Bachelor of Fisheries Science (B.F.Sc.)
(Four Year) Programme

FIRST SEMESTER

BFSC 101 Principles of Aquaculture
COURSE OUTCOME (CO)
At the end of the course, the student will be familiarized with following out come
CO1: The basic concept of Aquaculture their uses
CO2: The systematic approach of aquaculture farming and systematic approach extensive, semi-intensive, intensive and super intensive aquaculture will be known to the students
CO3: The students will be benefited with the techniques involved in selection of quality seeds and transportation technique of fish seeds and pre-stocking and post stocking pond management, carrying capacity of pond, factors influencing carrying capacity
CO4: Students will be fully made aware water and soil quality in relation to fish production, physical, chemical and biological factors affecting productivity of ponds
CO5: Students will learn the practical knowledge of aquaculture practices Growth studies in aquaculture system. Study on waste accumulation in aquaculture system (NH3, Organic matter, CO2). Analysis of manure etc

BFSC-102 Anatomy and Biology of Finfish
Course Outcome:
At the end of the course, the student will be familiarized with following out come
CO1: The students will be able to learn the external anatomy and internal anatomy and its associated glands and cell structure of finishes and shellfishes
CO2: Students can also understand the circulatory, respiratory, nervous and reproductive system of selected finishes on sexual dimorphism- maturity stages, eggs and larval stages and developmental biology of fin fishes
CO3: The practical knowledge on dissection of different shellfishes and finfishes to understand their internal organs, digestive, respiratory, excretory, nervous, circulatory and skeletal systems and also on sensory organs and structure of endocrine glands – different developmental stages and tagging marking methods will be fully practiced for achieving the target

BFSC-103 Taxonomy of Finfish
Course Outcomes
At the end of the course, the student will be familiarized with following out come
CO1: The importance of Taxonomy and its application for future research and its importance will be thoroughly understood
CO2: The students will be made expertise in identification of marine and fresh water fishes using traditional/conventional methods
CO3: The students will gain the knowledge on usage of modern tools in identification of fishes
CO4: The commercially important fishes of India and other countries will be categorized and their economical values will be known
CO5: The students will be imbibed with practical knowledge on conventional and modern techniques in taxonomical studies of fishes

BFSC-104 Meteorology, Climatology and Disaster Management
Course Outcomes
At the end of the course, the student will be familiarized with following out come

CO1: The fundamentals of nature of atmosphere and its importance and factors influencing affecting the weather and learn about temperature, pressure, density humidity and various meteorological instruments will be thoroughly understood

CO2: The students will be made expertise in understanding the cloud pattern, laws of atmospheric gases, pressure gradients, planetary wind system including coriolis forces etc

CO3: The students will gain the knowledge on weather forecasting cyclone warning precipitation, thunder storms, large atmospheric cycles, concepts of latitude, longitude and great circles; model globe, maps and different types of projections

CO4: Manmade hazards in in coastal hazards, disaster management - cyclones, floods, droughts, tsunami, El-nino, algal blooms, avalanches, pollution, habitat destruction, over fishing, introduction of exotic species, landslides, epidemics, loss of bio-diversity will be known to the student community

CO5: The students will be imbibed with practical knowledge on weather and meteorological instruments (Thermometer, Barometer, Hygrometer Anemometer, Rain gauge) and Condensation: observation and identification of various types of clouds and depicting sky picture

BFSC-105 Statistical Methods

Course Outcomes

At the end of the course, the student will be familiarized with following out come

CO1: The basic concept of statistics to understand the population dynamics and how to carry out the study using field generated data? Internal data and merits and demerits will understood by the students

CO2: The students will be familiarized with multivariate analysis, principal component analysis, cluster analysis, dendrogram/histogram etc

CO3: The techniques of statistical analysis regression, arithmetic calculations mean, mode deviation etc will be thoroughly known by the student.

CO4: Understand the T test and its merits and demerits is very important in statistics and Chi-square linear non-linear correlation; length-weight relationship; bivariate methods will be illustrated to the students.

CO5: The practical knowledge of fisheries data such as T test of hypothesis based on normal, t, chi-square and F distributions will be taught. The students will also be familiarized with recent statistical packages.

BFSC-106 Fundamentals of Biochemistry

Course Outcomes

At the end of the course, the student will be familiarized with following out come

CO1: Students will be able to know the concept of biochemistry, major nutrition, and different role of the nutrients in the animal body and their metabolism etc

CO2: Students will gather the knowledge on protein and basic amino acids; lipid and their basic units and carbohydrates and their classification and basic and functional properties.

