

**D.N.R. College (Autonomous), Bhimavaram**  
(Affiliated to Adikavi Nannaya University)  
I B.Sc. Aquaculture Technology Syllabus w.e.f. 2017-2018  
Semester-I  
Paper-I – Basic Principles of Aquaculture

**Unit – I**

**1. Introduction**

- A. Concept of Blue Revolution – History and definition of Aquaculture
- B. Scope of Aquaculture at global level, India and Andhra Pradesh.
- C. Fresh water aquaculture, brackish water aquaculture and mariculture
- D. Different Aquaculture systems – Pond, Cage, Pen, Running water, Extensive, Intensive and Semi-Intensive Systems and their significance. Monoculture, Polyculture and Monosex culture systems.
- E. Aquaculture versus Agriculture; Present day needs with special reference to Andhra Pradesh.

**Unit – II**

**2. Pond Ecosystem**

- A. General concepts of Ecology, Carrying Capacity and Food chains
- B. Lotic and lentic systems, streams and springs
- C. Nutrient cycles in culture ponds – Phosphorus, Carbon and Nitrogen
- D. Importance of Plankton and Benthos in culture ponds, nutrient dynamics and algal blooms.
- E. Concepts of productivity, estimation and improvement of productivity.

**Unit – III**

**3. Types of Fish Ponds**

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

**Unit – IV**

**4. Pond preparation**

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

**Unit – V**

**5. Pond Management Factors**

- A. 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
- B. Physico-chemical conditions of soil and water optimum for culture – temperature, depth, turbidity, light, water and shore currents,  $P_H$ , BOD,  $CO_2$  and nutrients; measures to increase oxygen and reduce ammonia & hydrogen sulphide in culture ponds; correction of  $P_H$ .
- C. Eradication of predators and weed control – Advantages and disadvantages of weed, weed plants in culture ponds, aquatic weeds, weed fish, toxins used in weed control and control of predators.

**D.N.R. College (Autonomous), Bhimavaram**  
(Affiliated to Adikavi Nannaya University)  
I B.Sc. Aquaculture Technology Syllabus w.e.f. 2017-2018  
Semester-II  
Paper-II – Biology of Fin fish & Shell fish

**Unit – I**

**1. General characters & Classification of Cultivable Fin & Shell Fish**

- A. General Characters and classification of fishes, crustaceans and molluscs upto the level of class.
- B. Fish, Crustaceans and Molluscs of commercial importance.
- C. Sense organs of fishes, crustaceans and molluscs.
- D. Specialized organs in fishes – electric organ, venom and toxins.
- E. Buoyancy in fishes – swim bladder and mechanism of gas secretion.

**Unit – II**

**2. Food, Feeding and Growth**

- A. Natural fishfood, 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.
- B. Principles of Age and growth determination; growth regulation, Growth rate measurement – scale method, otolith method, skeletal parts as age indicators.
- C. 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.
- D. Length-weight relationship, condition factor/Ponderal index, relative condition factor.

**Unit – III**

**3. Reproductive Biology**

- A. Breeding in fishes, breeding places, breeding habits & places, breeding in natural environment and in artificial ponds, courtship and reproductive cycles.
- B. Induced breeding in fishes.
- C. Breeding in shrimp, oysters, mussels, clams, pearl oyster, pila, freshwater mussel and cephalopods.

**Unit – IV**

**4. Development**

- A. Parental care in fishes, ovo-viviparity, oviparity, viviparity, nest building and brooding.
- B. Embryonic and larval development of fishes.
- C. Embryonic and larval development of shrimp, crabs and molluscs of commercial importance.
- D. Environmental factors affecting reproduction and development of cultivable aquatic fin & shell fish.

**Unit – V**

**5. Hormones & Growth**

- A. Endocrine system in fishes
- B. Neurosecretary cells, androgenic gland, ovary, Y-organ, chromatophores, pericardial glands and cuticle.
- C. Molting, molting stages, metamorphosis in crustacean shell fish.

