

ZOO2FM106-1

AQUACULTURE AND ORNAMENTAL FISH FARMING

Programme	B.Sc. Zoology				
Type of Course	MDC				
Semester	II				
Academic Level	100-199				
Course Details	Credit	Lecture per week	Tutorial per week	Practical per week	Total hours
	3	3			45
Pre-requisites	+2 /VHSC Biology or the following online courses 8. https://courseware.cutn.ac.in/courses/ornamental-aquaculture/ 9. http://ecoursesonline.iasri.res.in/course/view.php?id=297 10. https://www.classcentral.com/classroom/youtube-aquaculture-types-of-culture-systems-179652				
Course objectives	The student develops understanding and knowledge about different aquatic culture species and aquaculture systems. Student develops skill in setting up of ornamental fish aquariums				

Course outcome	CO statement	Cognitive Level*	Knowledge Category#	Evaluation Tools used
CO1	Identify and describe major commercially important aquaculture species of India and the basic principles of aquaculture and culture methodologies of fishes and shellfishes. [PSO1, PSO2]	U	F&C	
CO2	Describe the different types of tools used in aquariums [PSO2]	U	F&C	
CO3	Identify the diversity of ornamental fishes and develop skills in aquarium fabrication and maintenance. [PSO4, PSO5]	Ap	C&P	
CO4	Develop skills in culture and breeding of freshwater and marine ornamental fish varieties.[PSO4, PSO5]	Ap	C&P	
CO5	Develop expertise in setting up and maintenance of freshwater and marine aquariums as hobby and also in commercial level. [PSO5]	Ap	C&P	
CO6	Employment and Entrepreneurship skill development in the field of ornamental fish industry. [PSO5]	Ap	M&P	

* - Remember (R), Understand (U), Apply (Ap), Analyse (An), Evaluate (E), Create (C)

- Factual Knowledge(F) Conceptual Knowledge (C) Procedural Knowledge (P) Metacognitive Knowledge (M)

Question paper pattern for external examination: Module 1 : short answer 3 x 2 marks = 6 marks, paragraph 2 x 6 marks = 12 marks; Module 2 : short answer 3 x 2 marks= 6 marks, paragraph 1 x 6 marks = 6 marks; Module 3 : short answer 2 x 2 marks= 4 marks, paragraph 2 x 6 marks = 12 marks, Essay 1 x 10 marks = 10 marks; Module 4 : short answer 2 x 3 marks= 6 marks, paragraph 3x 6 marks = 18 marks, Essay 1x10marks = 10 marks; Module 5: paragraph 2 x 6 marks = 12 marks

Module 1: Introduction to Aquaculture 9hrs)

Unit 1: Aquaculture(3hrs) – Definition. Commercially important aquaculture species in India. Freshwater, Brackish and Marine finfish and shellfish species. Brief account of classification of aquaculture based on: Environment – Freshwater, brackish water and mariculture.

Unit2: Culture techniques (6hrs)– pond aquaculture, cage culture, pen culture, raft culture, pole culture, rack culture and long line culture. Number of species – Mono culture and poly culture. Type of organism – prawn culture, shrimp culture, edible oyster culture, lobster culture, Pearl culture, Pisciculture etc.

Module 2: Ornamental fish farming (10 hrs)

Unit 1: Introduction to Ornamental fish as a hobby(4hrs)- Role of public aquaria, design, shape, types of aquaria, accessories, setting up of aquaria. Physicochemical parameters of water and their maintenance in aquaria and ornamental fish ponds.

Unit 2: Ornamental fishes (6 hrs): Identification of commercially important fresh water ornamental fishes: exotic species: Goldfish, Koi carp, Silver shark, Cardinal Tetra, Kissing gourami, Angel fish etc.(Egg layers), Guppy, Molly, Sword tail, Platy etc. (Live bearers); Indigenous species: Deninson, S barb, Rosy barb, Honey gourami, Zebra fish, Glass fish etc.

Module 3: Aquarium Setting (8 hrs)

Unit 1: Introduction (2hrs)- Farm design, quarantine facility, transportation of fishes, Government programs and institutions facilitating the ornamental fish production.

