



ADIKAVI NANNAYA UNIVERSITY :: RAJAHMAHENDRAVARAM
B.Sc AQUACulture Technology Syllabus (w.e.f: 2020-21 A.Y)

UG PROGRAM (4 Years Honors)
CBCS - 2020-21

SUBJECT
AQUACULTURE TECHNOLOGY



Syllabus and Model Question Papers



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Note: BOS is to provide final soft copy in PDF and word formats and four copies of hard copies in bounded form to the office of Dean Academic affairs.



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1. Resolutions of the Board of Studies

Meeting held on

Time:

At:

Adikavi Nannaya University, Rajamahendravaram

Agenda:

1. Adoption of revised-common program structure and revising/updating course-wise syllabi (in the prescribed format) as per the guidelines issued by APSCHE
2. Adoption of regulations on scheme of examination and marks/grading system of the UG program
3. Preparation of Model question papers in prescribed format
4. List of equipment / software requirement for each lab/practical
5. Eligibility of student for joining the course
6. Eligibility of faculty for teaching the course
7. Any specific instructions to the teacher/paper-setter/student/ chief-superintendent/ paper-evaluator
8. List of paper-setters/paper evaluator with phone, email-id in the prescribed format

Members present:

1. Dr.K. Ramaneswari
2. Dr. N. Sreenivas
- 3.

Resolutions:

Recommended Combination: Zoology, Chemistry & Aquaculture Technology

“The domain subject “**AQUACULTURE TECHNOLOGY**”, embracing the fields of biology of commercial aquatic organisms like fish. Prawn, seaweed, pearl oysters, hatchery technology, culture practices, disease management, food and feeding habits, feed manufacturing, marketing, economics etc, is very much market-oriented course as the state of Andhra Pradesh is having longest coastal belt providing greater employment opportunities to the community.



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DETAILS OF COURSES AND CREDITS

Semester	Paper	Course Title	Course Type (T/P/L)	Teaching Hrs./Week	Credits	Max. Marks	Max. Marks
				Science :4+2	Science :4+1	Internal/Conti./Mid Assessment	Sem-End Exam
I	I	Basic Principles of Aquaculture	T	4	04	25	75
		Basic Principles of Aquaculture - I	L	2	01	-	50
II	II	Biology of Fin Fish & Shell Fish	T	4	04	25	75
		Biology of Fin Fish & Shell Fish - II	L	2	01	-	50
III	III	Fish Nutrition & Feed Technology	T	4	04	25	75
		Fish Nutrition & Feed Technology L - III	L	2	01	-	50
IV	IV	Freshwater & Brackish water Aquaculture	T	4	04	25	75
		Practical - IV	L	2	01	-	50
	V	Fish Health Mangement & Fisheries Economics	T	4	04	25	75
		Practical - V	L	2	01	-	50
V	VI	SEC -1	T	4	04	25	75
		Practical- VI	L	2	01	-	50
	VII	SEC-2	T	4	04	25	75
		Practical -VII	L	2	01	-	50
VI		Apprentice Ship					

Note: * Course Type Code : T-Theory, L - Lab, P: Problem solving



GENERAL CURRICULAR ACTIVITIES :

❖ Lecturer-based:

- 1) **Class-room activities:** Organization of Group discussions, question-answer sessions, scientific observations, use of audio-visual aids, guidance programmes, examination and evaluation work (scheduled and surprise tests), quizzes, preparation of question banks, student study material, material for PG entrance examinations etc.
- 2) **Library activities:** Reading books and magazines taking notes from prescribed and reference books and preparation of notes on lessons as per the syllabus; Reading journals and periodicals pertaining to different subjects of study; Making files of news-paper cuttings etc.
- 3) **Lab activities:** Organization of practicals use of virtual laboratory , maintenance of lab attendance registers/log registers, maintenance of glassware and chemicals
- 4) **Activities in the Seminars, workshops and conferences:** Organization of at least one seminar/workshop/conference per academic year either on academic/research aspects and inculcate research spirit among students
- 5) **Research activities:** Student study projects (General / RBPT model), Minor or Major research projects, Research guidance to research scholars, Publication of research articles/papers (at least one in 2 years) in UGC-recognized journals, Registration in Vidwan/Orcid/Scopus/Web of Science
- 6) **Smart Classroom Activities:** Organization of Departmental WhatsApp groups, Ed Modo groups/Google Class Rooms/Adobe Spark groups for quick delivery of the subject; Preparation of Moocs content & presentation tube lessons by trained lecturers; Using smart/digital/e- class rooms (mandarory) wherever present; Utilization of YouTube videos (subject to copy rights) etc.