**D.N.R. College (Autonomous), Bhimavaram**  
(Affiliated to Adikavi Nannaya University)  
I B.Sc. Aquaculture Technology Syllabus 2018-2019  
Semester-I  
Paper-I – Basic Principles of Aquaculture

**Unit – I**

**1. Introduction**

- A. Concept of Blue Revolution – History and definition of Aquaculture
- B. Scope of Aquaculture at global level, India and Andhra Pradesh.
- C. Fresh water aquaculture, brackish water aquaculture and mariculture
- D. Different Aquaculture systems – Pond, Cage, Pen, Running water, Extensive, Intensive and Semi-Intensive Systems and their significance. Monoculture, Polyculture and Monosex culture systems.
- E. Aquaculture versus Agriculture; Present day needs with special reference to Andhra Pradesh.

**Unit – II**

**2. Pond Ecosystem**

- A. General concepts of Ecology, Carrying Capacity and Food chains
- B. Lotic and lentic systems, streams and springs
- C. Nutrient cycles in culture ponds – Phosphorus, Carbon and Nitrogen
- D. Importance of Plankton and Benthos in culture ponds, nutrient dynamics and algal blooms.
- E. Concepts of productivity, estimation and improvement of productivity.

**Unit – III**

**3. Types of Fish Ponds**

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

**Unit – IV**

**4. Pond preparation**

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

**Unit – V**

**5. Pond Management Factors**

- A. 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
- B. Physico-chemical conditions of soil and water optimum for culture – temperature, depth, turbidity, light, water and shore currents,  $P_H$ , BOD,  $CO_2$  and nutrients; measures to increase oxygen and reduce ammonia & hydrogen sulphide in culture ponds; correction of  $P_H$ .
- C. Eradication of predators and weed control – Advantages and disadvantages of weed, weed plants in culture ponds, aquatic weeds, weed fish, toxins used in weed control and control of predators.

**D.N.R. College (Autonomous), Bhimavaram**  
(Affiliated to Adikavi Nannaya University)  
I B.Sc. Aquaculture Technology Syllabus 2018-2019  
Semester-II  
Paper-II – Biology of Fin fish & Shell fish

**Unit – I**

**1. General characters & Classification of Cultivable Fin & Shell Fish**

- A. General Characters and classification of fishes, crustaceans and molluscs upto the level of class.
- B. Fish, Crustaceans and Molluscs of commercial importance.
- C. Sense organs of fishes, crustaceans and molluscs.
- D. Specialized organs in fishes – electric organ, venom and toxins.
- E. Buoyancy in fishes – swim bladder and mechanism of gas secretion.

**Unit – II**

**2. Food, Feeding and Growth**

- A. Natural fishfood, 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.
- B. Principles of Age and growth determination; growth regulation, Growth rate measurement – scale method, otolith method, skeletal parts as age indicators.
- C. 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.
- D. Length-weight relationship, condition factor/Ponderal index, relative condition factor.

**Unit – III**

**3. Reproductive Biology**

- A. Breeding in fishes, breeding places, breeding habits & places, breeding in natural environment and in artificial ponds, courtship and reproductive cycles.
- B. Induced breeding in fishes.
- C. Breeding in shrimp, oysters, mussels, clams, pearl oyster, pila, freshwater mussel and cephalopods.

**Unit – IV**

**4. Development**

- A. Parental care in fishes, ovo-viviparity, oviparity, viviparity, nest building and brooding.
- B. Embryonic and larval development of fishes.
- C. Embryonic and larval development of shrimp, crabs and molluscs of commercial importance.
- D. Environmental factors affecting reproduction and development of cultivable aquatic fin & shell fish.

**Unit – V**

**5. Hormones & Growth**

- A. Endocrine system in fishes
- B. Neurosecretary cells, androgenic gland, ovary, Y-organ, chromatophores, pericardial glands and cuticle.
- C. Molting, molting stages, metamorphosis in crustacean shell fish.

