

## PG. DIPLOMA IN AQUACULTURE TECHNOLOGY AND MANAGEMENT

12 months ( 1 Year course)  
 9months teaching course work  
 3 months Field work-Project Report  
 Exam 3 hours-100 marks (70+30)  
 For admission in 2016-2017  
 Fee : Rs. 10,000  
 In take-30 students

Paper Code	Title of the Paper	No of hrs/week	Core/ Elective	External marks	Internal marks	No. of Credits
<b>SEMESTER I</b>						
I	ESTUARINE AND MARINE FISHERIES	3	Core	70	30	5
II	AQUACULTURE TECHNOLOGY AND MANAGEMENT	3	Core	70	30	5
<b>SEMESTER II</b>						
III	FISHERY EDUCATION, EXTENSION AND ECONOMICS OF AQUACULTURE	4	Core	70	30	5
	----- Field work-	2				2
IV	Project work			125	25	15
	Project Seminar			25	--	2
	Project Viva voce			25	--	2
<b>Practicals</b>						
	Microbial analysis	4	Core	30	20	4
	Culture techniques	4	Core	30	20	4
	<b>TOTAL</b>	<b>20</b>		<b>500 marks</b>		<b>44</b>

## **PAPER-1-ESTUARINE AND MARINE FISHERIES**

### **Unit – I**

- 1.1. Riverine Fisheries: River systems in India, their ecology and fisheries (Ganga, Brahmaputra, East-Coast River System and West-Coast river system)
- 1.2. Estuaries: Origin of estuaries - Structure of an estuary (Physico-chemical Features). Some typical estuarine habitats of India (Hoogly–Matlah, Mahanadi, Godavari, Krishna, Cauvery and West-coast Estuaries), Estuarine food webs.
- 1.3. Brackish water Lake Fisheries (Chilka lake, Pulicat lake, Kerala back waters)

### **Unit – II**

- 2.1. Fisheries of Indian Seas: Marine fish catch in India and fisheries of commercial importance
- 2.2. Fishery of: 1) Oil Sardines, 2) Mackerels, 3) Tuna and allied fishes, 4) Seer fish, 5) Flat fishes.
- 2.3. Shell fish fisheries: Fishery of Crustaceans, Mollusks and Edible Oyster, Fishery of Seaweed

### **Unit – III:**

- 3.1. Classification and topography of marine environment and salient features of different zones.
- 3.2. Physical environmental factors (temperature, light, pressure, currents, tides and waves)
- 3.3. Chemical environmental factors (oxygen, carbon dioxide and carbonates, pH, nitrogen cycle)

### **Unit – IV:**

- 4.1. Basics of aquaculture: Scope and definition, history of aquaculture, origin and growth, General principles underlying the practices of aquaculture
- 4.2. Types of culture systems: Traditional, extensive, modified extensive, semi-extensive, intensive and super-intensive culture of shrimps and their management and economics
- 4.3. Procurement of Stocking material from natural environment, Bund breeding and Induced breeding - Transportation of fish seed and brood fish (Methods of transporting fish seed – Fingerlings and breeders – Control of mortality and measures for reducing mortality during transportation).

### **Unit – V:**

- 5.1. Fish Catch Statistics: A general survey of Inland and Marine fish catches of India and the world (Available Fishing Potential, Estimation of Inland fish catches, Estimation of marine fish landings and Fisheries of different Maritime States).
- 5.2. Craft and Gear used in Inland and Marine Fisheries: Traditional and Mechanized Boats and Nets used in catching fish.
- 5.3. Fish Population dynamics: Fish populations and factors affecting the population structures Estimation of fish yield and control of over-fishing

## **PRACTICALS**

Analysis of water: Turbidity, pH, Dissolved oxygen, Alkalinity etc.

Primary productivity, Estimation by Light and Dark Bottle method

Spotters : Cultivable species of finfish and shellfish based on the theory

Identification of fresh water and marine fish

Observing different boats, nets and other instruments used in fishery

Biological analysis of fish samples for gut contents, maturity stages and fecundity

Fieldwork: Visit to fish landing and processing centres

## **Reference Books:**

1. Friedrich, H.: Marine Biology
2. Raymont, J.E.C.: Plankton and productivity in the Oceans, Volume 1.
3. Balakrishna Nair. N. and D.M. Thampy: A text book of Marine ecology
4. Broecker, W.S.: Chemical Oceanography
5. Sverdrup, H.V., M.W., Johnson and R.H. Fleming.: The Oceans - Their physics, chemistry and general biology. Prentice-Hall Inc. 1942.

## **PAPER II- AQUACULTURE TECHNOLOGY AND MANAGEMENT**

### **Unit -I**

- 1.1 Design, construction and management practices of Finfish hatcheries
- 1.2 Design, construction and management practices of prawn & shrimp Hatcheries

### **Unit – II**

- 2.1 Fertilizers: Introduction, properties of chemical fertilizers, role of inorganic, organic and bio-fertilizers in aquaculture practices.
- 2.2 Liming: Introduction, properties of liming materials, effects of liming on pond ecosystem, exchange of acidity and lime requirements, application of liming materials of ponds, acid sulfate soils

### **Unit – III**

- 3.1 Feeding methods: Introduction, different methods of feeding, frequency of feeding, fate of nutrients in feed, water quality and feeding rates
- 3.2 Harvesting methods-drainable ponds Cage & Raceway farms, Handling-Transport-Preservation methods, Sun Drying-Salt curing - Pickling-Smoking - Freezing and Canning.
- 3.3 Processing & Preservation of fish products and byproducts- Fish meal, Fish Oils, Fish Sauce, Fish Glue, Sanitation in Processing-Treatment & Disposal of Fish Wastes –Solid and Liquid

