. Amerine,M.A.andPangborm,R.M.PrinciplesofSensoryEvaluation ofFoods.
9. Connell,J.J.Control ofFish Quality
10. Bigh,E.G. Seafood Scienceand Technology
11. Gopakumar.K Tropical FisheryProducts

Reference Books

1. Kreuzer,R. FisheryProducts.
2. Borgstrom,G .Fish asFood
3. Suzuki,T. Fish and KrillProtein:ProcessingTechnology

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AQUACULTURE TECHNOLOGY BOARD OF STUDIES: 2020-2021

SEMESTERVI– CLUSTER ELECTIVE IB (Course Code: AQCE20323P)

FISHERY MICROBIOLOGY AND FISHERY BYPRODUCTS

Practical II

Experiments/Activities

1. Sterilization technique-dry heating, autoclaving
2. Media preparation
3. Isolation and maintenance of bacteria from fishes and water.
4. Gram staining of bacteria
5. Enumeration of bacteria by TPC method
6. Enumeration of total coli forms.
7. Evaluation of fish/fishery products for organoleptic, chemical and microbial quality Collection: Collection of fishery by-products

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AQUACULTURE TECHNOLOGY BOARD OF STUDIES: 2020-2021
SEMESTER VI– CLUSTER ELECTIVE IC (Course Code: AQCE20324)

QUALITY CONTROL IN PROCESSING PLANTS

UNIT I:

1-1 1 Quality management, total quality concept and application in fish trade.
1-2 2 Quality assessment of fish and fishery products- physical, chemical, organoleptic and microbiological.
1-3 3 Quality standards. Quality Assurance. Inspection and quality assurance:
1-4 Fish inspection in India, process; water quality in fishery industry, product quality, water analysis, treatments, chlorination, ozonisation, UV radiation, reverseosmosis, techniques to remove pesticides and heavymetals.

UNIT 2:

2.1Sensory evaluation of fish and fish products, basic aspects, different methods of evaluation, taste panel selection & constitution,
2-2 Statistical analysis Quality problem in fishery products: good manufacturing practices.
2-3 HACCP and ISO9000 series of quality assurance system, validation and audit. National and international standards, EUregulation for fish export trade,

UNIT 3:

3-1 IDPandSATformationsincertificationofexportworthinessoffishprocessingunits, regulations for fishing vessels pre-processing and processing plants, euregulations.
3-2 Factory sanitation and hygiene: National and international requirements, SSOP.

UNIT 4:

4-1 1 Hazards in seafoods: Sea food toxins, biogenicamines, heavymetals and industrial pollutants.
4-2 Infectionandimmunity,Microbialfoodpoisoning,bacteriaofpublichealthsignificanceinfish/fisheryproducts/environmentsSalmonella,Clostridia,Staphylococcus,E.coli,Streptococcus,Vibrio, Aeromonas, Listeria, Yersinia, Bacillus.
4-3 Laboratorytechniquesfordetectionandidentificationoffoodpoisoningbacteria.Mycotoxinsincured fish, bacterial associated with fish disease.

Unit-5 Hazards in seafoods

5-1 Hazards in seafoods: Sea food toxins, biogenic amines, heavy metals and industrial pollutants.
5-2 Infection and immunity, Microbial food poisoning, bacteriaofpublichealthsignificanceinfish/fisheryproducts/environments Salmonella, Clostridia, Staphylococcus, E.coli, Streptococcus, Vibrio, Aeromonas, Listeria, Yersinia, Bacillus.
5-3 Laboratorytechniquesfordetectionandidentificationoffoodpoisoningbacteria.Mycotoxinsincured fish, bacterial associated with fish disease.

PRESCRIBEDBOOK(S):

1. Adivi Reddysv 1997.An introduction to extensioneducation.Oxford&IBH Co.Pvt.Ltd. New Delhi
2. Jayaraman R 1996. FisheriesEconomics. Tamilnadu VeterinaryandAnimal ScienceUniversity. Tuticorn
3. Subba Rao N 1986. Economics of Fisheries.Dayapublishinghouse, Delhi

REFERENCES:

4. Dewwett KKand Varma JD 1993. Elementaryeconomic theory. S.chand, NewDelhi
5. KorakandyR 1996. Economics of Fisheries Mangement. Daya PublishingHouse, Delhi
6. Tripathi SD 1992. Aquaculture Economics. Asian FisheriesSociety,Mangalore.

7. Ellis Harward. 18FelixS,RijiJohn K,Prince Jeyaseelan MJ&Sundararaj V. 2001BacterialFishPathogens(Diseases inFarmand Wild)
8. FishDiseaseDiagnosis and HealthManagement.FisheriesCollege andResearch Institute,T.N. Veterinaryand Animal SciencesUniversity. Thoothukkudi.Inglis V, Roberts RJ &BromageNR. 1993.

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SEMESTERVI– CLUSTER ELECTIVE IC
(Course Code: AQCE20324P)

QUALITY CONTROL IN PROCESSING PLANTS

PRACTICALS

Project work/on-job training at industry