(Affiliated to Adikavi Nannaya University)
I B.Sc. Aquaculture Technology Syllabus w.e.f. 2020-2021
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. Different Aquaculture systems – Pond, Cage, Pen, Running water, Extensive, Intensive and Semi-Intensive Systems and their significance.
   D. Monoculture, Polyculture and Monosex culture systems

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 ponds
   C. Functional classification of ponds -rearing, production, stocking and quarantine ponds
   D. Fish Hatchery design

Unit – IV

4. **Pond preparation**
   A. Important factors in the construction of an ideal fish pond – site selection, topography
   B. Important factors in the construction of an ideal fish pond- nature of the soil, water resources
   C. Lay out and arrangements of ponds in a fish farm
   D. 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
   B. Role of nutrients; NPK contents of different fertilizers and manures used in aquaculture; and precautions in their application

C. Physico-chemical conditions of soil and water optimum for culture –temperature, depth, turbidity, light, water and shore currents, PH, DOD, CO_2 and nutrients; measures to increase oxygen and reduce ammonia & hydrogen sulphide in culture ponds; correction of PH

D. 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

Reference Books:

1. Pillay TVR & M.A.Dill, 1979. Advances in Aquaculture. Fishing News Books Ltd., London
2. Stickney RR 1979. Principles of Warm Water Aquaculture. John Wiley & Sons Inc. 1981
3. Boyd CE 1982. Water Quality Management for Pond Fish Culture. Elsivier Scientific Publishing Company.
4. Bose AN et.al., 1991. Costal Aquaculture Engineering. Oxford & IBH Publishing Company Pvt.Ltd.
5. Jhingran VG 1998. Fish and Fisheries of India. Hindusthan Publishing Corporation, New Delhi
6. Pillay TVR, 1996. Aquaculture Principles and Practices, Fishing News Books Ltd., London

Guidelines to Paper Setter

1) **Part – I** Essay type questions. Each question carries TEN marks. 5x10=50 M
FIVE questions are to be given at the rate of TWO internal choice questions from each unit (Total Five units) and student has to answer ALL.

2) **Part – II** Paragraph type questions. Each question carries FIVE marks. 5x5=25 M
EIGHT questions are to be given and student has to answer any FIVE

3) **Other information:**
Duration of examination – 3hrs. Maximum Marks : 75 M

Blue Print

Questions	Unit-I	Unit-II	Unit-III	Unit-IV	Unit-V
Essay Questions (1-5)	A or B	A or B	A or B	A or B	A or B
Short Answer questions (6-13)	01	02	01	02	02

AP STATE COUNCIL OF HIGHER EDUCATION
w.e.f. 2020-21 (Revised in April, 2020)
AQUACULTURE TECHNOLOGY COURSE SYLLABUS

SEMESTER - I – PAPER-I
BASIC PRINCIPLES OF AQUACULTURE

PRACTICALS:

1. Estimation of Carbonates, Bicarbonates in water sampies
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

PRESCRIBED BOOK(S):

1. Jhingran VG 1998. 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 & Sons Inc. 1981
3. Boyd CE 1982. Water Quality Management for Pond Fish Culture. Elsivier Scientific Publishing Company.
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I B.Sc. Aquaculture Technology Syllabus w.e.f. 2020-2021

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 up to the level of Class

B. Fish, Crustaceans and Molluscs of commercial importance

C. Sense organs of fishes, crustaceans and molluscs

D. Buoyancy in fishes- swim bladder and mechanism of gas secretion

Unit – II

2. Food, feeding and growth

A. 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

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

B. Breeding in natural environment and in artificial ponds, courtship and reproductive cycles

C. Induced breeding in fishes

D. Breeding in shrimp, pearl oyster, pila, 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

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

D. Molting, molting stages, metamorphosis in crustacean shell fish

References:

1. Tandon K.K. & Johal M.S. 1996. Age and Growth in Indian Fresh Water Fishes. Narendra

I B.Sc. Aquaculture Technology Practical Syllabus w.e.f. 2020-2021

Semester – II

Paper II – Biology of Fin fish & Shell fish

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

Additional input:

13. Visit to Shrimp & Prawn hatchery to study developmental changes

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AQUACULTURE TECHNOLOGY COURSE 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 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 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
3.2Feed formulation – extrusion processing and steam pelleting, grinding, mixing and drying, pelletization, and packing
3.3Water 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

4.1Binders, anti-oxidants, probiotics
4.2Feed attractants and feed stimulants
4.3Enzymes, hormones, growth promoters and pigments
4.4 Anti-metabolites, afflatoxins and fiber

UNIT-V: Nutritional Deficiency In Cultivable Fish:

(a). Protein deficiency, vitamin and mineral deficiency Symptoms.