### **Unit IV**

- 4.1 Introduction: Diseases: Definition, Disease problems in aquaculture, Infectious and non-infectious diseases- Role of microbes –Important diseases caused by protozoan, bacteria and viruses,
- 4.2 Environmental induced diseases of fish. Thermal stress, O<sub>2</sub> deficiency, stress due to pH variations; Gas bubble disease
- 4.3 Nutrition deficiency diseases: Avitaminosis, Mineral deficiency, Starvation.
- 4.4 Diseases caused by other factors: Hereditary factors, Tumors of hereditary origin, Hydrocoel, Tumours, Benign and Malignant

### **Unit V**

- 5.1 Fishery and Economics- Cost calculation of projects – packaging technology, Demand and Price analysis.
- 5.2 Economic Feasibility of investment analysis, Cash flow analysis- Socio-economic analysis, risk and insurance–Role of banks and funding agencies-
- 5.3 Fish exports- Marketing and Resource Management. Legal and Environmental issues

## **PRACTICALS**

1. Examination of normal and diseased fish - Thorough examination of external surface
2. Autopsy of the diseased fish

3. Host examination – Collection of parasites
4. Slide preparation - fixing - staining and mounting of parasites
5. Histopathology of organs of diseased fish ( Sectioning – Staining and Mounting)
6. Slides of fish parasites (Protozoan – Helminth and Copepod)
7. Design and estimates of area and construction of freshwater fish/shrimp farm

#### **Reference Text Books :**

1. Pillay, T.V.R. & M.A. Dill. Advances in Aquaculture. Fishing News (Books) Ltd., England, 1979.
2. Stickney, R.R. Principles of Warm water Aquaculture. John Wiley & Sons Inc., 1979.
3. Hefner, B. & Y. Prugim. Commercial Fish Farming. John Wiley & Sons Inc., 1981.
4. Boyd, C.E. Water Quality Management for Pond Fish Culture. Elsevier Scientific Publishing Company, 1982.
5. Jhingran, V.G. Fish and Fisheries of India. Hindustan Publishing Corporation India, 1982
6. Bose, A.N. et. Al. Coastal Aquaculture Engineering. Oxford & IBH Publishing Company Pvt. Ltd., 1991.
7. Cheng, T.C. The Biology of Animal Parasites. Saunders, Philadelphia, 1964.
8. Reichenbach, H.H. Fish Pathology. T.F.H. (Great Britain) Ltd., England, 1965.
9. Conroy, D.A. & R.L. Herman. Textbook of Fish Diseases. Ibid, 1968.
10. Ribelin, W.E. & G. Migaki. The Pathology of Fishes. The Univ. of Wisconsin Press Ltd., Great Russel st., London, 1975.
11. Schaperclaus. Fish Diseases. Vol. I & II.

## **PAPER III-FISHERY EDUCATION, EXTENSION AND ECONOMICS OF AQUACULTURE**

### **Unit – I:**

- 1.1 Understanding extension education, extension research, and extension service;
- 1.2 historical overview of growth of extension in India ;
- 1.3 similarities and differences among extension, continuing and distance education systems; overview of fisheries research, development and extension systems in India;
- 1.4 Scope and importance of fisheries extension and aquaculture extension.

### **UNIT II**

- 2.1 Fisheries training and education in India: Training Institutes, Universities, Research Organisations, etc.
- 2.1 Institutional funding to fisheries and aquaculture sector

### **Unit – III:**

- 3.1 Socio-economic conditions of fishermen and fish farmers
- 3.2 Fishermen Co-operative Societies

### **Unit – IV**

- 4.1 Role of government agencies – Role of NABARD and other central government agencies in the upliftment of fisher folk.
- 4.2 Role of state government agencies in various fishery activities – Loans and credits, policies
- 4.3 Integrated coastal zone management, ocean policy, role of NGO's CRZ

### **Unit – V:**

- 5.1 Fishery and Economics- Cost calculation of projects – packaging technology, Demand and Price analysis. Economic viability, data requirement, analysis of data
- 5.2 Financial and Economic Feasibility of investment analysis, Cash flow analysis- Socio-economic analysis.
- 5.3 Risk and insurance–Role of banks and funding agencies- Fish exports- Marketing and Resource Management. Legal and Environmental issues

## **PRACTICALS**

Visiting marine research Institutes etc.,  
Collecting data of the Fishermen in the nearby fishing villages.  
Collecting the particulars of Farming practices and its economics.  
Case studies of extension approaches practiced by select state departments of fisheries, practice of extension methods / approaches in a marine fishing village and an aquaculture based village; field exposure on extension activities by DoF and other agencies

**Reference Text Books :**

1. Bond, et. al. Fish Inspection and Quality Control. Fishing News (Books), England, 1971.
2. Allen, et. al. Eds. Bio-Economics of Aquaculture, Elsevier, 1984.
3. Chaston, I. Business Management in Fisheries and Aquaculture, Fishing News (Books) Ltd., 1984.
4. Govindan, T.K. Fish Processing Technology, Oxford-IBH, 1985.
5. Meade, J.W. Aquaculture Management, Van Nostrand, New York, 1989.
6. Hephher, B. and Y. Pruginin. Commercial Fish Farming. Wiley-Interscience, 1989.
7. Shang, Y.C. Aquaculture Economic Analysis – An Introduction. 1990.
8. Pillay, T.V.R. Aquaculture Principles and Practices. Fishing News (Books) Ltd., London, 1990.