CO3: The students will be fully trained on assessment of proximate composition and all the laboratory techniques, DNA, RNA isolation and estimation using advanced techniques

BFSC-107 Fundamentals of Microbiology

Course Outcomes

At the end of the course, the student will be familiarized with following out come

CO1: The ecosystem and taxonomy of microbes will be understood by the students along with prokaryotic and eukaryotic divisions

CO2: Hands on techniques on handling the microscopes in the class and instrumentation lab will be elaborate study of microbial organisms

CO3: Screening, isolation and enumeration of microbes using different media and application of advanced techniques for easy and speedy identification will be known

CO4: Understand the role of microbes in biochemical process and their role in nutrient cycle in the ecosystem will be acquainted to the students and the microbial diseases and their control measures will be understood

CO5: The practical knowledge of microbial isolation from the environment and enumeration/identification. Genetic and biochemical aspects will be achieved by the students

BFSC-108 Soil and Water Chemistry

Course Outcomes

At the end of the course, the student will be familiarized with following out come

CO1: The students will made familiarize with the analytical chemistry in which the Titrimetric, gravimetric and volumetric methods

CO2: Students will also be enabled to learn and understood the water quality analysis and their importance

CO3: The soil chemistry with texture and minerals in the soil and assess the soil quality and soil types and their distribution will be understood by the students

CO4: The methods involved in soil quality analysis including texture, minerals and organic carbon will be taught to the students

CO5: The students will also learn the practical knowledge of analytical techniques all aspects of water and soil quality analysis

BFSC-109* Swimming

Course Outcomes:

This course is being offered with the following objectives

CO1: To learn the swimming techniques and to understand the practice of ducking the head, kicking action, holding breath under water and various strokes

CO2: To familiarize with the methods of life saving in water; Boating, canoeing and sailing: types, maintenance, skill development, rules and regulations and practice.

COURSE OUTCOMES

At the end of the course, the student will be familiarized with following out come

CO1: The students will be made familiarize with the swimming art including scuba diving etc. of all aspects swimming techniques

CO2: Students will also be enabling to learn the techniques of swimming and skill development, rules and regulations and practice.

SECOND SEMESTER

BFSC 201- Freshwater Aquaculture

Course Outcomes

At the end of the course, the student will be familiarized with following out come

CO1: The basic concept of fresh water aquaculture their use in the fisheries, International scenario and the importance of fresh water and coastal aquaculture will fully learnt by the students

CO2: The fresh water aquaculture farming and systematic approach if farming soil quality management and fertilizers application and water cultivation technique will be taught to the students

CO3: The students will be benefited with the techniques involved in selection of quality seeds and transportation technique of fish seeds and important steps to identify the cultivable fish and shellfish

CO4: Students will be fully made aware of the culture methods of Indian fresh water prawn major carps, Exotic carps, Minor carps etc

CO5: Students will learn the practical knowledge of aquaculture pond preparation, nursery techniques and rearing techniques and primary production etc

BFSC 202 Aquaculture In Reservoirs

Course Outcomes

At the end of the course, the student will be familiarized with following out come

CO1: The basic concept of reservoirs, topography and species diversity, importance of morpho-edaphic index in reservoir productivity and classification; factors influencing fish production will be learnt by the students

CO2: The salient features of reservoirs and recent advances in reservoirs fisheries management conservation measures in reservoir fisheries will be taught to the students

CO3: The students will be benefited with the techniques involved in cage and pen culture and fish stocking reservoirs

CO4: Students will learn the practical knowledge on reservoir aquaculture and case studies on cage and pen culture; field visit to cage and pen culture site to acquaint with construction details and operation

BFSC-203 Taxonomy of Shellfish

Course Outcomes

At the end of the course, the student will be familiarized with following out come

CO1: Students will be able to learn the morphology and meristic characteristics features features of shellfishes

CO2: The classification of fishes, molluscs and crustaceans will be understood and commercially important shell fishes

CO3: The students will learn the knowledge of identification of shellfishes using morphology, and meristic characters and apply for their taxonomical studies

BFSC-204 Anatomy and Biology of Shellfish

Course Outcomes

At the end of the course, the student will be familiarized with following out come

CO1: The students will be able to learn the external anatomy and internal anatomy and its associated glands and cell structure of shellfishes