❖ Student-based:

- 1) **Class-room activities:** Power point presentations, seminars, assignments
- 2) **Library activities:** Visit to library during library hour and preparation of notes
- 3) **Lab activities:** Maintenance of observation note book and record, keeping lab clean and tidy
- 4) **Activities in the Seminars, workshops and conferences:** Participation/presentation in seminar/workshop/conference

CO-CURRICULAR ACTIVITES:

❖ OBJECTIVES:

The co-curricular activities are aimed at strengthening the theoretical knowledge with an activity related to the content taught in the class room. The aesthetic development, character building, spiritual growth, physical growth, moral values, creativity of the student.

The different types of co-curricular activities relevant to Sericulture domain are listed below:



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❖ **Academic – based**

- Preparation of Charts/Clay or Thermocol Models
- Debates, Essay Writing Competitions
- Group Discussions
- Departmental (Sericulture) magazine
- Formation of Book clubs
- Animal album-making
- Viva-Voce

❖ **Lab/Research –based**

- Documentaries
- Field Visit/Excursions/to sericulture research stations- sericulture units
- Training at research centres (sericulture etc.)
- Exposure to scientific instruments and hands-on experience
-

❖ **Value - based**

- Organization of works shop with the aqua farmers like lab to pod activity annually with the students and stake holders
- **Observation of Days of National/International Importance**

World Cancer Day (February 4th)	International Biological Diversity Day (May 22nd)
Darwin Day (February 12th)	World Turtle Day (May 23rd)
National Science Day (Feb 28th)	World blood Donor Day (June 14th)
World Wildlife day (March 3rd)	World Zoonoses Day (July 6th)
National Vaccination Day (March 16th)	World Mosquito Day (August 20th)
World Health Day (April 7th)	World Turtle Day (May 23rd)
Earth Day (April 22nd)	World Mosquito Day (August 20th)
Malaria Day (April 25th)	World Animal day (October 4th)
World Hepatitis Day (May 19th)	World Fisheries Day (November 21)



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B Sc	Semester: I	Credits: 4
Course: 1	BASIC PRINCIPLES OF AQUACULTURE	Hrs/Wk:4

Course Outcomes: By the completion of the course the graduate should able to –

- Describe the concept of blue revolution and different aqua culture systems
- Explain the pond ecosystem
- Describe the different types of fish ponds
- Explain the steps of pond preparation
- Describe the pond management practices

Learning objectives:

- To understand the concept of blue revolution and different aqua culture systems.
- To understand the pond ecosystem .
- To understand the different types of fish ponds.
- To understand steps of pond preparation.
- To understand the pond management practices

UNIT I: INTRODUCTION:

- 1.1. Concept of Blue Revolution - History and definition of Aquaculture. Scope of Aquaculture at global Level, India and AndhraPrades
- 1.2. Different Aquaculture systems – Pond, Cage, Pen, Running water, Extensive, Intensive and & Semi-Intensive Systems and their significance.
- 1.3. Monoculture, Polyculture and Monosex 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 spring
- 2.3 Nutrient Cycles in Culture Ponds – Phosphorus, Carbon and Nitrogen 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 ponds
- 3.3 Functional classification of ponds -rearing, production, stocking and quarantine ponds
- 3.4 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 Lay out and arrangements of ponds in a fish farm
- 4.4 Construction of an ideal fish pond – space allocation, structure and components of barrage pond

UNIT V: POND MANAGEMENT FACTORS



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- 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 sulphide 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 BOOKS:

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 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. Elsevier Scientific Publishing Company.
4. Bose AN et.al., 1991. Costal Aquaculture Engineering. Oxford & IBH Publishing Company Pvt.Ltd.



