Vidyasagar University

Curriculum for Industrial Fish & Fisheries (Major)

[Choice Based Credit System]

Semester-IV

Course	Course Code	Name of the Subjects	Course Type/ Nature	Teaching Scheme in hour per week			Credit	Marks
				L	T	P		
CC-8		**C8T:** Fish Immunology and Microbiology	Core Course-8	4	0	0	6	75
		C8P: Practical		0	0	4		
CC-9		**C9T:** Aquatic Ecology & Environment Management	Core Course-9	4	0	0	6	75
		C9P: Practical		0	0	4		
CC-10		**C10T:**Fish Nutrition, Biochemistry and Feed Technology	Core Course-10	4	0	0	6	75
		C10P: Practical		0	0	4		
GE-4		**TBD**	Generic Elective-4				4/5 2/1	75
SEC-2		SEC-2A: Environmental Impacts of Fisheries Industries **Or** SEC-2B: Fisheries Planning and Policies	Skill Enhancement Course -2	1	1	0	2	50
Semester Total							**26**	**350**

L = Lecture, **T** = Tutorial, **P** = Practical, **CC**- Core Course, **TBD** - To be decided, **SEC**- Skill Enhancement Course, **GE** - Generic Elective.

Generic Elective (GE) (Interdisciplinary) from other Department [Paper will be of 6 credits]. Papers are to be taken from following discipline: **Physics/Botany/Zoology/Geography/ Economics.**

Modalities of selection of Generic Electives (GE): A student shall have to choose **04** Generic Elective (**GE1 to GE4**) strictly from **02** subjects / disciplines of choice taking exactly **02** courses from each subjects of disciplines. Such a student shall have to study the curriculum of Generic Elective (GE) of a subject or discipline specified for the relevant semester.

List of Core Courses and Elective Courses

Core Courses (CC)

CC-8: **Fish Immunology and Microbiology**
CC-9: **Aquatic Ecology & Environment Management**
CC-10: **Fish Nutrition, Biochemistry and Feed Technology**

Skill Enhancement Courses (SEC)

SEC-2A: Environmental Impacts of Fisheries Industries
Or
SEC-2B: Fisheries Planning and Policies

Semester –IV

Core Course (CC)

CC-8: Fish Immunology and Microbiology **Credits 06**

C8T: Fish Immunology and Microbiology **Credits 04**

Course Contents:

Definition and Types of immunity: Innate and adaptive immunity, cell mediated and humoral immunity, cells and organs of the immune system. Antigens – structure and types. epitopes, haptens. Antibody – fine structure, classes with structure and functions, antigenic determinants on immunoglobulins. MHC complex – types, structure, and functions. Antigen and antibody. Classification of immunity. Humoral and cell mediated immunity. Antigen-antibody reaction, Macrophages. Specific and nonspecific defence system in fish. Introduction to fish immunization and vaccine production. Immuno-stimulants and Vaccines-Principles in preparation/formulation, mechanism of action. Biological characters of bacteria, virus and fungi. Culture of bacteria – culture media – common ingredients in media. Different types of media - synthetic and non-synthetic media. Bacterial growth – growth phase and multiplication rate – effect of temperature and medium on growth. Gram +ve and –ve bacteria. Microbial biofilms. Sewage and their treatment. Bioremediators. Nutrient cycles-carbon, nitrogen, sulphur, phosphorus, iron, and manganese cycles.

C8P: Fish Immunology and Microbiology (Practical) **Credits 02**

Practical:

1. Collection of water and sediment samples for microbiological analysis Isolation, identification and enumeration of various groups of microorganisms from different water bodies including aquaculture systems.
2. Study of bacteria involved in nutrient cycles. Biofilms, water testing for potability, enumeration of coliform.
3. Collection, separation and identification of fish leucocytes. Separation of blood plasma and serum. Differential counting - RBC and WBC by Haemocytometer. Study of different types of leukocytes and isolation of macrophages.
4. Identification gram +ve and gram –ve bacteria.
5. Sterilization technique- dry heating, autoclaving. Preparation ofMedia. Plate count method.

CC-9: Aquatic Ecology & Environment Management **Credits 06**

C9T: Aquatic Ecology & Environment Management **Credits 04**

Course Contents:

Ecosystems and productivity, biotic interaction within ecosystems and ecological homeostasis. Structure and productivity of aquatic ecosystem. Food chain food web. Physical and chemical characteristics of water. Distribution of fresh water. Lotic and Lentic system and their biotic community with special emphasis on Phytoplankton, zooplankton and benthic fauna. Wetland and freshwater biomes - ecology of tropical freshwater Lakes, Reservoir and Ponds. Ecology of estuarine ecosystem and brackish water lagoons. Ecology of Mangroves. Physical and chemical properties of soil. Classification of soils, distribution of different types of soil in India with special emphasis on aquaculture. Organic manures, inorganic fertilizers and liming –their interaction with soil. Macro vegetation. Nitrogen cycle, Carbon cycle. Introduction to aquatic pollution, the sources of pollutants, toxic organic compounds and their impacts in the aquatic organisms and the abiotic environment, Classification of pollution physical, chemical and biological classification of water pollution- description of terminologies.Human impact on fresh water eco-system; Fresh water and Marine water pollution. Eutrophication. Biomagnification. Waste water discharge, its quality and quantity; impacts of effluents on ecosystems, chemical degradation of soil and water. Problems and preventive measures of antibiotic and drug residues, salination of soil and water, Environment impact assessment, toxicity assessment. Conservation of aquatic resources; Problems and Prospects, strategies for conservation of aquatic resources.

