

SACRED HEART COLLEGE (AUTONOMOUS)

Department of Aquaculture

MASTER OF AQUACULTURE AND FISH PROCESSING

Course plan

Academic Year 2018-19

Semester III

16P3AQCT09: CULTURE OF FIN FISH, MOLLUSCS AND SEA CUCUMBERS.

PROGRAMME	MASTER OF AQUACULTURE & FISH PROCESSING	SEMESTER	3
COURSE CODE AND TITLE	16P3AQCT09: Culture of Fin Fish, Molluscs and Sea Cucumbers.	CREDIT	4
HOURS/WEEK	4	HOURS/SEM	72
FACULTY NAME	Litty Mary		

COURSE OBJECTIVES

- To understand the commercial practices on culture of fin fishes and mollusc
- To analyze the food and feeding of fin fishes ,mollusc and sea cucumbers
- To understand the characteristics and criteria for selection of species for mariculture
- To understand the seed collection and transportation techniques
- To describe the culture and conservation of sea cucumbers n India
- To understand the processing of sea cucumbers
- To understand different types of grow out culture systems
- To study of eco labelling and organizations related to it.

SESSION	TOPIC	LEARNING RESOURCES	VALUE ADDITIONS	REMARKS
MODULE I- FIN FISH CULTURE				
1	Marine, brackish water and fresh water species cultured.	PPT/Lecture	Q & A Session	
2	Fish seeds	PPT/Lecture		
3	Natural seed resources, their distribution, abundance,	PPT/Lecture		
4	Collection from natural sources and	PPT/Lecture		
5	Transportation of fish seeds.	PPT/Lecture		
6	Hatchery technology- types of hatcheries.	PPT/Lecture		
7	Hatchery technology – structure and components	PPT/Lecture		
8	Vertical hatcheries.	PPT/Lecture		
9	Portable and circular hatcheries- Ecohatchery.	PPT/Lecture		
10	Hatchery technology- brood stock management and breeding under controlled conditions.	PPT/Lecture		
11	Induced breeding	PPT/Lecture	Q & A Session	
12	Hormones involved and hormonal analogues.	PPT/Lecture		
13	Egg incubation, larval rearing, and production of seed, nursery phase	PPT/Lecture		
14	Fin fish culture in pens- different types.	PPT/Lecture		
15	Cages- different types.	PPT/Lecture		
16	Materials and different types of cages- construction.	PPT/Lecture		
17	Raceways and running water systems.	PPT/Lecture		
18	Traditional farming practices- different types	PPT/Lecture		
19	Polyculture and monoculture.	PPT/Lecture		
20	Operational details of monoculture and polyculture.	PPT/Lecture		
21	Integrated farming	PPT/Lecture		
22	Agro-based Integrated systems	PPT/Lecture		
23	Live stock-based Integrated systems	PPT/Lecture		
24	Sea ranching of fin fish	PPT/Lecture		
25	Seminar	PPT/Lecture	Discussion	
26	Seminar	PPT/Lecture	Discussion	
27	Seminar	PPT/Lecture	Discussion	
28	Seminar	PPT/Lecture	Discussion	
29	Seminar	PPT/Lecture	Discussion	
CIA- 1				
30	Aquaponics.	PPT/Lecture		
31	Aquaponics- different types.	PPT/Lecture		
32	Aquaponics- construction and working	PPT/Lecture		