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B Sc	Semester: I	Credits: 1
Course: 1	BASIC PRINCIPLES OF AQUACULTURE LAB	Hrs/Wk:2

PRACTICALS:

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. Field survey of nearby habitat for dietary dependency on and requirement of aqua-products



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MODEL QUESTION PAPER(Semester-End)
B.Sc Degree Examinations
SEMESTER - I
Course 1:BASIC PRINCIPLES OF AQUACULTURE

Time : 3 hrs

Max. Marks : 75

SECTION –A

Answer any FIVE of the following

5x5 = 25 Marks

(Draw labelled diagrams wherever necessary)

1. Write a note on Pen culture
2. Illustrate the importance of Poly culture
3. Why plankton is important in culture
4. Discuss the management of Nursery pond
5. Quarantine plays an important role in ponds- discuss
6. What are the ideal soil characters for the construction of fish pond
7. Discuss the weed control in culture ponds
8. What measures you suggest for the pH correction in the culture ponds

SECTION –B

Answer ALL the questions each question carries 10 marks

5x10=50 Marks

(Draw diagrams wherever necessary)

9. a). Explain in detail the scope of aquaculture in Andhra Pradesh
(or)
b) Write an essay on the Intensive system of Aquaculture and its merits and demerits.
10. a). Write an essay on the Nitrogen Cycle in pond ecosystem
(or)
b). What measures are to be taken for the improvement of Pond Productivity.
11. a). Describe in detail the fish hatchery design.
(or)
b). what is head pond ? Describe the preparation and management of head pond
12. a). Describe in detail the Layout and arrangement of ponds in an ideal fish farm
(or)
b).Explain in detail the nature water resources required for the construction of fish pond.
13. a). Write an essay on the need of Pond fertilization in aquaculture
(or)
b).Explain in detail the optimum physicochemical conditions for water in culture ponds



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B Sc	Semester: II	Credits: 4
Course: 2	BIOLOGY OF FIN FISH & SHELL FISH	Hrs/Wk:4

Course Outcomes: By the completion of the course the graduate should able to –

- Describe the general characters and classification of cultivable fishes.
- Explain the food, feeding and growth of fish.
- Describe the reproductive biology of fishes.
- Explain the parental care and development of fishes.
- Describe the parental care and development of fishes

Learning objectives:

- To understand the general characters and classification of cultivable fishes
- To understand the food, feeding and growth of fish.
- To understand the reproductive biology of fishes.
- To understand the parental care and development of fishes.
- To understand the parental care and development of fishes

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 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
- 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, pearl oyster, pila, 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



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UNIT V: Hormones & Growth

- 5.1 Endocrine system in fishes
- 5.2 Neurosecretary cells, androgenic gland, ovary,
- 5.3 Y-organ, chromatophores, pericardial glands and cuticle.
- 5.4 Molting, molting stages, metamorphosis in crustacean shell fish

PRESCRIBED BOOKS:

- 1. Bone Q et al., 1995. Biology of fishes, Blackie academic & professional, LONDON
- 2. Saxena AB 1996. Life of Crustaceans. Anmol Publications Pvt.Ltd., New Delhi

REFERENCES BOOKS:

- 1. Tandon KK & Johal MS 1996. Age and Growth in Indian Fresh Water Fishes. Narendra Publishing House, New Delhi.
- 2. Raymond T et al., 1990. Crustacean Sexual Biology, Columbia University Press, New York
- 3. Guiland J.A (ed) 1984. Penaeid shrimps- Their Biology and Management.
- 4. Barrington FJW 1971. Invertebrates: Structure and Function.ELBS
- 5. Parker F & Haswell 1992. The text book of Zoology, VolII. Invertebrates (eds. Marshal AJ & Williams). ELBS & Mc Millan & Co.



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B Sc	Semester: II	Credits: 1
Course: 2(L)	BIOLOGY OF FIN FISH & SHELL FISH - II LAB	Hrs/Wk:2

PRACTICALS:

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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MODEL QUESTION PAPER(Semester-End)
B.Sc Degree Examinations
SEMESTER - II
Course 2: BIOLOGY OF FIN FISH & SHELL FISH

Time : 3 hrs

Max. Marks : 75

SECTION – A

Answer any FIVE of the following

5x5 = 25 Marks

(Draw labelled diagrams wherever necessary)

1. Write General characters of Crustaceans
2. Discuss the commercial importance of Molluscs with examples
3. Natural fish feed
4. Natural breeding places of fish
5. Breeding in shrimp
6. Nest building in fishes
7. Androgenic gland
8. Y -organ

SECTION –B

Answer ALL the questions each question carries 10 marks

5x10=50 Marks

(Draw diagrams wherever necessary)