CO2: Students can also understand the age and growth and circulatory, respiratory, nervous and reproductive system of selected finishes and shell fishes and their importance

CO3: The practical knowledge on dissection of different shellfishes to understand their internal organs, digestive, respiratory, excretory, nervous, circulatory and skeletal systems and also on sensory organs and structure of endocrine glands will be taught to the students and students will be fully practiced

BFSC-205 Inland Fisheries

Course Outcomes

At the end of the course, the student will be familiarized with following out come

CO1: The students will be able to learn inland fisheries and freshwater fishery regions of the world and their major fish species composition and global inland fish production data

CO2: Students can also understand the estimation of inland fish catch data and fishing crafts and gears and minor major riverine and estuarine and brackish water system

CO3: The practical knowledge on commercially important groups and observations and experimental operations of selected fishing crafts and gears in inland / estuarine waters etc.

BFSC-206 Limnology

Course Outcomes

At the end of the course, the student will be familiarized with following out come

CO1: The students will be able to aware of the basic concept of Limnology and origin and evolution of fresh water on the earth

CO2: The students will be understood the physical properties of fresh water in different habitat and their quality such as dissolved gases, carbonate and bicarbonates, pH, dissolved minerals etc

CO3: The ecological pyramids of fresh water from primary producers to higher tropic level organisms and lotic and lentic ecosystems and their salient features will be learnt by the students

CO4: Students will be able to gather knowledge of morphometry of lotic and lentic ecosystems and collection of phytoplankton and zooplankton etc and practically, they will be fully aware of the fresh water ecosystems

BFSC-207 Marine Biology

Course Outcomes

At the end of the course, the student will be familiarized with following out come

CO1: The students will be able to understand the major division of marine environment and major biological groups and classification phytoplankton

CO2: Students will also become aware of the environmental variables which are affecting the primary production and energy flow through the food chain

CO3: The understanding of the relationship between phytoplankton and zooplankton in aquatic ecosystem and inter tidal ecology and rocky shore, sandy shore and mud flats, zonations, communities, and the adaptation and classification, physico-chemical factors, biota and productivity, examples of some estuaries and boring and fouling organisms will be made to the students

CO4: Students will be learnt the practical knowledge on collection, preservation and analysis of phytoplankton, zooplankton, sea weeds, marine organisms and also inter tidal organisms

BFSC-208 Food Chemistry and Fish Nutrition
Course Outcomes
At the end of the course, the student will be familiarized with following out come
CO1: Students will be understood the fish Nutrition and structure and Composition and their properties and digestion and Metabolism

CO2: Students will become aware of different methods of different methods fish muscle carbohydrates. Lipids - metabolism of lipids, oxidation of fatty acids; lipoproteins, proteins in foods - role in hydration, native and denatured proteins
CO3: Students will became aware of composition of fish with emphasis on nutritional value and minerals in fish - micro- and macro-elements, trace elements, significance in human nutrition etc
CO4: Students will be able to learn practical knowledge about the proximate composition of crude protein, fat, ash (including acid soluble) in fish. Determination of energy value of fish and estimation of glucose and salt content in foods etc

BFSC-209 Information and Communication Technology
Course Outcomes
At the end of the course, the student will be familiarized with following out come

CO1: The technology computer study all kinds of software and hardware systems and basic components of systems will be understood and perceived by the students

CO2: The students will be familiarized with system software and application software and application programmes also the students will be made to learnt the programming languages and to learn Programme execution modes etc
CO3: The techniques involved computer network and all software programmes, settings documents and related programmes will be fully learnt by the students
CO4: The students will be made understood the data communication networks and Stand-alone and communication modes and also to learn Computer networks and local Area network, wide area network etc
CO5: Students will be benefitted by learning the practical knowledge of MS Office and fisheries software and the Word Processor and application of word processors and usage of software

BFSC-210* Physical Education, First Aid & Yoga Practices
Course Outcomes
At the end of the course, the student will be familiarized with following out come

CO1: The physical education: definition, objectives, scope, history, development and importance; physical culture will be understood and perceived by the students

CO2: The students will be the Yoga; Introduction to - Asanas, Pranayam, Meditation and Yogic Kriyas; Role of yoga in sports; governance of sport in India; Important national sporting events

CO3: The techniques involved requirement of first aid. First Aid equipments and upkeep. Handling and transport of injured I traumatized persons. Emergency procedure for suffocation, demonstration of artificial respiration etc will be known to

SEMESTER III

BFSC-301 Ornamental Fish Production and Management

Course Outcomes

At the end of the course, the student will be familiarized with following out come.

