3. COURSE STRUCTURE:

ANDHRA PRADESH STATE COUNCIL OF HIGHER EDUCATION

UG SINGLE MAJOR PROGRAMME UNDER CBCS

(from the Academic Year 2023-24)

Programme: B.Voc (Honors) - COMMERCIAL AQUACULTURE

Course Structure

Semester	Course Code	Course Title	Major/ Minor	Hours/ Week	Credits	Marks						
						Theory			Practical			Total
						IA	EA	Total	IA	EA	Total	
Sem-II	23COA201	Principles of Aquaculture	Major/ Minor	3+2	4+1	25	75	100	0	50	50	150
	23COA202	Taxonomy & Biology of Finfish & Shellfish	Major	3+2	4+1	25	75	100	0	50	50	150
Community Service Project of 180 Hours with 4 credits												
Exit Option 1 for award of Certificate in Commercial Aquaculture												
Sem-III	23COA301	Inland & Marine Fisheries	Major	3+2	4+1	25	75	100	0	50	50	150
	23COA302	Fresh Water Aquaculture	Major	3+2	4+1	25	75	100	0	50	50	150
	23COA303	Coastal Aquaculture	Major/ Minor	3+2	4+1	25	75	100	0	50	50	150
	23COA304	Post-Harvest Technology	Major	3+2	4+1	25	75	100	0	50	50	150
Sem-IV	23COA401	Aquatic Ecology	Major/ Minor	3+2	4+1	25	75	100	0	50	50	150
	23COA402	Fish Disease Management	Major/ Minor	3+2	4+1	25	75	100	0	50	50	150
	23COA403	Fish Immunology & Microbiology	Major	3+2	4+1	25	75	100	0	50	50	150
Short Term Internship/Apprenticeship/OJT of 180 hrs with 4 Credits												
Exit Option -2 for award of Diploma in Commercial Aquaculture												
Sem-V	23COA501	Aquaculture Engineering	Major/ Minor	3+2	4+1	25	75	100	0	50	50	150

4. SYLLABUS

4.1 Semester –I

Semester I is common for students of all life sciences subjects. Faculty and students are advised to keep visiting the website https://apsche.ap.gov.in/ for necessary instructions and guide lines.

4.2 Semester – II

Course Code: 23COA201 - PRINCIPLES OF AQUACULTURE

Credits: 4 **Marks: 100 (25 IA + 75 EA)**

COURSE OUTCOMES:

After successful completion of this course, the student will be able to -

- Know the present status of aquaculture and its role in world economy and food production.
- Understand the pond ecosystems and natural food production. 3. To improve the technical knowledge on preparation and management of fish and shrimp ponds.
- Gain knowledge on the estimation of different parameters in culture ponds for better aquaculture practices.
- Gain knowledge on harmful algal blooms and their control.
- Improve the technical skills in soil and water analysis for better aquaculture practice. (This course is introductory, and the teachers are expected to introduce different dimensions of aquaculture)

UNIT - I: INTRODUCTION

1.1 Definition, Significance and History of Aquaculture; Concept of Blue Revolution; Present status of aquaculture in the world and India

1.2 Types of Aquaculture methods: Freshwater, Brackish water and Mariculture; Monoculture, Polyculture, Composite culture, Monosex culture and Integrated fish farming.

1.3 Culture systems: Ponds, Raceways, Cages, Pens, Rafts and water recirculating systems; Culture practices: Traditional, extensive, modified extensive, semi-intensive and intensive culture.

UNIT - II: CULTIVABLE ORGANISMS

2.1 Major cultivable species for aquaculture and their commercial importance: freshwater, brackish water and marine.

2.2 Criteria for the selection of species for culture

UNIT - III: DESIGN AND CONSTRUCTION OF AQUAFARMS

3.1 Criteria for the selection of site for freshwater and brackish water farms

3.2 Design and construction of a freshwater fish farm and hatchery.

3.3 Design and construction of a shrimp farm and hatchery.

3.4 Functional classification of ponds.

UNIT - IV: POND MANAGEMENT

4.1 Water quality and Soil characteristics in aquaculture: Significance of physico-chemical and biological parameters and their management at optimal levels in ponds.

4.2 Organic manures and Chemical fertilizers -Types and need of their application in ponds

UNIT – V: WEED CONTROL

5.1. Eradication of aquatic weeds, insects and unwanted fishes:
5.2. Common aquatic weeds- advantages and disadvantages and their control;
5.3. Common aquatic insects – disadvantages and their control;
5.4. Common weed and predatory fishes - disadvantages and their control.