9. a).Write an essay on the general characters and classification of fishes
(or)
b).Explain in detail the sense organs of fishes and their importance
10. a). Describe structural modifications seen in fish in relation to feeding habits
(or)
b). Discuss in detail the Scale and otolith methods of growth rate measurement in fish.
11. a).Write an essay on the breeding of fish in artificial fish ponds
(or)
b). Write an essay on the induced breeding in fish.
12. a).Describe in detail the embryonic and larval development of shrimp
(or)
b).Discuss in detail various environmental factors affecting the reproduction and development of cultivable aquatic fish.
13. a). Write an essay on the endocrine system of fish
(or)
b). Describe in detail the molting and metamorphosis in a crustacean shell fish



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B Sc	Semester: III	Credits: 4
Course: 3	FISH NUTRITION & FEED TECHNOLOGY	Hrs/Wk:4

Course Outcomes: By the completion of the course the graduate should able to –

- Describe the nutritional requirements of cultivable fishes
- Explain the different types of feed and feeding methods of fish
- Describe the techniques of fish feed manufacturing and storage methods
- Explain the concept of fish feed additives, non nutrient ingredients.
- Describe the different nutritional deficiency symptoms of fish

Learning objectives

- To understand the nutritional requirements of cultivable fishes.
- To understand the different types of feed and feeding methods of fish.
- To understand the techniques of fish feed manufacturing and storage methods.
- To understand the concept of fish feed additives, non nutrient ingredients.
- To understand the different nutritional deficiency symptoms of fish.

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
- 3.2 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



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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,
- 5.4 Importance of balanced diet

PRESCRIBED BOOKS:

- 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



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B Sc	SEMESTER: III	Credits: 1
Course: 3(L)	FISH NUTRITION & FEED TECHNOLOGY - III LAB	Hrs/Wk:2

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



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MODEL QUESTION PAPER(Semester-End)
B.Sc Degree Examinations
SEMESTER - III
Course 3: FISH NUTRITION & FEED TECHNOLOGY

Time : 3 hrs

Max. Marks : 75

SECTION – A

Answer any FIVE of the following

5x5 = 25 Marks

(Draw labelled diagrams wherever necessary)

1. Check tray
2. Micronutrients required for the prawn at Mysis stage
3. Protein efficiency ratio.
4. Principle feed ingredients
5. Chemical Spoilage during feed storage
- 6 Probiotics
7. Vitamin deficiency symptoms in cultivable fish
8. Balanced diet for cultivable fish

SECTION –B

Answer ALL the questions each question carries 10 marks

5x10=50 Marks

(Draw diagrams wherever necessary)

9. a) Explain the requirements for Energy, Fiber , Protein in the fingerling stages of fish
(or)
b) Explain in details the essential amino acids and fatty acids required for the cultivable fish
10. a) Describe in detail wet and dry feed used in aquaculture
(or)
b) Describe the mechanism of bag feeding and tray feeding add a note on the merits and demerits of the same
11. a) Describe in detail feed formulation and processing
(or)
b) Write an essay on the proper storage methods to be adopted for aquafeed storage.
12. a) write an essay on the different types of feed binders used in aqua feeds
(or)
b) Discuss in detail the role of enzymes and growth promoters in aquafeed
13. a) Write an essay on the protein and mineral deficiency symptoms of cultivable fish
(or)
b) Write the importance of Natural and supplementary feeds used for the cultivable fish.



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B Sc	SEMESTER: IV	Credits: 4
Course: 4	FRESH WATER & BRACKISHWATER AQUACULTURE	Hrs/Wk:4

Course Outcomes: By the completion of the course the graduate should able to –

- Describe the prospects and scope of fresh water aquaculture at various levels
- Explain the practices involved in carp culture
- Describe the culture of cold water and air breathing fish
- Explain the culture practices of prawn.
- Describe the culture of different brackish water species

Learning objectives :

- To understand the prospects and scope of fresh water aquaculture at various levels.
- To understand the practices involved in carp culture.
- To understand the culture of cold water and air breathing fish.
- To understand the culture practices of prawn.
- To understand the culture of different brackish water species

UNIT I: Introduction to Freshwater Aquaculture

- 1.1 Status, scope and prospects of fresh water aquaculture in the world, India and AP
- 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,
- 4.3 Pond preparation, stocking, management of nursery and grow-out ponds, feeding, and harvesting

UNIT V: Culture of Brackishwater Species

- 5.1 Culture of *P. mondon* – 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



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B.Sc AQUACulture Technology Syllabus (w.e.f: 2020-21 A.Y)

PRESCRIBED BOOKS:

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

REFERENCES BOOKS:

