Research Methodology

Unit-1 Basic concept of research

- objectives of research, Identification of research problem, Types of research- fundamental/ applied/ action/ quantitative/ qualitative
- Methods of research: Concept and formulation of hypothesis, Survey method, Experimental method

Unit-2 Research methodology (Aquatic field)

- Sampling of data: Concept of sampling, sample collection methodology(for Microbes, Plankton, freshwater and marine fishes and other aquatic organisms, water and sediment samples), Sampling error
- Collection of data: Primary and Secondary data collection, Methods of data generation/ collection – by experiments, questionnaire, interview schedule, focus groups etc. Methodology for Identification of Microbes, Plankton, freshwater and marine fishes and other aquatic organisms.
- Preservation Methodology: Fixation, Preservation and maintenance techniques for Microbes, Plankton, freshwater and marine fishes and other aquatic organisms, water and sediment sample
- Statistical Analysis of data: analysis techniques, Hypothesis testing, student 't' test, Analysis of variance, Correlation and regression, Non parametric tests

Unit-3 Proposal writing, Project formulation, Report preparation

- Writing a research Proposal: Components, writing, funding sources for life sciences research, peer review
- Project formulation for aquaculture (Lay out, SOP, CAPEX, OPEX, Economics)
- Report preparation: Structure and component of research report, Organization of data, Indexing of journal and research output, Format and styles of Citation, references, bibliography, Copyright, plagiarism, originality of research work

Unit-4 Review of literatures, Certification and Licensing

- Review of literatures: Primary source, Secondary source, Searching e- resources, using search engines, Searching database, Writing literature review
- Criteria of Certification and Licensing for aquaculture (MPEDA registration, Coastal aquaculture authority, EIL-Export Import License, SIP-Sanitary Import Permit, EU, BAP, ASC)

Subject specific

UNIT-1

Etiology, Fish Diseases & Health Management of fishes.

- Physical, chemical and physiological defence mechanisms in fishes, Methods of pathological examination of fish, Diagnostic tools: Histopathological methods, PCR, ELISA
- Mode of action of drugs, Use of Anti parasites, Sedatives, Disinfectants, Use of Probiotics, regulation of the use of drugs in aquaculture
- Pathogenic diseases: symptoms and control - Bacterial, Fungal, Viral diseases in fin fishes & shell fishes
- Parasitic diseases: symptoms and control - Protozoan, Crustacean, and Worm diseases in fin fishes & shell fishes
- Non-pathogenic diseases: symptoms and control- Algal, Environmental, Nutritional and Hereditary diseases

Unit - II

Quality control of fish, plankton studies and Nutrition in Fishes

- Post mortem changes (Hypermia, Rigor mortis, Autolysis, Microbial Petrification, Auto oxidation) Fish pathogens; their prevention and control, Microbial quality control of processed fishery products, HACCP
- General classification of plankton, Method of estimation of Primary productivity, secondary and tertiary productivity, Effects of plankton production in aquatic environment. Microalgae as a source of protein
- Principles of nutrition. Types of aqua feed. Nutritional requirements of fish and prawn at various developmental stages

UNIT-III

Induced breeding, Transportation, Post-harvest technology

- Selection of brooders, extraction of pituitary gland, preparation of dosage and injection, spawning and fertilization, stripping method, use of inducing agents in induced breeding, Eyestalk ablation technique in shrimp
- Causes of mortality during transportation, methods for transportation of fish seeds, fingerlings, brooders and trout eggs, use of chemicals in live fish transportation
- Principles and techniques of processing and preservation, chilling, freezing, drying, salting, smoking, canning, pickling, pasting, preservation with chemicals, preservation by exposure of gamma rays, modern techniques of preservation, packaging of fish and fish products, Effect of processing and preservation on nutritive aspects of fish, fishery products and by-products.

UNIT-IV

Shrimp, Oyster, pearl, Lobster and Clam and Micro algae (Spirulina and Chlorella) culture

- Types of shrimps, Preparation and management of shrimp farm (pond preparation, seed selection and stocking, water quality, feeding, diseases, bio-security, harvesting and marketing). Effluent treatment plant in shrimp farming, Recent advances in shrimp farming (Two phase, Three phase, Race way culture, biofloc and RAS).

- Edible oyster culture, Pearl oyster culture, techniques of pearl production, Lobster and Clam culture.
- Taxonomy of economically important micro algae. Distribution, morphology, reproduction, life cycle, growth physiology and Culture techniques and Importance of *Spirulina & chlorella.* Application of microalgae in waste water treatment as bioremediation