Course Code: 23COA201 - PRINCIPLES OF AQUACULTURE (LAB)

Credits: 1 **Marks: 50**

COURSE Outcomes:

After completion of this course, the student will be able to –

- Acquire skills for the estimation of different water quality parameters in culture ponds
- Report field conditions of different aquaculture ponds
- Assess soil quality parameters of aquaculture farm ponds

PRACTICALS:

1. Estimation of temperature, transparency and pH of pond water
2. Estimation of total dissolved oxygen in pond water.
3. Estimation of Total alkalinity in water samples
4. Estimation of Total hardness in water samples
5. Estimation of Salinity in the water
6. Estimation of Total ammonia nitrogen in water
7. Collection &identification of zooplankton and phytoplankton
8. Determination of soil nitrogen and phosphorus
9. Identification of aquatic weeds and insects
10. Field visit to aquafarms: Observation of farm structure, construction and management.

REFERENCES:

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
3. Pillay TVR &M.A.Dill, 1979. Advances in Aquaculture. Fishing News BooksLtd., London
4. Stickney RR 1979. Principles of Warm Water Aquaculture. John Wiley &SonsInc. 1981
5. Boyd CE 1982. Water Quality Management for Pond Fish Culture. Elsivier Scientific Publishing
6. Bose AN et.al., 1991. Costal Aquaculture Engineering. Oxford & IBH Publishing Company
7. Gopakumar K. (Ed.). 2002. Text Book of Fish Processing Technology. ICAR.
8. Govindan, TK. 1985. Fish Processing Technology, Oxford-IBH.
9. Ivar LO. 2007. Aquaculture Engineering. Daya Publ. House.
10. Shang, Y.C. 1990. Aquaculture Economic Analysis – An Introduction

WEB RESOURCES:

1. https://www.pdfdrive.com/aquaculture-principles-and-practices-second-edition-d53659389.html#top
2. https://www.pdfdrive.com/aquaculture-principles-and-practices-fishing-news-books-e157254532.html
3. http://ecoursesonline.iasri.res.in/course/view.php?id=259
4. https://courseware.cutm.ac.in/courses/principles-of-aquaculture/
5. https://igor.crew.c-base.org/aquaculture.pdf

Course Code: 23COA202–TAXONOMY & BIOLOGY OF FIN FISH AND SHELL FISH

Credits: 4 **Marks: 100 (25 IA + 75 EA)**

COURSE OUTCOMES:

After completing this course, the students will be able to –

- Classify fishes of commercial interest
- Know the feeding habits of cultivable organisms of fin fish and shell fish
- Identify different stages of development of cultivable species
- Know about factors that influence fish growth

UNIT -1: GENERAL CHARACTERS & CLASSIFICATION OF CULTIVABLE FIN & SHELL FISH

1-1 General Characters and classification of fishes, crustaceans and molluscs
1-2 Fish, Crustaceans and Molluscs of commercial importance
1-3 Sense organs of fishes, crustaceans
1-4 Specialized organs in fishes – electric organ, venom and toxins
1-5 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.
2-2 Principles of Age and growth determination; growth regulation, Growth rate measurement – scale method, otolith method.
2-4 Length-weight relationship, condition factor.

UNIT-III: REPRODUCTIVE BIOLOGY

3-1 Breeding in fishes, breeding places, breeding habits & places, breeding in natural environment and in artificial ponds, courtship and reproductive cycles
3-2 Induced breeding in fish and shrimp

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 and prawn of commercial importance
4-4 Environmental factors affecting reproduction and development of cultivable aquatic fin & shell fish

MODULE-V: HORMONES & GROWTH

5-1 Endocrine system in fishes
5-2 Neurosecretory cells, androgenic gland, ovary, Y-organ, chromatophores.
5-3 Moulting: moulting stages, metamorphosis in shrimp

Course Code: 23COA202–TAXONOMY & BIOLOGY OF FIN FISH AND SHELL FISH (LAB)

Credits: 1 **Marks: 50**

COURSE OUTCOMES:

After successful completion of this course, the student will be able to –

- Know the anatomy of culture fish
- Identify different larval stages
- Learn the know-how of brooding

PRACTICALS:

1. Dissection and display of digestive system of fish and shrimp
2. Dissection and display of reproductive system of fish and shrimp
3. Dissection and display of swim blabber in fish
4. Length-weight relationship of fishes
5. Gut content analysis in fish and shrimp
6. Identification of different appendages of cultivable shrimps and prawns
7. Identification of different life history stages of fish and shrimp
8. Estimation of Gonad Somatic Index (GSI) and fecundity in fishes
9. Identification of different larval stages of crab

REFERENCES:

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

WEB RESOURCES:

1. http://ecoursesonline.iasri.res.in/mod/page/view.php?id=83249
2. https://www.msdvetmanual.com/exotic-and-laboratory-animals/aquarium-fish/fish-taxonomy
3. https://www.researchgate.net/publication/318816871_A_Review_of_Fish_Taxonomy_Conventions_and_Species_Identification_Techniques

4.
https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3A_Introductory_Biology_(CK-12)/12%3A_Vertebrates/12.10%3A_Fish_Classification

5.
https://nfdb.gov.in/PDF/Fish%20&%20Fisheries%20of%20India/1.Fish%20and%20Fisheries%20of%20India.pdf