ANDHRA PRADESH STATE COUNCIL OF HIGHER EDUCATION

Syllabus for 4-Year UG Honours in B.Sc. (Aquaculture) as Major in consonance with Curriculum framework w.e.f. AY 2025-26

Prepared by Acharya Nagarjuna University, Guntur

COURSE STRUCTURE (for Semester I to II)

ear	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
I	I	1	Basic Principles and Practices of Aquaculture	3	3
			Basic Principles and Practices of Aquaculture-Practical	2	1
		2	Biology of Finfish & Shellfish	3	3
			Biology of Finfish & Shellfish - Practical	2	1
	II	3	Freshwater Aquaculture	3	3
			Freshwater Aquaculture - Practical	2	1
		4	Brackish water Aquaculture and Mariculture	3	3
			Brackish water Aquaculture and Mariculture - Practical	2	1
II	III	5	Fish Health Management	3	3
			Fish Health Management - Practical	2	1
		6	Shrimp Health Management	3	3
			Shrimp Health Management - Practical	2	1
		7	Fish Nutrition & Feed Technology	3	3
			Fish Nutrition & Feed Technology - Practical	2	1
	IV	8	Fish Immunology	3	3
			Fish Immunology - Practical	2	1
		9	Fish Processing Technology	3	3
			Fish Processing Technology -Practical	2	1
		10	Extension, Economics and Marketing	3	3
			Extension, Economics and Marketing-Practical	2	1
II	V	11	Ornamental Fish Culture	3	3
			Ornamental Fish Culture -Practical	2	1
		12 A	Soil and Water Quality Management	3	3
			Soil and Water Quality Management-Practical	2	1
			OR		
		12 B	Coastal Aquaculture	3	3
			Coastal Aquaculture - Practical	2	1

SEMESTER-I

COURSE 1: BASIC PRINCIPLES AND PRACTICES OF AQUACULTURE

Theory **Credits: 3** **3 hrs/week**

COURSE OBJECTIVES:

- To study the significance, history, present status of aquaculture in world, India and AP
- To gain knowledge on various types of aquaculture systems and practices
- To learn the design and construction principles of aqua farms and hatcheries.
- To understand the significance of water and soil quality parameters in aquaculture ponds.
- To study the methods of eradication of aquatic weeds, insects, unwanted fishes and algal blooms in culture ponds.
- To improve technical skills in water analysis, identification of pond biota and gain hands-on and field experience by visiting aqua farms.

LEARNING OUTCOMES:

By the completion of the course, student will be able to –

- Understand the scope and status of aquaculture with related schemes and its significance.
- Differentiate various aquaculture systems and culture practices, and their significance.
- Explain design and construction principles of aqua farms and hatcheries.
- Analyse the physico-chemical and biological parameters of water and soil in aquaculture ponds and maintain their optimum levels for better production.
- Implement proper liming and fertilization techniques for maintaining pond health.
- Apply proper pond culture management practices for high yielding profitable culture.

SYLLABUS:

UNIT-I: Introduction

1.1. Definition, Significance and History of Aquaculture.
1.2. Concept of Blue Revolution and Pradhan Mantri Matsya SampadaYojana (PMMSY)
1.3. Present status of Aquaculture at global, India and Andhra Pradesh level
1.4. Aquaculture versus Agriculture; Present day needs with special reference to A.P.

UNIT-II: Aquaculture Systems and Practices

2.1. Types of aquaculture: Freshwater aquaculture, Brackish water aquaculture and Mariculture
2.2. Culture Systems: Ponds, Raceways, Cages, Pens, Rafts, Water Recirculating Systems, Bio-floc technology and 3C system
2.3. Culture practices: Traditional, Extensive, Modified Extensive, Semi-Intensive, Intensive and Super Intensive systems of fish and shrimp.