33	Aquaculture Stewardship Council	PPT/Lecture		
34	Marine Stewardship council.	PPT/Lecture		
35	Eco-labelling	PPT/Lecture		
36	Seminar	PPT/Lecture	Discussion	
37	Seminar	PPT/Lecture	Discussion	
Module II Sea cucumber culture				
38	Natural resources and recent advances in breeding	PPT/Lecture		
39	Sea cucumbers- biology	PPT/Lecture		
40	Seed production- hatchery phase (spawning and larval rearing)	PPT/Lecture		
41	Culture (farming techniques and grow out systems)and	PPT/Lecture		
42	Uses, by- products of sea cucumbers.	PPT/Lecture		
43	Conservation of sea cucumbers in India.	PPT/Lecture		
44	Collection from natural bed and pre cooking processes.	PPT/Lecture		
45	Processing of sea cucumbers (upto packaging)	PPT/Lecture		
46	Seminar	PPT/Lecture	Discussion	
MODULE III- Culture of Molluscs				
47	Overview of culture of Molluscs in the world	PPT/Lecture		
48	Major species of oysters, mussels, clams, scallops, gastropods in aquaculture.	PPT/Lecture		
49	Grow out culture systems- in common	PPT/Lecture		
50	Distribution and abundance of commercial important species.	PPT/Lecture		
51	The collection techniques of molluscs- in common	PPT/Lecture		
52	Anatomy and morphology of oysters	PPT/Lecture		
	Oyster farming-site selection, farm structure	PPT/Lecture		
53	Hatchery production of oyster seed and brood stock management.	PPT/Lecture		
54	Edible oyster culture (farming and grow out systems)	PPT/Lecture		
55	Anatomy and morphology of mussels	PPT/Lecture		
56	Hatchery production of mussels and brood management.	PPT/Lecture		
57	Natural pearl formation- pearl sac theory.	PPT/Lecture		
58	Artificial pearl production- surgery.	PPT/Lecture		
CIA- 2				
59	Pearl oyster culture (farming and grow out systems)	PPT/Lecture		
60	Pearl culture- mabe pearl.	PPT/Lecture		
61	Anatomy and morphology of clams	PPT/Lecture		
62	Hatchery production of clams and brood stock management.	PPT/Lecture		
63	Spat settlement and spat collection.	PPT/Lecture		

64	Induced maturation, spawning and larval rearing techniques for molluscs.	PPT/Lecture		
65	Farming techniques of molluscs- monitoring growth and condition index.	PPT/Lecture		
66	Water quality, bio-fouling and disease control	PPT/Lecture		
67	Transportation of seed.	PPT/Lecture		
68	Control of predators and harvesting of molluscs	PPT/Lecture		
69	Depuration of bivalves, principles and methods	PPT/Lecture		
70	Processing and products of bivalves.	PPT/Lecture		
71	Seminar	PPT/Lecture	Discussion	
72	Seminar	PPT/Lecture	Discussion	

GROUP ASSIGNMENTS/SEMINAR – Details & Guidelines

	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc)
1	Carp culture practice in India.
2	Clam resources of India.
3.	Problems and prospects of cage culture.
4.	Grow out culture of India- advantages and disadvantages.
5.	Abalone culture.
6.	Criteria of selection of species for mariculture.
7.	Present status of sea cucumber culture in India.
8.	Overview of fin fish culture in the world
9.	Major species cultured country wise production.
10.	Fin fish culture in India.-historical background and recent advances

TEXTBOOKS AND REFERENCES	
1.	Pillai T. V. R. (2005), Aquaculture Principles and Practices, Fishing News Books.
2.	CMFRI Bulletin No. 48, Artificial reefs and Sea Farming Technologies.
3	CMFRI Special Bulletin No. 66, Transportation of live fish and shell fish.
4.	Santhanam R. Coastal aquaculture in India.
5.	CMFRI Bulletin (1991) Hatchery technology and culture of sea cucumber, CMFRI Special Publication

6.	Baedac J. E. W. (1972) Aquaculture farming and Husbandary of fresh water and marine organisms.
7.	Beveridge M. C. M. (1987), Cage culture, Fishing News.
8.	Pillai T. V. R. (1994), Aquaculture development progress and prospects, Halsted Press.
9.	Boyd C. E. and Pillai V. K., Water quality management in aquaculture (1985), CMFRI Special Publication No. 22
10.	Menon N. G. and Pillai P. P. etal, Prospectives in Mariculture. (2001), The marine biological association of India Publication

Web resource references:

1. <http://eprints.cmfri.org.in/5026/#:~:text=Finfish%20culture%20is%20an%20ancient,its%20development%2C%20through%20many%20centuries.>
2. <http://www.fao.org/3/t8598e/t8598e05.htm>
3. [http://eprints.cmfri.org.in/3452/1/Special Publication No 57.pdf](http://eprints.cmfri.org.in/3452/1/Special%20Publication%20No%2057.pdf)
4. <http://www.fao.org/3/AB736E/AB736E03.htm>
5. <http://www.fao.org/3/AB722E/AB722E00.htm>
6. [.http://eprints.cmfri.org.in/2582/](http://eprints.cmfri.org.in/2582/)

16P3AQCT10: Aquariculture, Aquaculture Economics, Management and Administration

PROGRAMME	MASTER OF AQUACULTURE & FISH PROCESSING	SEMESTER	III
COURSE CODE AND TITLE	16P3AQCT10:Aquariculture, Aquaculture Economics, Management and Administration	CREDIT	4
HOURS/WEEK	4	HOURS/SEM	72
FACULTY NAME	Dr. T. V. Mercy		

COURSE OBJECTIVES

- To Identify and breed of ornamental fin fishes.
- To understand the basic principles of economic theories applied to farm management, entrepreneurships and small scale industries.
- To Identify aquarium plants and invertebrates.
- To study construction and maintenance of aquarium
- To Set up aquarium tanks.
- To Identify common diseases in aquarium fishes and management
- To apply production economics in aquaculture
- To analyze market demand for aquaculture products by conducting consumer surveys.