**D.N.R. College (Autonomous), Bhimavaram**  
(Affiliated to Adikavi Nannaya University)  
II B.Sc. Aquaculture Technology Syllabus w.e.f. 2018-2019  
Semester-III  
Paper-III – Fish Nutrition & Feed Technology

**Unit – I**

**1. Nutritional requirements of cultivable fish**

- a) Requirements for energy, proteins, carbohydrates, lipids, fiber, micronutrients for different stages of cultivable fish and prawns.
- b) Essential aminoacids and fatty acids, protein to energy ratio, nutrients interactions and protein sparing effect.
- c) Dietary sources of energy, effect of ration on growth, determination of feeding rate, check tray.
- d) Factors affecting energy partitioning and feeding.
- e) Feed characteristics and feed acceptability (Additional input).

**Unit – II**

**2. Forms of feeds & Feeding methods**

- a) Feed conversion efficiency, Feed conversion ratio and protein efficiency ratio.
- b) Wet feeds, moist feeds, dry feeds, mashes, pelleted feeds, floating and sinking pellets, advantages of pelletization.
- c) Manual feeding, demand feeders, automatic feeders, surface spraying, bag feeding and tray feeding.
- d) Feeding devices, feeding strategies, feeding response

**Unit – III**

**3. Feed manufacture and storage**

- a) Feed ingredients and their selection, nutrient composition and nutrient availability of feed ingredients
- b) Feed formulation – Extrusion processing and steam pelleting, grinding, mixing and drying, pelletization and packing.
- c) Water stability of feeds, farm made aqua feeds, microcoated feeds, micro-encapsulated feeds and micro-bound diets.
- d) Microbial, insect and rodent damage of feed, chemical spoilage during storage period and proper storage methods.

**Unit – IV**

**4. Feed additives and non-nutrient ingredients**

- a) Binders, anti-oxidants, probiotics
- b) Feed attractants and feed stimulants
- c) Enzymes, hormones, growth promoters and pigments.
- d) Anti-metabolites, aflatoxins and fiber.

**5. Nutritional deficiency in cultivable fish**

- a) Protein deficiency, vitamin and mineral deficiency symptoms.
- b) Nutritional pathology and anti-nutrients
- c) Importance of natural and supplementary feeds, balanced diet.

**D.N.R. College (Autonomous), Bhimavaram**  
(Affiliated to Adikavi Nannaya University)  
II B.Sc. Aquaculture Technology Syllabus w.e.f. 2018-2019  
Semester-IV  
Paper-IV – Fresh Water & Brackish Water Aquaculture

**Unit – I**

**1. Introduction to Fresh Water Aquaculture**

- a) Status, Scope and prospects of Fresh Water Aquaculture in the World, India and A.P.
- b) Fresh Water Fisheries research institution in India (CIFRI, CIFA, NRCCWF)  
(Additional input)
- c) Different Fresh Water Aquaculture Systems – Pond, Raceway Culture, cage, Pen, Recirculation system

**Unit – II**

**2. Carp Culture**

- a) Major cultivable Indian Carps – Catla, Labeo, Cirrhinus and Minor carps.
- b) Exotic fish species introduced to India – Tilapia, Pangassius and Clarius sp, exotic carps.
- c) Composite fish culture system of Indian and Exotic carps.
- d) Impact of exotic fish, compatibility of Indian and exotic carps and competition among them.

**Unit – III**

**3. Culture of Air-breathing and cold water fish**

- a) Recent developments in the culture of Clarius, Anabas, Murrels.
- b) Air-breathing fishes – seed resources, feeding management and production.
- c) Cold water fishes – Biology, feed resources, feeding management and production.

**Unit – IV**

**4. Culture of prawn**

- a) Fresh water prawns of India – commercial value
- b) Macrobrachium resenbergi and M.malcomsonii – Biology, seed production, Pond preparation, stocking management of nursery and grow-out ponds, feeding, morphotypes and harvesting.

**5. Culture of brackish water species**

- a) Estuarine environment – Physico – Chemical properties of estuaries, classification of estuaries (additional input)
- b) Culture of P.monodon – Hatchery technology and culture practices including feed and disease management.
- c) Culture of P.vannamei – Hatchery technology and culture practices including feed and disease management.
- d) Mixed culture of fish and prawns.