2.4. Culture methods: Monoculture, Poly culture, Mono-sex culture and Integrated fish farming.

UNIT-III: Design and Construction of Aqua Farms

3.1. Functional classification of ponds – head pond, hatchery, nursery, rearing, production, stocking and quarantine ponds
3.2. Criteria for the selection of site for freshwater and brackish water pond farms
3.3. Design and construction of an ideal fish and shrimp farms.
3.4. Design and construction of fish and shrimp hatcheries.

UNIT-IV: Pond Culture Management-I

4.1. Water quality in freshwater fish ponds: Significance of physico-chemical (temperature, transparency, turbidity, light, pH, DO, CO_2, orthophspahates, NH_3, NO_2) and biological (plankton and benthos) characteristics and their management at optimal levels in ponds.
4.2. Water quality in shrimp culture ponds: Significance of physico-chemical and biological characteristics and their management at optimal levels in ponds.
4.3. Significance of soil characteristics and their optimal levels for culture
4.4. Liming and fertilization: Lime and Fertilizers (organic manures and chemical Fertilizers) - Types and need of their application in ponds

UNIT-V: Pond Culture Management-II

5.1. Common aquatic weeds- advantages and disadvantages and their control in culture ponds
5.2. Aquatic insects: Disadvantages of insects and their control
5.3. Unwanted fishes: Common weed and predatory fishes - Disadvantages and their control.
5.4. Algal blooms: Bloom forming algae and their control

REFERENCE BOOKS:

1. Jhingran VG 1998. *Fish and Fisheries of India*. Hindustan Publishing Corporation, New Delhi
2. Pillay TVR & Kutty MN. 2005. *Aquaculture- Principles and Practices*. 2nd Ed. Blackwell
3. Pillay TVR & Dill MA. 1979. *Advances in Aquaculture*. Fishing News Books Ltd., London
4. Stickney RR 1979. *Principles of Warm Water Aquaculture*. John Wiley & Sons Inc.1981
5. Boyd CE 1982. *Water Quality Management for Pond Fish Culture*. Elsivier Scientific Publ.
6. Bose AN et.al, 1991. *Costal Aquaculture Engineering*. Oxford & IBH Publishing Company.

SEMESTER-I

COURSE 1: BASIC PRINCIPLES AND PRACTICES OF AQUACULTURE

Practical **Credits: 1** **2 hrs/week**

1. Estimation of Dissolved Oxygen in pond water.
2. Estimation of total alkalinity, Bicarbonates and Carbonates in water samples.
3. Estimation of total hardness of water sample.
4. Estimation of Ammonia in water.
5. Study of beneficial and harmful algal species.
6. Collection, identification and isolation of zooplankton and phytoplankton.
7. Collection and study of aquatic weeds, aquatic insects, weed, predatory and larvivorous fishes.
8. Field visit to hatchery, nursery, rearing and stocking ponds of aqua farms.

SEMESTER-I

COURSE 2: BIOLOGY OF FINFISH & SHELLFISH

Theory	Credits: 3	3 hrs/week

COURSE OBJECTIVES:

- To understand the classification, morphology and digestive system of fish and shrimp.
- To study the structure and functioning of respiratory, circulatory and endocrine systems of fish and shrimp.
- To explore the excretory, sensory, and reproductive systems in fish and shrimp.
- To understand feeding, methods of determination of age and growth in fish and shrimp.
- To study breeding biology, parental care and developmental stages in fish and shrimp.

LEARNING OUTCOMES:

By the completion of the course student will be able to –

- Identify and describe general features and digestive system of fish and shrimp.
- Explain gill structure,mechanism of respiration and gaseous exchange and endocrine glands
- Compare circulatory physiology in fish (closed) and shrimp (open).
- Gain knowledge on endocrine glands and their significance in fish and shrimp.
- Describe excretory,sensory and reproductive systems in fish and shrimp.
- Provide suitable type of feeding for fish and shrimp in culture ponds.
- Apply different methods (scales, otoliths, skeletal parts) for age and growth determination.
- Outline breeding activity and larval development in fish and shrimp

SYLLABUS:

UNIT-I: General characters, Classification, External Morphology and Digestive System

1.1. General characters of fishes and crustaceans
1.2. Classification of fish and crustaceans up to classes
1.3. External morphology of teleost fish and shrimp
1.4. Digestive system of fish and shrimp.