SESSION	TOPIC	LEARNING RESOURCES	VALUE ADDITIONS	REMARKS
Module 1- Construction and maintenance of aquarium				
1	Introduction to aquariculture, scope and importance.	PPT/Lecture	Q & A Session	
2	Construction of glass tank aquarium	Pr.		
3	Construction of glass tank aquarium	Pr.		
4	Construction of glass tank aquarium	Pr.		
5	Setting up of fresh water aquarium	Lr.		
6	Components and their function	Lr.		
7	Setting up of fresh water aquarium	Pr.		
8	Setting up of Marine aquarium	Th. Lecturer		
9	Setting up of Marine aquarium	Practical		
10	Maintenance of Fresh water.	Lecturer		
11	Maintenance of marine aquarium			
12	Filters	Lecture		
13	Different types of filters	Lecture		
Module 2- Culture of aquarium fishes and management.				
14	Identification of marine ornamental fishes	Ppt/lecture	Q & A Session	

15	Identification of marine invertebrates	Ppt/lecture		
16	Identification of aquatic plants	Ppt/lecture		
17	Types and propagation.	Ppt/lecture		
18	Identification of fresh water ornamental fishes/barbs and live bearers	Ppt/lecture		
19	Identification of fresh water ornamental fishes/cichlids/ gourami/fighter	Ppt/lecture		
20	Breeding of Live bearer.	Practical		
21	Breeding of gold fish.	Ppt/lecture		
22	Breeding of koi carp	Ppt/lecture		
23	Breeding of angel fish	Ppt/lecture		
24	Breeding of fighter.	Ppt/lecture		
25	Breeding of barb.	Ppt/lecture		
26	Breeding of gourami.	Ppt/lecture		
27	Breeding of clown fish.	Ppt/lecture		
28	Breeding of damsels.	Ppt/lecture		
29	Breeding of butterfly fish.	Ppt/lecture		
CIA-1				
30	Breeding of seahorse.	Ppt/lecture	Q & A Session	
31	Live feed culture	Ppt/lecture		
32	Bulk production of ornamental fishes.	Ppt/lecture		
33	Nutrition of aquarium fishes	Practical		
34	Types of feeds for aquarium fishes.	Ppt/lecture		
35	Design and construction of ornamental fish culture unit.	Ppt/lecture		
36	Components of culture unit.	Ppt/lecture		
37	Establishment of commercial ornamental fish culture unit.	Ppt/lecture		
38	Identification of common diseases.	Ppt/lecture		
39	Management of diseases	Ppt/lecture		
40	Quarantine and biosecurity	Ppt/lecture		
Module 3- Economics				
41	Application of production economics in aquaculture.	Ppt/lecture	Q & A Session	
42	Law of diminishing returns; definition and application	Ppt/lecture		
43	Marginal analysis-total products	Ppt/lecture		
44	Average product, marginal product curves and formulae.	Ppt/lecture		
45	Producer decision criteria	Ppt/lecture		
46	Profit maximization.	Ppt/lecture		
47	Cost fractions-determining maximum profit level of production.	Ppt/lecture		
48	Opportunity costs, fixed costs, variable costs, full costs.	Ppt/lecture		
49	Revenue function, total average.	Ppt/lecture		

50	Marginal-production function in aquaculture.	Ppt/lecture		
51	Investment financial planning and market analysis.	Ppt/lecture		
52	Investment-definition, autonomous and induced investment.	Ppt/lecture		
53	choice and formulation of aquaculture investment projects	Ppt/lecture		
54	factors influencing investments and decisions,	Ppt/lecture		
55	Budget and partial for aquaculture enterprises	Ppt/lecture		
56	Income cash flow and statements.;;	Ppt/lecture		
57	Ration analysis	Ppt/lecture		
58	Supply and demand functions for aquaculture products	Ppt/lecture		
CIA- 2				
59	Consumer surveys for aquaculture products	Ppt/lecture		
Module 4- Aquaculture managment				
60	Market analysis and questionnaire design.	Ppt/lecture		
61	Management of hatcheries.	Ppt/lecture		
62	Management of farms.	Ppt/lecture		
63	Availability of manpower and skilled labour in India	Ppt/lecture		
64	Personal requirements and management.	Ppt/lecture		
65	Material management.	Ppt/lecture		
66	Financial management.	Ppt/lecture		
67	Poaching and natural calamities.	Ppt/lecture		
68	Water quality control for hatcheries.	Ppt/lecture		
69	Water quality control for farms.	Ppt/lecture		
70	Feasibility report, Criteria for preparation of feasibility reports	Ppt/lecture		
71	Criteria of data input for a report	Ppt/lecture		
72	Nature of data input needed for preparation of feasibility reports for hatcheries and feed mills.	Ppt/lecture		

