

# Vidyasagar University

## Curriculum for Industrial Fish & Fisheries (Major) [Choice Based Credit System]

### Semester-III

| Course                | Course Code | Name of the Subjects   | Course Type/<br>Nature      | Teaching Scheme in hour per week |   |   | Credit    | Marks      |
|-----------------------|-------------|--|-----------------------------|----------------------------------|---|---|-----------|------------|
|                       |             |  |                             | L                                | T | P |           |            |
| CC-5                  |             | C5T: Fish Genetics, Endocrinology and Reproduction   | Core Course-5               | 4                                | 0 | 0 | 6         | 75         |
|                       |             | C5P: Practical   |                             | 0                                | 0 | 4 |           |            |
| CC-6                  |             | C6T: Fish Breeding and Hatchery Management   | Core Course-6               | 4                                | 0 | 0 | 6         | 75         |
|                       |             | C6P: Practical   |                             | 0                                | 0 | 4 |           |            |
| CC-7                  |             | C7T: Fish Pathology  | Core Course-7               | 4                                | 0 | 0 | 6         | 75         |
|                       |             | C7P: Practical   |                             | 0                                | 0 | 4 |           |            |
| GE-3                  |             | TBD  | Generic Elective-3          |                                  |   |   | 4/5       | 75         |
|                       |             |  |                             |                                  |   |   | 2/1       |            |
| SEC-1                 |             | SEC1AT: Indigenous Traditional Knowledge in Fisheries Or SEC1BT: Software for Fisheries Data Analysis and Management | Skill Enhancement Course -1 | 1                                | 1 | 0 | 2         | 50         |
| <b>Semester Total</b> |             |  |                             |                                  |   |   | <b>26</b> | <b>350</b> |

**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.

**Semester –III**  
**Core Course (CC)**

**CC-5: Fish Genetics, Endocrinology and Reproduction** **Credits 06**

**C5T: Fish Genetics, Endocrinology and Reproduction** **Credits 04**

**Course Contents:**

Principles of genetics; concepts of biotechnology, Genes and chromosomes, gene interaction. Principles and practices of genetic engineering; recombinant DNA technology and gene cloning methods; Gene mapping; Sequencing and DNA fingerprinting; Recombinant vaccines and transgenic fish; DNA amplification and genomic DNA library; Gene therapy. Linkage and crossing over. Chromosome maps, sex determination, chromosomal aberrations. Gene mutation; genome manipulation: gynogenesis, androgenesis, polyploidy. Transgenic fish, Sex-reversal, inbreeding & hybridization. Modes of reproduction. Secondary sexual characters and maturation process. Different endocrine glands and their hormonal regulation. Ecological and hormonal influence on maturation and spawning; Breeding behavior; Pheromones in fishes.

**C5P: Fish Genetics, Endocrinology and Reproduction (Practical)** **Credits 02**

**Practical:**

1. Selection of breeders of carps and catfishes. Collection and preservation of pituitary glands in fishes.
2. Preparation and administration of pituitary gland extract.
3. Use of synthetic compounds for induced breeding of fishes.
4. Study of hatchery technology of fishes.
5. Identification of different life stages of cultivable fish species: spawn, fry, and fingerling.
6. Study of care of eggs, spawn and fry.
7. Estimation of Gonadosomatic index of fishes.
8. Demonstration of protocol of androgenesis, gynogenesis and polyploidy.

**CC- 6: Fish Breeding and Hatchery Management** **Credits 06**

**C6T: Fish Breeding and Hatchery Management** **Credits 04**

**Course Contents:**

Natural breeding and seed production of fishes. Significance of propagation, sexual maturity, season of reproduction, place of propagation, parental care. Environmental and hormonal control of reproduction. Fecundity and spawning. Factors affecting maturation and spawning. Types of fish eggs and mechanism of hatching. Riverine spawn collection site, gears used for collection, methods of spawn collection, behavior of spawn in relation to hydrological and hydro-biological

factors. Bundh breeding. Types of hatchery. Criteria for site selection of hatchery. Design and construction of modern hatchery. Operation, management and hatchery technology for seed production of important finfish and shell fish species. Chinese technique using spawning pool and incubation/hatching pools. Criteria for selection of brood fish and their management, techniques of inducing ovulation. Multiple carp spawning. Cryopreservation of fish gamete. Hypophysation technique, synthetic hormones and analogues for induced spawning. Disease management and their control in the hatchery systems. SPF and SPR. Better management practices (BMPs). Seed packaging and transportation methods.

