

## ANDHRA PRADESH

### RECRUITMENT OF ASSISTANT PROFESSORS IN THE UNIVERSITY

#### SYLLABUS FOR THE SCREENING TEST

### FISHERY SCIENCE AND AQUACULTURE

#### SUBJECT CODE - 83

1. **AQUACULTURE PRINCIPLES AND METHODS:** definition; origins and growth of aquaculture; biological and technological basis; Traditional, extensive, semi - intensive and intensive culture; monoculture, polyculture, composite culture, mixed culture, monosex culture; cage culture, pen culture, raft culture, race way culture, culture in circulatory systems; warm water and cold-water aquaculture; sewage – fed fish culture, integrated fish farming.

**AQUACULTURE ENGINEERING:** Design and construction of pond, layout and design of aquaculture farm, construction, water intake system, drainage system; aeration and aerators; recent advances in aquaculture engineering; tips for better aquaculture practices; design and construction of hatcheries.

2. **PHYSICAL & CHEMICAL CHARACTERISTICS OF WATER:** Light - penetration of sunlight into aquatic media, effect of light on productivity, photoperiodicity in animals; Temperature - annual temperature cycles, thermal stratification of water bodies, thermal optimum, maximum and minimum, water movements, periodic and a periodic current system; Turbidity - causes, variations and effects. Atmosphere and atmospheric gases dissolved in water; Oxygen - oxygen and life, hypoxia, anoxia and hyperoxia, adaptations of animals to varying oxygen tensions; Carbon dioxide - sources of  $\text{CO}_2$ , its ecological effects; pH or hydrogen ion concentration - its significance. total hardness and total alkalinity

**POST STOCKING MANAGEMENT:** Water and soil quality parameters required for optimum production, control of aquatic weeds and aquatic insects, algal blooms; specific food consumption, food conversion ratio (FCR), protein efficiency ratio, true net protein utilization, apparent net protein utilization, biological value of protein.

### 3. **FIN FISH & SHELL FISH ANATOMY:**

Basic structure of the skin in fishes; epidermal derivatives – microridges and integumentary glands; dermal derivatives – cosmoid scales, ganoid scales, placoid scales, elasmoid, cycloid and ctenoid scales; fish age and scales; integumentary pigments; mouth and jaws; gill slits; fins – median fins and paired fins, origin of paired fins; coloration – morphology of chromatophores, pigments, physical and chemical colours, mixed colours, colour change, adaptive significance.

External morphology of shell fish: prawn, shrimp, crab and molluscs – exoskeleton and appendages.

### 4. **CULTURE OF INDIAN MAJOR CARPS** – Catla, Rohu, Mrigal

**CULTURE OF EXOTIC CARPS** – Grass carp, common carp, silver carp, tilapia

**CULTURE OF AIR BREATHING FISHES** – Murrels and cat fishes

**FRESHWATER PRAWN CULTURE:** Seed collection from natural sources; culture of *M. rosenbergii* / *M. malcolmsonii*

**FRESHWATER PEARL CULTURE:** Definition and scope, origin of pearls, pearl producing molluscs; freshwater pearl culture in the World and in India; types of pearls; mantle cavity insertion, mantle tissue insertion, gonadal insertion; water quality management.

### 5. **AQUARIUM FISHES AND MANAGEMENT :** Identification of commercially important ornamental fishes, setting and design of freshwater aquarium; taxonomy of species; live bearing fishes; egg laying fishes; biology of ornamental fishes; physiochemical properties of water used in aquaria; aquatic plants and other structures for beauty and utility; common aquarium fish diseases and their control; preparation of supplementary feeds and mass production of ornamental fishes.

### 6. **DISEASES IN FINFISH AND SHELLFISH:** Causes, symptoms, diagnosis, prophylactic and therapeutic measures.

#### **CRUSTACEAN AND HELMINTH PARASITES IN FISH:**

Diseases caused by isopods and leaena; diseases caused by dactylogyrus and monocoelium; trematode larvae, nematodes and fish leeches – clinical picture, symptoms and prophylaxis. **Tumours in**

**fish** – Epitheliomas and fibroepitheliomas, epithelioma papulosum; papillomas; adenomas; carcinomas; hepatoma and melanosarcomas.

**NUTRITIONAL DEFICIENCY DISEASES:** Metabolic disturbances; vitamin deficiency; gastritis and enteritis; aflatoxins in feed.

**ENVIRONMENTAL STRESS DISEASES:** Lack of oxygen; gas bubble disease; pH; acidosis and alkalosis; intoxications; hydrocyanic acid, free chlorine, metals, phenol, and temperature, disturbances. Fish farming and public health; techniques of curative baths and mass injections.