UNIT-II: Respiratory, Circulatory and Endocrine systems

2.1. Structure of gills, Mechanism of Respiration and gaseous exchange in fish and shrimp
2.2. Structure of heart in fishes
2.3. Physiology of Circulation in fish and Shrimp
2.4. Endocrine glands and their role in fish and shrimp.

UNIT-III: Excretory, Sensory and Reproductive Systems

3.1. Structure and function of kidneys in fishes.

3.2. Excretory organs in shrimp.
3.3. Sensory organs in fish and shrimp.
3.4. Reproductive structure in Fishes and Shrimp

UNIT-IV: Feeding and Growth

4.1. Natural food and feeding habits of commercially important fishes and shrimp.
4.2. Methods of determination of age and growth in fishes - scale method, otolith method, skeletal parts as age indicators
4.3. Factors affecting growth in fish and shrimp.
4.4. Molting and molting stages in shrimp.

UNIT-V: Reproductive and Developmental Biology

5.1. Breeding in fishes - breeding places and breeding habits
5.2. Parental care in fishes
5.3. Life cycle of carp and shrimp.
5.4. Larval forms of prawn and shrimp.

REFERENCE BOOKS:

1. Lagler KF, Bardach, JE, Miller, RR, Passino DRM. 2005. *Ichthyology*, John Wiley & Sons.
2. Nikolsky GV. 1963. *Ecology of Fishes*, Academic Press.
3. Hoar WS and Randall DJ. 1970. *Fish Physiology*, Vol. I-IX, AP.
4. Bond E. Carl. 1979. *Biology of Fishes*, Saunders.
5. Norman JR and Greenwood PH 1975. *A History of Fishes*, Halsted Press.
6. Moyle PB and Joseph J. Cech. *Fishes: An Introduction to Ichthyology*, Prentice Hall.
7. Bone Q et al., 1995. *Biology of fishes*, Blackie academic & professional, LONDON.
8. Barnes RD. *Invertebrates Zoology,* III edition, W.B. Saunders Co., Philadelphia.
9. Saxena AB 1996. *Life of Crustaceans*. Anmol Publications Pvt.Ltd., New Delh
10. Barrington EJW. 1971. *Invertebrates: Structure and Function*. ELBS.
11. Tandon KK & Johal MS 1996. *Age and Growth in Indian Freshwater Fishes*. Narendra Publishing House, New Delhi.
12. Raymond T et al., 1990. *Crustacean Sexual Biology*, Columbia University Press, New York
13. Guiland J.A (ed) 1984. *Penaeid shrimps- Their Biology and Management*.
14. Barrington FJW 1971. *Invertebrates: Structure and Function*. ELBS
15. Parker TJ & Haswell WA1992. *The text book of Zoology*, Vol I. Invertebrates (eds. Marshal AJ & WD Williams). ELBS & Mc Millan & Co.

SEMESTER-I

COURSE 2: BIOLOGY OF FIN FISH & SHELLFISH

Practical	**Credits: 1**	**2 hrs/week**

1. External morphology of fish and shrimp.
2. Digestive system of herbivorous, carnivorous and predatory fishes, and in shrimp.
3. Gut content analysis in fish and shrimp
4. Mouth parts and appendages of cultivable prawn and shrimp.
5. Endocrine glands and its significance in fish and shrimp.
6. Study of eggs of fish, shrimp and prawn.
7. Study of maturity stages and fecundity in fish and shellfish
8. Life cycles of carp and shrimp.
9. Observation of crustacean larvae
10. Study of nest building and brooding of fishes