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



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B Sc	SEMESTER: IV	Credits: 1
Course: 4(L)	Practical - IV LAB	Hrs/Wk:2

PRACTICALS:

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 – *Scylla cerrata*, *Portunus pelagicus*, *P.sanguinolentus*, *Neptunus pelagicus*, *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*, *Picnodonta*
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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MODEL QUESTION PAPER(Semester-End)
B.Sc Degree Examinations
SEMESTER - IV

Course 4: FRESH WATER & BRACKISHWATER AQUACULTURE

Time : 3 hrs

Max. Marks : 75

SECTION – A

Answer any FIVE of the following

5x5 = 25 Marks

(Draw labelled diagrams wherever necessary)

1. Types of fresh water culture
2. Mixed culture
3. *Pangassius*
4. Murrel culture
5. Cage culture
6. Commercial value of fresh water prawn
7. MBV
8. Mixed culture

SECTION –B

Answer ALL the questions each question carries 10 marks

5x10=50 Marks

(Draw diagrams wherever necessary)

9. a). Write an essay on the status of freshwater aquaculture in India
(or)
b) Describe different types of freshwater culture systems in aquaculture
10. a) Write an essay on the Biology of *Catla Catla*
(or)
b) Describe the Composite fish culture system with the exotic carps.
11. a) Describe in detail the recent developments cold water fish culture
(or)
b) Explain in detail RAS system of aquaculture
12. a) Write an essay on the seed Production Technology of *M. rosenbergii*
(or)
b) Write an essay on the management of Nursery ponds in prawn culture
13. a) Describe the culture practice of *P.monodon*
(or)
b) Explain the feed and disease management in *L vannamei culture*



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B.Sc AQUACulture Technology Syllabus (w.e.f: 2020-21 A.Y)

B Sc	SEMESTER: IV	Credits: 4
Course: 5	FISH HEALTH MANGEMENT & FISHERIES ECONOMICS	Hrs/Wk:4

Course Outcomes: By the completion of the course the graduate should able to –

- Describe the diseases of fin fish
- Explain the diseases of shell fish
- Describe the fish health management strategies
- Explain different fisheries economic policies
- Describe the various schemes for the welfare of fishermen community

Learning objectives :

- To understand the diseases of fin fish
- To understand the the diseases of shell fish.
- To understand the fish health management strategies.
- 4. To understand the different fisheries economic policies .
- To understand the various schemes for the welfare of fishermen community

UNIT I: Diseases of Fin Fish

- 1.1 Fungal diseases– Saprolegniosis, brachiomycosis, ichthyophorus diseases – Lagenidium diseases – Fusarium disease, prevention and therapy
- 1.2 Viral diseases – Emerging viral diseases in fish, haemorrhagic septicemia, spring viremia of carps, infectious hematopoietic necrosis in trout, infectious pancreatic necrosis in salmonids, swim-bladder inflammation in cyprinids, channel cat fish viral disease, prevention and therapy
- 1.3 Baterial diseases – Emerging bacterial diseases, Aermonas, Pseudomonas and vibrio infections, columnaris, furunculosis, epizootic ulcerative syndrome, infectious abdominal dropsy, bacterial gill disease, enteric red mouth, bacterial kidney disease, proliferative kidney disease, prevention and therapy

UNIT II: Diseases of Shell Fish

- 2.1 Major shrimp viral diseases – Bacculovirus penaeii, Monodon Bacculovirus, Bacculoviral midgut necrosis, Infectious hypodermal and haematopoietic necrosis virus, Hepatopancreatic parvo like virus, Yellow head bacculovirus, white spot bacculovirus.
- 2.2 Bacterial diseases of shell fish – aeromonas, pseudomonas and vibrio infections, luminous bacterial disease, filamentous bacterial disease. Prevention and therapy
- 2.3 Protozoan diseases- Ichthyophthiriasis, Costiasis, whirling diseases, trypanosomiasis. Prevention and therapy

UNIT III : Fish Health Management

- 3.1 Diagnostic tools – immune detection- DNA/RNA techniques, General preventive methods and prophylaxis. Application and development of vaccines.
- 3.2 Quarantine – Significance, methods and regulations for transplants.
- 3.3 Good Feed management for healthy organisms, Zero water exchange, Probiotics in health management, Issues of biosecurity.



