Name of the Programme: **M.Sc. Zoology**

Course Code: ZOO-612 **Title of the Course:** Developments in Aquaculture (Theory)

Number of Credits: 03

Effective from AY: 2023-24

Pre-requisites for the Course:	Basic knowledge of fish biology/aquatic biology and fish culture methods. Parallel enrollment for ZOO-614 Techniques in Aquaculture (Practical)	
Course Objectives:	1. To impart knowledge and scientific skills to understand the field of modern Aquaculture. 2. To provide an in-depth understanding of different forms of fish farming practices and aquaculture farm construction. 3. To inculcate detailed knowledge of fish nutrition, fish feed formulation and organic farming techniques. 4. To develop a comprehensive knowledge of various aquaculture diseases, parasite problems and preventive measures. 5. To empower learners to understand the recent trends and challenges of a fish-farming society and get confidence to work on different kinds of aquaculture practices.	
Content:	**Module 1** Review on the fundamentals of Aquaculture: Scope and principles of aquaculture, History of aquaculture, Importance of aquaculture: worldwide, Nationwide, and state-wide. Different sectors of Aquaculture and Types of culture practices: Monoculture, Mono-sex culture, Cage culture, Pen culture, composite culture and other techniques. Hatchery management: types of hatcheries, design, and construction, Pond management, and fertilization; pre-and post-stocking management. Water-quality criteria for Aquaculture. Aquafeed technology: Sources of food, Aquafeed Technology: Balanced diet, Feed formulation, Linear programming, Feed additives, Feed conversion ratio (FCR), Protein retention, and Calorie retention. Nutritional requirements at various stages of development of fish & crustaceans. **Module 2** Finfish and Shellfish farming: Freshwater and marine fish seed	15 hours

	resources in India. Gears and crafts are used for seed collection and fish collection. Concept of Bundh breeding (Advantages and Disadvantages) Maintenance and criteria for optimum conditions for Hatchery and nursery management (Brood stock collection and transportation, Life cycle, breeding behaviour, breeding season, and sexual maturity) of Indian Major Carps, Freshwater prawns, white-leg shrimp, Mud crab, edible oyster, Green mussels. Induced breeding technique in Carps and Salmonids. Advantages of GIFT (Genetically Improved Farmed Tilapia) in Aquaculture. Fish diseases and Integrated health management of the farm. **Module 3** Organic farming techniques: Integrated farming, Biofloc technology. Green aquaculture, Aquaponic system, Bioremediation, Biofiltration, Eco-labelling. Zero water exchange, and Reuse. Aquaculture Industries: Technology of Fish products and By-products, Environmental considerations: Impact of Climate Change on aquaculture, Mitigation, and adaptive strategies.	15 hours 15 hours
Pedagogy:	Lectures/ tutorials/assignments/self-study/Presentation/classroom activities	
References/ Readings:	1. R. R. Stickney, Aquaculture-An introductory text, Alex Lainsburry, CABI South Asia Edition.2022. 2. FAO, The Stare of World Fisheries and Aquaculture,2020. Available: http://doi.org/10.4060/ca9229en 3. R.L. Naylor, R.W. Hardy, Buschmann, and A.H., Bush, “A 20-year retrospective review of global aquaculture”, Nature, 2021. 4. J.S. Lucas, Aquaculture: Farming aquatic animals and plants, John Wiley & Sons,2019. 5. “The state of world fisheries and aquaculture”, The sustainable development goals. FAO. License: CC BY-NC-SA 3.0 IGO.2020. 6. S. Ayyappan, Handbook of Fisheries and Aquaculture, ICAR Publications,	

	New Delhi, 2011. 7. T.V. Pillay, and M.N. Kutty, Aquaculture: Principles and practices (2nd Edition), Blackwell Publishing,2015. 8. D. Mills, Aquarium fishes, Dorling Kindersley Ltd, London,1998. 9. J.D. Jameson, and R. Santhanan, Manual of ornamental fishes and farming technologies, 1996. 10. N.K. Thakur, Culture of live food organisms for aqua hatcheries. Training manual. CIFE (ICAR), Mumbai,1998.
Course Outcomes:	The learner will 1. Conclude the importance of aquaculture in the country. 2. Assess the basis of technologies of fisheries and aquaculture to understand the principles, their importance, purpose and application. 3. Construct methods and techniques for hatchery/pond construction, their management methods and quality assurance principles. 4. Appraise advanced techniques in aquaculture concerning inducing breeding in fish, fish feed preparation, and fish disease prevention 5. Analyze and evaluate the effects of fisheries and aquaculture on the environment, to provide preventive safety measures. 6. Develop the ability to research in the field of fish biology, fisheries and aquaculture.

(Back to top)