C9P: Aquatic Ecology & Environment Management (Practical) **Credits 02**

Practical:

1. Collection of species of fishes and other organisms and studying the assemblages of organisms of rocky, sandy and muddy shores, lentic and lotic habitats.
2. Observation of adaptive characters and interrelationships like commensalisms, symbiosis, parasitism and predation.
3. Physical characteristics of polluted waters; Colour, Odour, Turbidity. Determination of pH, salinity, alkalinity, hardness, BOD, COD, Hydrogen sulphide, Phosphates, Ammonia, Nitrates, Heavy metals and Oil and grease in water.
4. Determination of pH, conductivity, organic carbon, nitrogen, phosphorus, heavy metals in sediments.
5. Methods of pesticide residue analysis in waters and fish tissue; bioassay and toxicity study.
6. Visit to a Cold water Fishery area/Lake/ Lagoon.

CC-10: Fish Nutrition, Biochemistry and Feed Technology **Credits 06**

C10T: Fish Nutrition, Biochemistry and Feed Technology **Credits 04**

Course Contents:

Natural and artificial feeds. Nutritional requirements of cultivable fishes and prawns. Digestion, assimilation and conversion of feed. Nutritional bioenergetics of fish. Fundamentals of fish nutrition and growth in fish. Principal nutrients and nutritional requirements of cultivable fish and shellfish. Feeding devices and methods. Non-conventional feed ingredients and anti-nutritional factors. Digestive enzymes, feed digestibility. Factors affecting digestibility. Classification of carbohydrates. Structure and properties of maltose, lactose, sucrose, starch, glycogen and pectin. Classification and general structures of amino acids, properties due to carboxyl and amino groups of amino acids. Primary, Secondary, tertiary and quaternary structures of proteins. Classification of lipids. Structures of palmitic acid, stearic acid, oleic acid, linoleic acid, arachidonic acid, lecithin and cephalin. Composition and metabolism, autoxidation and antioxidants, changes during processing and storage, rancidity, indices of rancidity. Enzymes: nomenclature; classification; specificity; mechanism of enzyme action; kinetics and regulation of enzyme activity. Steroid and peptide hormones- chemistry and function. Methods of feed formulation and manufacturing. Feed additives: binders, antioxidants, enzymes, pigments, growth promoters, feed stimulants. Feed storage: use of preservatives and antioxidants. Feed evaluation: feed conversion ratio, feed efficiency ratio, protein efficiency ratio, net protein utilization and biological value.

C10P: Fish Nutrition, Biochemistry and Feed Technology (Practical) **Credits 02**

Practical:

1. Preparation of normal solution of acid and base, buffers and reagents.
2. Qualitative determination of carbohydrates, proteins and lipids.
3. Estimation of total nitrogen and crude protein of fish tissue.
4. Estimation of carbohydrates in foods. Determination of specific gravity of oil.
5. Extraction and estimation of total lipids in fish tissue.
6. Proximate composition analysis of feed ingredients and feeds.
7. Preparation of artificial feeds using locally available feed ingredients.
8. Determination of sinking rate and stability of feeds.
9. Effect of storage on feed quality.

Skill Enhancement Course (SEC)

SEC-2A: Environmental Impacts of Fisheries Industries **Credits 02**

SEC2AT: Environmental Impacts of Fisheries Industries

Course Contents:

Environmental Management Systems: Environmental issues, (Ozone depletion, global warming etc.) pollution, long term ecosystem degradation etc in aquaculture and processing industries. Environmental impact assessment studies of fisheries industry and control measures, Sources of environmental concerns (physical, chemical and microbiological). Techniques for the identification of environmental aspects. Environmental Management System in fisheries industry: Background, policy and planning, implementation, checking and review, International Laws for Environmental Protection, National Environmental Laws.

Or

SEC-2B: Fisheries Planning and Policies **Credits 02**

SEC2BT: Fisheries Planning and Policies

Course Contents:

Planning in India-Objectives, allocation, achievements and bottlenecks of Indian plans, Strategy of Indian planning, resource Mobilization.Fisheries Development and policy under the plans, Fisheries schemes; Centrally and State sponsored schemes. Different sectoral schemes, Agriculture policies, Need for a separate fishery policy. Leasing policies for inland water bodies and brackish water bodies in different states, Input Policy, Financing and Credit Policy, fish marketing and pricing policy, Export –Import Policy. Types of planning, Stages in the planning process, planning models. Planning for utilization of surplus resources including manpower. Subsidies in Fisheries, regional disparities, poverty and unemployment in India with respect to the fisher folk. Policies, sectoral study of capture and culture fisheries.