GROUP ASSIGNMENTS – Details & Guidelines

	Topic of Assignment & Nature of assignment (Group – Written/Presentation – Graded or Non-graded etc)
1	Breeding of sword tail.
2	Breeding of gold fish.
3	Breeding of koi carp
4	Breeding of angel fish
5	Breeding of fighter.
6	Breeding of barb.
7	Breeding of gourami.
8	Breeding of guppy.
9	Breeding of molly.
10	Breeding of platy.

References

1. Lackey, RLTA Nielson 1980, Fisheries management Balckwell Sci. Pub. Oxford.
2. Panayottou, T. 1982. Management concept for small scale fisheries economic and social aspects.
3. T. V. Anna Mercy et al, 2007. Ornamental fishes of the Western Ghats of India. NBFGR publication, Lucknow.
4. Herber J Axelord, Leonard P. Schultz. Handbook of Tropical Aquarium Fishes, TSH, USA.

Web resource references:

1. <http://www.fao.org/3/a-bb206e.pdf>
2. http://www.fao.org/tempref/fi/cdrom/fao_training/fao_training/general/x6709e/x6709e09.htm
3. <http://www.fao.org/3/ca9051en/CA9051EN.pdf>
4. <http://www.fao.org/3/w7387e/W7387E00.htm>

16P3AQCT11: CULTURE OF CRUSTACEANS, SEAWEEDS AND FISHERIES TECHNOLOGY

PROGRAMME	MASTER OF AQUACULTURE & FISH PROCESSING	SEMESTER	III
COURSE CODE AND TITLE	16P3AQCT11: Culture of Crustaceans, Seaweeds and Fisheries Technology	CREDIT	4
HOURS/WEEK	4	HOURS/SEM	72
FACULTY NAME	Sangeetha.K.R. ,Dr. Jose Joseph ,Dr. S.Sanjeev & Dr. Leena Raphael		

COURSE OBJECTIVES

To understand the culture of the economically important crustaceans and seaweeds
To Identify of economically important sea weeds
To describe the methods of processing and extraction of different seaweed products
To understand the fundamental principle of bacteriology
To describe spoilage causing microorganisms of fish and fishery products
To evaluate fresh fish and fish products
To analyse post mortem changes in fish
To describe handling of fish onboard , landing centres ,retail outlets and pre-processing centres

SESSION	TOPIC	LEARNING RESOURCES	VALUE ADDITIONS	REMARKS
MODULE I-Crustacean culture				
1	Overview of crustacean culture in the world	PPT/Lecture	Video	
2	Major species cultured	„		
3	Technologies and problems of crustacean culture in India	„		
4	Historical background and recent advances	„	E-resources	
5	Potential species and characteristics of their suitability for aquaculture	„		
6	Natural seed resources, their distribution and abundance	„		
7	Seed and brood stock collection and transportation	PPT/Lecture		
8	Hatchery production of seed- site selection for shrimp hatchery	„	E-resources	
9	Components of shrimp hatchery	„	„	
10	Brood stock management and breeding under controlled conditions	„	„	
11	History of shrimp hatchery technology	„	„	
12	History of fresh water prawn hatchery technology	„	„	