### **C6P: Fish Breeding and Hatchery Management (Practical)**

**Credits 02**

#### **Practical:**

1. Detailed study of design and operation of Chinese circular hatchery and funnel shaped hatchery.
2. Study of seed production technology of Indian carps/Cat fishes, Tilapia.
3. Methods of isolation and culture of bacteria and fungus. Identification methods of common bacterial and fungal pathogens of fish.
4. Study of model hatchery.
5. Fecundity estimation of fishes.
6. Preparation and management of fish nursery. Fish seed and brood-stock transportation, use of anesthetics, disinfectants and antibiotics in fish breeding.
7. Water quality monitoring in fish hatcheries and nurseries.
8. Breeding and larval rearing of common fin fishes/shell fishes.
9. Visit to an IMC hatchery / Shrimp hatchery/ Tilapia hatchery.

### **CC-7: Fish Pathology**

**Credits 06**

### **C7T: Fish Pathology**

**Credits 04**

#### **Course Contents:**

Definition and Types of diseases. Disease and environment. Stress as a factor in the occurrence of diseases. Parasitism – host-parasite relationship. General preventive methods and prophylaxis against the occurrence of diseases. Probiotics in health management of fish and shell fishes. Environmental disease (finfish): Gas bubble disease, algal toxicosis disease, Yolk coagulation disease, academia disease, cold disease, hypercapnia disease. Nutritional disease (finfish): – Vitaminosis, Pin head disease, Neoplasia disease, lipid liver degeneration. Viral disease (finfish) – IPN, IHNV, Viral Hemorrhagic Septicemia, Spring Viremia of carps, Channel catfish virus. Viral disease (shrimp) -Monodon type baculo virus disease, Baculo viral midgut necrosis, Yellow head disease, and White spot disease. Bacterial disease (finfish) – Furunculosis, columnaris, bacterial gill disease, gill rot, Edwardsiellosis, vibriosis, tail and fin rot, EUS. Eye

disease of catla, Dropsy, Ulcer disease. Bacterial disease (shrimp) – brown spot disease, black gill disease, black spot disease, filamentous bacterial disease. Fungal diseases (finfish) – Saprolegniasis, Branchiomycosis, ichthyophonous disease. Protozoan diseases (finfish) – Ichthyophthiriasis, Trihodiniasis, Costiasis, whirling diseases, trypanosomiasis. Protozoan diseases (shrimp) – Microsporidiosis, Gregaria disease. External fouling disease Helminth disease (finfish): Dactylogyrosis, Gyrodactylosis, Black spot disease, Ligulosis Crustacean disease (finfish) : Argulosis, Larnaeosis, Ergasilosis

### **C7P: Fish Pathology (Practical)**

**Credits 02**

#### **Practical:**

1. Live and post mortem examination of fish and shellfish. Pathology of organ systems. Histopathology of normal and diseases fish and shellfish, Diagnosis of abiotic fish diseases.
2. General procedure for disease diagnosis. Methods of sampling fish and shellfish for disease diagnosis.
3. Taxonomy, lifecycle and identification of fish and shellfish parasites.
4. Sampling, preparation of media and culture of pathogenic bacteria: Techniques for bacterial classification.
5. Techniques in disease diagnosis: Microbiological, haematological, Histopathological, immunological, molecular techniques and Biochemical tests.

### **Skill Enhancement Course (SEC)**

#### **SEC-1A: Indigenous Traditional Knowledge in Fisheries**

**Credits 02**

#### **SEC1A T: Indigenous Traditional Knowledge in Fisheries**

#### **Course Contents:**

Indigenous knowledge - historical perspective, terminologies, concepts, systems, Importance, Relevance and roles in fisheries sector; Reasons for the non adoption of technical knowledge; Indigenous vis-a-vis scientific knowledge. Types of indigenous knowledge; Information, practices and technologies; Beliefs, tools, materials, documentation, validation and dissemination of ITK; Peoples' Biodiversity Register; Accessing the indigenous knowledge; Constraints of indigenous knowledge, conserving ITK. Issues in protection of traditional knowledge / ITK - understanding Indian Biological Diversity Act and National Biodiversity Authority, - limits to benefit sharing – IPR, PIC, TRIPS vs. CBD; Blending indigenous knowledge and modern technologies.

Or

**SEC-1B: Software for Fisheries Data Analysis and Management**

**Credits 02**

**SEC1BT: Software for Fisheries Data Analysis and Management**

Introduction to computer software: SPSS, SAS, SYSTAT and STATISTICA for analysis and presentation of fisheries data; Basic concepts of database management systems; Introduction to MS-ACCESS, ORACLE (RDBMS); Exercises on analysis of data using MS-EXCEL, SPSS, SAS, FISAT, SYSTAT and STATISTICA; Creation of Database using MS-ACCESS, ORACLE.