**7. AQUACULTURE ECONOMICS:** Production economics – definition of economics and application of economic principles to aquaculture; the input-output relationship; maximum level of input; least-cost combination of inputs; maximum level of output; combination of products; economics of size; partial budget analysis.

**MARKET ECONOMICS:** Basic concepts in demand and price analysis; supply and demand for fish; elasticity of demand (price elasticity of demand, income elasticity of demand, cross elasticity of demand).

**FINANCING OF AQUACULTURE:** Economic viability; assets and liabilities; cost-return analysis; production costs-variable and fixed costs; operating income; evaluation of farm performance; sensitivity analysis; minimum farm size; gross revenue.

Economic feasibility of investment analysis; methods of feasibility analysis – the payback method, net present value method, average rate of return, discounting method; benefit – cost ratio; internal rate of return; cash flow analysis; socio-economic analysis; risk and insurance.

Economics of carp, prawn and shrimp breeding farms and production farms.

Role of banks, central organizations and other funding agencies in the growth and development of aquaculture.

**FISHERIES EXTENSION:** Extension education-objectives and principles; role of extension in community development; rural development strategies – programmes for weaker sections of the community; fisheries as a tool in rural development; extension strategies and methodologies; employment generation.

**REMOTE SENSING:** Utility of remote sensing techniques for the identification of suitable grounds for aquaculture and for obtaining data on geographical information system (GIS); role of remote sensing in the assessment of aquatic pollution.

## **8. BIOMOLECULES**

A brief account of structure and function of protein, lipid and carbohydrate.

### **METABOLISM**

Interconversions of protein, lipid and carbohydrates; A general account of vitamins and minerals and their importance.

## **BIOENERGETICS**

Definition and scope; bioenergetics model; structure of an energy budget; components of the energy budget – measurement of components; faecal losses – the absorption efficiency; excretory losses – the assimilation efficiency; metabolic losses; effects of environmental factors on metabolism – temperature, salinity, oxygen and other abiotic factors; examples of energy budgets.

## **FEED MANAGEMENT & ECONOMICS**

Feed Manufacture: Feed formulation and processing, On-farm feed manufacture, Commercial feed manufacture, Feed storage

Feeding Practices: Supplementary feed – theory and practice, Complete diet - theory and practice, Feeding methods and scheduling, ration size, feed performance and economics. culture and use of different live feed in shellfish hatcheries, Aquarium fish feeds

Introduction to fisheries economics, Farm production economics – production functions in capture and culture fisheries; Costs and returns – breakeven analysis of fish production system; factors of production, marginal cost and return, law of diminishing marginal return, returns to scale, economies of scale and scope, Revenue, profit maximization, measurement of technological change, farm planning and budgeting.

## **9. PRESERVATION AND PROCESSING:** Processing and preservation of fish products and byproducts – minced meat, FPC, fish meal, fish oils, fish hydrolysate, fish sauce, fish glue; sanitation in processing plants and quality control of fresh and processed fish and fishery products; IQF shrimp Freezing.

Common bacteria present in fish; identification and isolation. Bacteria of sanitary significance.

**Handling of fish:** spoilage of fish and shellfish; effect of temperature on fish spoilage, use of ice;

**Byproducts:** processing of low-cost fish, minced meat, fish oil, fish meal, fish sausages, isinglass, glue, fish silage, chitosan, chitin pearl essence, alginates, agar and corals.

### **Process Biochemistry**

1. Major and minor constituents of fish, their distribution and function - moisture, proteins, lipids, carbohydrates, vitamins and minerals.
2. Post-mortem biochemical changes in fish- rigor mortis, autolysis, auto-oxidation and their significance.
3. Toxins and toxic substances in fish.

## **10. MARINE ECOLOGY**

1. Classification of the marine environment and salient features of different zones.
2. Classification of marine organisms and their characteristic features.
3. Shore environment: Physico-chemical and biological factors of intertidal zone; distribution of life on rocky, sandy, mud shores and their characteristic features; fauna and their adaptations.

### Brackish water Ecology

1. Classification of brackish water habitats and salient features of different zones: Estuaries, mangroves, lakes, lagoons and marshes/wetlands.
2. Ecology of some typical brackish water habitats of India: Estuaries – Hooghly-Matlah, Mahanadi, Godavari, Krishna, Cauvery and west coast estuaries; lakes and coastal lagoons – Chilka, Pulicat, Kerala backwaters, Kaliveli lake, Rann of Kutch.

**SEAWEED CULTURE:** Seaweed morphology, biology, reproduction, importance of seaweeds; culture of seaweeds.

**MARINE AND BRACKISHWATER FISH CULTURE:** Culture of *Lates calcarifer*, *Etroplus suratensis* and *Mugil cephalus*.