13	Larval rearing techniques	„		
14	Seminar			
15	Mass production of seed	„		
16	Criteria for site selection of fresh water prawn hatchery	„		
17	Components of fresh water prawn hatchery	„		
18	Seed production of fresh water prawn	„	E-resource	
19	Criteria for site selection of shrimp farm	„		
20	Pond preparation	„	Quiz	
21	Selection of seed ,transportation , acclimatization and stocking	„		
22	Water quality management	„		
MODULE III-Microbiology				
23	Fundamental principles of bacteriology	„		
24	Morphology and size of bacteria	„		
25	Reproduction and growth	„		
MODULE IV-Fisheries technology				
26	Chemical composition of fish	„		
27	Sensory evaluation of fresh fish	„		
28	Principle changes following death of fish- autolysis	„		
29	Post mortem changes in fish	„		
CIA-1				
30	Lobster culture	„		
MODULE II-Seaweed culture				
31	Taxonomy of Agar yielding seaweeds	„		
32	Taxonomy of Algin yielding seaweeds	„		
33	Taxonomy of Agaroid yielding seaweeds	„		
34	Taxonomy of Edible seaweeds	„		
35	General characters of different classes of seaweeds	„		
36	Seminar			
37	Morphology of green algae – Codium , its distribution & growth pattern	„		
38	Reproduction and life cycle in Codium	„		
39	Morphology of brown algae – Sargassum, its distribution & growth pattern	„		
40	Reproduction and life cycle in Sargassum	„		
41	Morphology of red algae – Porphyra , , its distribution & growth pattern	„		
42	Reproduction and life cycle in Porphyra	„		
43	Growth of seaweeds and factors affecting it.	„		
MODULE I- Crustacean culture				
44	Different kinds of grow out culture systems	„		
45	Culture of <i>Fenneropenaeus vannamei</i> .	„		
46	Specific Pathogen Free shrimp and SPR shrimp	„		
47	Seminar			
48	Small scale and commercial scale culture operations.	„		

49	Utilization of seaweeds	„		
50	Seminar			
51	Seminar			
MODULE III- Microbiology				
52	Bacterial spores	„		
53	Staining of bacteria, various staining methods	„		
54	Effect of environment on growth of bacteria- classification of bacteria	„		
55	Seminar			
MODULE IV- Fisheries technology				
56	Seminar			
57	Iced storage- different types of ice and their production flow ice and gel ice	„	Video	
58	Chilled storage- in ice, CSW, CFW, RSW, shelf life.	„		
CIA- 2				
MODULE III- Microbiology				
59	Intrinsic parameters affecting microbial growth in food	„		
MODULE IV- Fisheries technology				
60	Modified atmospheric packaging (MAP) and controlled atmospheric packaging (CAP).	„	Video	
61	Handling of fish on board, landing centers, retail outlets and preprocessing centers.	„		
62	Seminar			
63	Transportation of fish and containers used for transportation	„		
64	Seminar			
MODULE I- Crustacean culture				
65	Feed management	„		
66	Diseases and its management	„		
67	Harvesting of cultured shrimp	„		
68	Crab culture	„		
69	Hatchery seed production of lobster	„		
70	Hatchery seed production of crab	„	Video	
71	Seminar			
72	Seminar			

INDIVIDUAL ASSIGNMENTS/SEMINAR – Details & Guidelines

	Topic of Assignment & Nature of assignment (Individual/Group – Written/Presentation – Graded or Non-graded etc.)
1	Sea ranching of prawns
2	Processing and extraction of align and alginates
3	Processing and extraction of agar
4	Processing and extraction of mannitol and carrageen
5	Psychrophilic microbes in processed fish and fishery products
6	Mesophilic microbes in processed fish and fishery products
7	Fresh water prawn culture
8	Shrimp farming in cages
9	Shrimp farming in pens
10	Shrimp farming in recirculation system
11	Nursery phases of shrimp and prawn larvae
12	Chemical composition of seaweed
13	Handling of fish on retail outlets and preprocessing centers
14	Changes in fish during iced storage
15	Rigor mortis, autolytic enzymes
16	Causes of mortality of seaweeds
17	Post – harvest technology of cleaning, washing and storage of seaweeds
18	Extrinsic parameters affecting microbial growth in food
19	Seaweed pigments

References

- **Campell R.C. 1978.Statistics for biologists,Blackie and sons publishers ,Bombay**
- **Caswell,F. 1982.Success in statistics ,John Murray Publishers, Bombay.**
- **Agarwal.W.L.1986.Basc statistics. New Age International pvt.Ltd.Publishers,New Delhi,Baily**
- **Jain.V.K.,1983.Computer fundamentals ,BPB publishers ,New Delhi**

- Neswin D 1998. Microsoft windows at a glance .BPH publishers, New Delhi.
- Sebasta R.W. 1999. Concepts of programming languages ,Addison-Wesely, Massachusetts.

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- <http://web.stanford.edu/class/bios221/book/introduction.html>
- https://www.tutorialspoint.com/basics_of_computers/basics_of_computers_in_troduction.htm