



GUJARAT TECHNOLOGICAL UNIVERSITY
Integrated Master of Science (Biotechnology)
Semester: 7
Subject Name: Basic Principles of Aquaculture
Subject Code: 1370412

Prerequisite:

Basic knowledge of biology, fisheries science, and environmental science is required. Understanding aquatic ecosystems, fish physiology, and water quality management will help students explore the principles of aquaculture, species selection, culture techniques, and sustainable aquaculture practices.

Rationale:

This course introduces the fundamental principles of aquaculture, covering species selection, culture techniques, nutrition, disease management, and sustainability. It equips students with knowledge and skills to develop and manage aquaculture systems, ensuring efficient production, resource conservation, and environmental sustainability in fisheries and aquatic farming.

Course Scheme :

Teaching Scheme			Total Credits	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Practical		
				ESE (E)	PA(M)	ESE (V)	PA (I)	
4	0	8	8	70	30	30	20	150

Course Content:

Unit No.	Content	No. of Hours	Weightage (%)
1	Introduction Concept of Blue Revolution - History and definition of Aquaculture; Scope of Aquaculture at global Level, India and Andhra Pradesh; Different Aquaculture systems – Pond, Cage, Pen, Running water, Extensive, Intensive and & Semi-Intensive Systems and their significance; Monoculture, Polyculture and Monosex culture systems.	12	20
2	Pond Ecosystem General Concepts of Ecology, Carrying Capacity and Food Chains; Lotic and lentic systems, streams and springs; Nutrient Cycles in Culture Ponds – Phosphorus, Carbon and Nitrogen Importance of Plankton and Benthos in culture ponds, nutrient dynamics and algal blooms; Concepts of Productivity, estimation and improvement of productivity.	12	20
3	Types of Fish Ponds: Classification of ponds based on water resources – spring, rain water, flood water, well water and water course ponds; Functional classification of ponds – head pond, hatchery, nursery ponds;	12	20



GUJARAT TECHNOLOGICAL UNIVERSITY
Integrated Master of Science (Biotechnology)

Semester: 7

Subject Name: Basic Principles of Aquaculture

Subject Code: 1370412

	Functional classification of ponds -rearing, production, stocking and quarantine ponds; Fish Hatchery design.		
4	Pond Preparation Important factors in the construction of an ideal fish pond – site selection, topography; Important factors in the construction of an ideal fish pond- nature of the soil, water Resources; Lay out and arrangements of ponds in a fish farm; Construction of an ideal fish pond – space allocation, structure and components of barrage pond.	12	20
5	Pond Management Factors 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; 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; 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	12	20
	Total Hours:	60	100

Textbook:

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

Reference Books:

1. Pillay TVR & M.A.Dill, 1979. Advances in Aquaculture. Fishing News Books Ltd., London
2. London
3. Stickney RR 1979. Principles of Warm Water Aquaculture. John Wiley & Sons Inc. 1981
4. Boyd CE 1982. Water Quality Management for Pond Fish Culture. Elsevier Scientific Publishing Company.
5. Bose AN et.al., 1991. Coastal Aquaculture Engineering. Oxford & IBH Publishing Company Pvt.Ltd.

Course Outcomes:

No.	Course Outcomes	RBT Level*
1	Describe the fundamental concepts, history, and scope of aquaculture.	RM, UN
2	Explain the biological, environmental, and technical factors influencing aquaculture production.	UN, AP
3	Analyze different aquaculture systems, species selection criteria, and culture techniques.	AN, EL



GUJARAT TECHNOLOGICAL UNIVERSITY
Integrated Master of Science (Biotechnology)

Semester: 7

Subject Name: Basic Principles of Aquaculture

Subject Code: 1370412

4	Evaluate sustainable aquaculture practices, water quality management, and disease control strategies.	EL, CR
5	Apply aquaculture principles to design and manage efficient fish and shellfish farming systems.	AP, CR

*RM: Remember, UN: Understand, AP: Apply, AN: Analyze, EL: Evaluate, CR: Create

Suggested Course Practical List:

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 aquaproducts

List of Laboratory/Learning Resources Required

1. Equipment & Instruments

- Water Quality Analysis Instruments: pH meter, dissolved oxygen meter, spectrophotometer.
- Soil Analysis Kits: Nitrogen and phosphorus estimation kits.
- Microscopes: Compound and stereo microscopes for plankton identification.
- Aeration Devices: Paddlewheel aerators, air pumps, and diffusers.

2. Field Sampling & Collection Tools

- Plankton Nets: For zooplankton and phytoplankton collection.
- Sediment Samplers: For soil and organic matter analysis.
- Water Sampling Bottles: For physicochemical parameter testing.
- Hand Nets & Sieves: For collecting aquatic weeds and macroorganisms.

3. Glassware & Consumables

- Beakers, flasks, burettes, pipettes, measuring cylinders.
- Filtration apparatus and filter papers.
- Reagents for carbonate, chloride, ammonia, and phosphorus estimation.
- Staining reagents for plankton identification.

4. Field & Laboratory Facilities

- Access to aquaculture farms, hatcheries, and field sites for sample collection.
- Laboratory with water quality testing, soil analysis, and microscopy facilities.
- GIS and Remote Sensing tools for habitat analysis.

5. Reference Manuals & Learning Resources

- Boyd, C. E. (1998). Water Quality for Pond Aquaculture.



GUJARAT TECHNOLOGICAL UNIVERSITY
Integrated Master of Science (Biotechnology)

Semester: 7

Subject Name: Basic Principles of Aquaculture

Subject Code: 1370412

- APHA (2017). Standard Methods for the Examination of Water and Wastewater.
- Wetzel, R. G. (2001). Limnology: Lake and River Ecosystems.
- New, M. B., Tacon, A. G. J. (2001). Farming Freshwater Prawns: A Manual for the Culture of the Giant River Prawn (*Macrobrachium rosenbergii*).
- FAO Guidelines on Water Quality Monitoring in Aquaculture.