(b). Nutritional pathology and ant-nutrients.

(c). Importance of natural and Supplementary feeds.

(d). Importance of balanced diet.

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AQUACULTURE TECHNOLOGY COURSE SYLLABUS

SEMESTER III – PAPER-III
FISH NUTRITION & FEED TECHNOLOGY

PRACTICALS:

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

PRESCRIBED BOOK(S):

1. HALVER JE 1989. Fish nutrition. Academic press, San diego

REFERENCES:

1. Lovell rt 1998. Nutrition and feeding of fishes, Chapmann & Hall, New York
2. Sena de silva, trevor a anderson 1995. Fish nutrition in aquaculture. Chapmann & Hall, New York

RAYALASEEMA UNIVERSITY
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2nd YEAR B.Sc AQUACULTURE TECHNOLOGY

IV SEMESTER THEORY SYLLABUS

PAPER - IV FRESH WATER & BRACKISH WATER AND AQUACULTURE

PAPER -IV

UNIT - I : Introduction to fresh water Aquacultures :

(A) Status, scope and prospects of fish water aquaculture in the world. India and A.P.

(B) Different fresh water aquaculture systems.

UNIT - II : Carp culture :

(A) Majar cultivable india carps - Labeo, catla and cirhinus & Minor carps.

(B) Exotic fish species introduced to india - Tilapia pangassius and cyrinus carpio.

(C) Composite fish culture system of india and exotic carps.

UNIT - III : Culture of Air - Breathing and cold water fish :

(A) Recent developments in the culture of clarius, Anabas murrels.

(B) Seed resources, feeding, managment and production.

(C) Special systems of Aquaculture - breef study of culture in running water re-circulatory systems, cages and pens, sewage - fed fish culture.

UNIT - IV : Culture of Prawn :

(A) Fresh water prawns of India - commercial value.

(B) Macrobra chium ressenbergi and M.Malcornsoni - biology, seed production.

(C) Pond preparation, stocking managment of nursery and grow - out ponds feeding and harvesting.

UNIT - V : Culture of Brodish water species :

(A) Culture of P.Mondon - Hatchery technology and culture practieces including feed and disseases managment .

(B) Culturing in Fish

(C) Culturing in Prawns.

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2nd YEAR B.Sc AQUACULTURE TECHNOLOGY

IV SEMESTER PRACTICAL SYLLABUS

PAPER - IV FRESH WATER & BRACKISH WATER AND AQUACULTURE

PAPER -IV

(1) Identification of importent cultirable 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 prawns.

(6) Identification of mussels and clams.

(7) Field visit nots.

(8) Record book.

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2nd YEAR B.Sc AQUACULTURE TECHNOLOGY

V SEMESTER THEORY SYLLABUS

PAPER - V FISHER'S HEALTH MANAGMENT , EXTENSION AND MARKETING

PAPER -V

UNIT - I : Diseases of Fin fish :

(A) Fungal disceases : Saprolegnisis, Branchiomycosis and gill rot diseases.

(B) Viral diseases : Spring viraemia of carp, Swim bladder inflammation of carp (SBI) and viral Hemorhage spticomia (VHS).

(C) Bacterial diseases : Bactirial gill disceas and clumnoris.

UNIT - II : Diseases of Shell fish :

(A) Majar shrimp viral diseases : Infections hypodermal, Haemopoitic Necrosis and White spot syndromevirus.

(B) Bacterial diseases of shell fish : Vibriosis, blackgill and Early mortality syndrome (EMS)

(C) Fungal diseases inshrimp : Larval Mycosis, Black gill.

UNIT - III : Fish Health Management :

(A) Application and Development of vaccins.

(B) Quaratine and Singification of fish health managment.