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UNIT IV: Fisheries Economics- I

- 4.1 Methods of economic analysis of business organizations
- 4.2 Aquaculture economics- application of economics principles to aquaculture operations
Various inputs and production function laws of variable proportions
- 4.3 Cost and earnings of aquaculture systems – carp culture, shrimp farming systems,

UNIT V: Fisheries Economics- II

- 5.1 Socio-economic conditions of fishermen in Andhra Pradesh
- 5.2 Role of Matsyafed and NABARD in uplifting fishermen's conditions, fishermen cooperatives
Contribution of fisheries to the national economy
- 5.3 Economic analysis preparation of project and project appraisal

PRESCRIBED BOOKS:

1. Shaperclaus W. 1991 Fish Diseases- Vol.I & II. Oxonian Press Pvt.ltd
2. Roberts RJ 1989. Fish pathology. Bailliere Tindall, New York
3. Lydia Brown 1993. Aquaculture for veterinarians- fish husbandry and medicine. Pergamon Press. Oxford
4. Jayaraman R 1996. Fisheries Economics. Tamilnadu Veterinary and Animal Science University. Tuticorn
5. Subba Rao N 1986. Economics of Fisheries. Daya publishing house, Delhi

REFERENCES BOOKS:.

1. Shankar KM & Mohan CV. 2002. Fish and Shellfish Health Management. UNESCO Publ. Sindermann CJ. 1990
2. Walker P & Subasinghe RP. (Eds.). 2005 Principal Diseases of Marine Fish and Shellfish. Vols. I, II. 2nd Ed. Academic Press
3. DNA Based Molecular Diagnostic Techniques: Research Needs for Standardization and Validation of the Detection of Aquatic Animal Pathogens and Diseases. FAO Publ. Wedmeyer G, Meyer FP & Smith L. 1999.
4. Bullock G et.al., 1972 Bacterial diseases of fishes. TFH publications, New Jersey
5. Post G 1987. Text book of Fish Health. TFH publications, New Jersey
6. Johnson SK 1995. Handbook of shrimp diseases. Texas A & M University, Texas
7. Dewwett KK and Varma JD 1993. Elementary economic theory. S.chand, New Delhi
8. Korakandy R 1996. Economics of Fisheries Mangement. Daya Publishing House, Delhi
9. Tripathi SD 1992. Aquaculture Economics. Asian Fisheries Society, Mangalore



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B Sc	SEMESTER: IV	Credits: 1
Course: 5(L)	FISH HEALTH MANGEMENT & FISHERIES ECONOMICS	Hrs/Wk:2

PRACTICALS:

1. Enumeration of Bacteria by TPC Method
2. Enumeration of total Coliforms
3. Observation of gross pathology and external lesions of fish and prawn 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, hepatopncreas, lymphoid organ, muscles and nerves of prawn and shrimp
6. Collection, processing and analysis of data for epedemeiological investigations of viral diseases
7. Bacterial pathogens – isolation, culture and characterization
8. Identification of parasites in fishes: Protozoan, Helmiths, Crustaceans
9. Antibigrams – 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 shell fish
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
15. Cost benefit analysis calculations



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MODEL QUESTION PAPER(Semester-End)
B.Sc Degree Examinations
SEMESTER - IV

Course 5: FISH HEALTH MANGEMENT & FISHERIES ECONOMICS

Time : 3 hrs

Max. Marks : 75

SECTION – A

Answer any FIVE of the following

5x5 = 25 Marks

(Draw labelled diagrams wherever necessary) z

1. *Fusarium disease*
2. Black gill disease
3. MBV
4. Biosecurity in aquatic health management
5. vaccines in aquaculture
6. Need of economic analysis in aquaculture
7. Matyafed
8. Project appraisal

SECTION – B

Answer ALL the questions each question carries 10 marks

5x10=50 Marks

(Draw diagrams wherever necessary)

9. a) Write an essay on emerging viral diseases symptoms – treatment - therapy in fin fish
(or)
b) Describe in detail any 3 Bacterial diseases of finfish.
10. a) Explain in detail the bacterial diseases of shell fish
(or)
b) Describe the protozoan diseases of shell fish with a note on their prevention and therapy.
11. a) Describe the role of quarantine in fish health management
(or)
b) Describe the Good feed management practices
12. a) Describe the laws of variable proportions in relation to aquaculture
(or)
b) Describe the Cost earnings for Carp culture
13. a) Write an essay on the socio economic conditions of fishermen in Andhra Pradesh
(or)
b) write an essay on the fishermen cooperative societies in Andhra Pradesh