Unit 2: Aquarium construction (6hrs) -Types of aquaria- Biotope aquarium. Vivarium, insectarium, terrarium, paludarium, oceanarium, dolphinarium. Reef aquarium. Nano aquariums. Principles of setting up and maintenance of aquaria: Construction of fresh water aquarium. Aquarium accessories- aerators, filters, skimmers, chillers, lighting, decorates, etc.

Module 4: Aquarium Maintenance (9 hrs)

Unit 1: Feeding and nutrition(5hrs)- Breeding of ornamental fishes (One each for live bearer and egg layer). Live feed culture. Formulated feeds. Preparation of aquarium fish food. Colour enhancement techniques. Feed preparation and coloration, Formulate feed with thrust on coloration. Aquatic plants, ornamental plants.

Unit 2: Fish trading (2hrs)- Packaging, transportation and marketing of aquarium fishes. Anaesthetics used in the trade.

Unit 3: Health care (2hrs)- Common diseases and parasites of ornamental fish. Health management of aquarium fishes. Cleaning the aquarium –Siphoning, Water exchange.

Module 5: Ornamental fishes and skill development (9 hrs)

Practise sessions for fabrication and setting up of a fresh water aquarium and its maintenance can be conducted. Field visits can be conducted to nearest marine aquarium.

References

- Ashok Kumar Rathoure, Dinesh Kumar, Nazneen Z. and Deshmukh (2015): Applied and Economic Zoology; Daya Publishing House. 326 pages.
- Jawid Ahsan and Subhas Prasad Sinha (2010): A hand Book on Economic Zoology; S. Chand, ISBN. 9788121908764, 314 pages
- V. B. Upadhyay and G. S. Shukla (2007): Applied and Economic Zoology; Rastogi Publications. 496 pages
- Ahilan. B, Felix. N. & Jameson, J.D., 2009. Goldfish. Daya Publishing House, New Delhi. 87 pp.
- Alappat, H.J. & A. Biju Kumar 1996. Aquarium Fishes (A Colourful Profile). B.R. Publ., Delhi, 106 pp. Alderton, D., 2019.
- Encyclopedia of aquarium and pond fish. DK Publishers, UK. 400 pp.
- Bailey M., & Sanford, G., 2017. Aquarium fish- a definitive guide to identify and keeping freshwater and marine fishes. Smithmark Publishers, USA. 256 pp.
- Biju Kumar, A. & Alappat, H.J., 1996. A Complete Guide to Aquarium Keeping. Books for All, Delhi, 80 pp.
- Dholakia, A.D., 2009. Ornamental fish Culture & Aquarium Management. Daya Publishing House, Delhi, 313 pp.
- Kurup, M.B., 2008. Ornamental Fish Farming, Breeding and Trade. Dept. Fish., Govt. Kerala, 280 pp.

- Meenakshi, J., N.K. Yadava & Gupta, R.K., 2010. Freshwater Ornamental Fishes. Mangalam Publications, Delhi, 397 pp.
- Mills, D., 1984. A Fish Keepers Guide to the Tropical Aquarium. Salamander Books, Ltd., London, 115 pp.
- Rataj, K. & Zukal, R., 1971. Aquarium Fishes and Plants. The Hamlyn Publ. Group Ltd., London.
- Mills, D., 1987. The Practical Encyclopedia of the Marine Aquarium. Salamander Books Limited, London.

Online Sources

1. <https://thefishsite.com/articles/an-introduction-to-ornamental-aquaculture>
2. http://cifa.nic.in/sites/default/files/Ornamental_fish.pdf
3. <http://aquaculturetraining.com.au/pdf/ornamental-fish-culture-practices.pdf>
4. <https://www.proquest.com/openview/1739d1a26c3a75fee7599ca1828d23e3/1?pq-origsite=gscholar&cbl=237326>

Mapping of COs with PSOs and POs :

	PSO 1	PSO 2	PSO 3	PSO4	PS O5	PSO 6	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	2	3					3						
CO 2		3					3						
CO 3				3	2				3				
CO 4				2	3				3				
CO 5					3				3				
CO 6					3				3				

Correlation Levels:

Level	Correlation
-	Nil
1	Slightly / Low
2	Moderate / Medium
3	Substantial / High