(C) Good feed management for health managements.

UNIT - IV : Fisherish Economic - 1 :

(A) Method's and Economic Analysis.

(B) Aquaculture Economics : Application of Economic priciple's of Aquaculture.

(C) Cost and Carring's of Aquaculture system carp culture shrimp farming system's.

UNIT - V : Fishrish Economic-2 :

A) Sosio Economic condition's of fisher man in Andhra Pradesh.

B) Role of mostyafed and "NABARD" in Uplifing fishermen's conditions fishermen's co-operative's contribution of fisheries to the national economy.

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2nd YEAR B.Sc AQUACULTURE TECHNOLOGY

V SEMESTER PRACTICAL SYLLABUS

PAPER - V FISHER'S HEALTH MANAGMENT , EXTENSION AND MARKETING

PAPER -V

(1) Identification of Fungal diseases in fishes.

(2) Identification of Bactirial diseases in fishes.

(3) Identification of Viral diseases in fishes.

(4) Identification of Fungal diseases in shrimps.

(5) Identification of Bactirial diseases in shrimps.

(6) Identification of Viral diseases in shrimps.

(7) Field visit - Notes.

(8) Record notes.

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III YEAR (B.Sc) AQUACULTURE TECHNOLOGY

V SEMISTER THEORY SYLLABUS

PAPER – 6 ORNAMENTAL FISHERIES

UNIT – I

a) Aquarium and ornamental fishes – Introduction
b) Present status of aquarium trade in world and India
c) Aquarium accessories, aerators, filters, lighters and heaters

UNIT - II

a) Live bearers, gold fish, koi, gourami, barbs and tetras, angel fish and chi chid fish
b) Brood stock development breeding, larval rearing and grow out
c) Larval feeds and feeding

UNIT- III

a) Major marine ornamental resources of India
b) Collection and transportation of live fish use of anaesthetics
c) Breeding of marine ornamental fish

UNIT - IV

a) Setting up fresh water, marine and reef aquarium
b) Water quality management for different types of aquarium
c) Common disease of aquarium fish, diagnosis and treatment

UNIT – V

a) Commercial production units of ornamental fish requirements and design
b) Mass production of aquarium plants
c) Retail marketing and export of ornamental fish

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III YEAR (B.Sc) AQUACULTURE TECHNOLOGY

V SEMISTER (PRACTICAL SYLLABUS)

PAPER – 6 ORNAMENTAL FISHERIES

1. Identification of common fresh water aquarium fishes
2. Identification of common marine aquarium fishes
3. Collection and identification of aquarium plants
4. Breeding of breeders
5. Identification and collection of ornamental fishes
6. Types of aerators
7. Field trip
8. Record

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KURNOOL - 518007, A.P

III YEAR (B.Sc) AQUACULTURE TECHNOLOGY

V SEMISTER THEORY SYLLABUS

PAPER – 7 CRUSTACEANS CULTURE

UNIT – I

A) Status of crustacean forming in India, food and export value of crustaceans
B) Present status of their resources and culture practices

UNIT - II

A) Classification of crustaceans up to level of species with example
B) Important cultivable species of shrimps and prawn their food, feeding habits and their reproductive biology
C) Types of forming – traditional extensive, semi intensive methods

UNIT - III

A) Crustacean culture in cages, Re-circulatory system, rice fields, super intensive, ultra intensive system
B) Supplementary feeding, dry feeds, wet feeds role of artificial feeds, feed ingridients and nutrition quality

UNIT – IV

A) Forming of prawns and shrimps pond and large scale forming
B) Composite culture
C) Forming of curb and lobster

UNIT – V

A) Diseases of crustaceans. Bacterial fungal and viral diseases encountered during large scale culture of crustaceans

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III YEAR (B.Sc) AQUACULTURE TECHNOLOGY

V SEMISTER (PRACTICAL SYLLABUS)

PAPER – 7 CRUSTACEANS CULTURE

1. Identification of Bacterial disease in crustaceans
2. Identification of fungal Disease in crustaceans
3. Identification of Viral disease in virus
4. Types of crustaceans
5. Identification of Bacterial disease in shrimp
6. Identification of Fungal disease in shrimp
7. Identification of Viral disease in shrimp
8. Field trip
9. Record