C CO1: To understand the clear understanding on endemic and exotic ornamental.

CO2: To understand the in depth knowledge on water quality management in the aquarium.

C CO3: To understand the clear in depth knowledge on aquarium plants and associated components filters and lighting.

C CO4: To understand the clear knowledge on breeding and rearing of ornamental brood stocks.

CO5: To understand the clear understanding on the common diseases and packaging methods of ornamental fishes.

BFSC-302 fish food organisms

Course Outcomes

At the end of the course, the student will be familiarized with following out come

CO1: To understand the clear knowledge on shore based and sea based aquaculture.

C CO2: To understand the detailed knowledge on fin and shell fishes of fresh, brackish and marine waters.

3: CO3: To understand the clear understanding on shore based commercial and traditional aquaculture.

CO4: To understand the knowledge on different methods of culture like, rafts, racks, cages and poles.

CO5: To understand the clear knowledge on growth, survival and productivity of different aquaculture systems.

BFSC-303 Fish Immunology

Course Outcomes

At the end of the course, the student will be familiarized with following out come

CO1: To understand the clear knowledge ondrug development from fin and shell fishes.

CO2: To understand the detailed knowledge on source and classification of drugs.

CO3: To understand the clear understanding on pharmacotherapeutics and drug classification.

CO4: To understand the knowledge on pharmacodynamics, dose response and efficacy.

CO5: To understand the clear knowledge on drug action and experimental pharmacology.

BFSC-304 Marine Fisheries

Course Outcomes

At the end of the course, the student will be familiarized with following out come

CO1: To understand the clear knowledge onmarine fishery resources.

CO2: To understand the detailed knowledge on major fisheries of India.

CO3: To understand the clear understanding on demersal and deep sea fisheries.

CO4: To understand the knowledge on shell fish and seaweed resources of India.

CO5: To understand the clear knowledge on traditional and modern gears used in fisheries.

BFSC-305 Aquatic Ecology and Biodiversity

Course Outcomes

At the end of the course, the student will be familiarized with following out come

CO1: To understand the clear knowledge onflora, fauna and animal associations in aquatic ecosystems

CO2: To understand the detailed knowledge on aquatic biodiversity and associated ecosystem

CO3: To understand the clear understanding on conservation of habitats and management

CO4: To understand the knowledge on conservation of aquatic mammals and reptiles

CO5: To understand the clear knowledge on biology of aquatic vertebrates and invertebrates

BFSC-306 Freezing Technology

Course Outcomes

At the end of the course, the student will be familiarized with following out come

CO1: To understand the clear knowledge on freezing technology of fin and shell fishes.

CO2: To understand the detailed knowledge on preservation, spoilage and storage of sea foods.

CO3: To understand the clear understanding on different types of freezing.

CO4: To understand the knowledge on changes during storage.

CO5: To understand the clear knowledge on different types of thawing and HACCP in fish processing.

BFSC-307 Refrigeration and Equipment Engineering

Course Outcomes

At the end of the course, the student will be familiarized with following out come

CO1: To understand the clear knowledge on the law of thermodynamics and types of refrigeration.

CO2: To understand the detailed knowledge on refrigeration technology.

CO3: To understand the clear understanding on the compressors and refrigerants.

CO4: To understand the knowledge on different types of freezers.

CO5: To understand the clear knowledge on refrigeration effect and use in freezing process.

BFSC-308 Fisheries Extension Education and Personality Development

Course Outcomes

At the end of the course, the student will be familiarized with following out come

CO1:To understand the clear knowledge on the concept, objectives and principles of fisheries extension.

CO2:To understand the detailed knowledge on characteristics of technology and technology transfer process.

CO3:To understand the clear understanding on the participatory planning, conflicts and gender in fisheries.

CO4:To understand the knowledge on theories of learning and oral presentation skills.

CO5:To understand the clear knowledge on public speaking and technical writing.

BFSC-309 Fisheries Economics

Course Outcomes

At the end of the course, the student will be able to

CO1: To understand the clear knowledge on the micro and macroeconomics.

CO2: To understand the detailed knowledge on micro-economics and production functions in capture and culture fisheries.

CO3: To understand the clear understanding on costs, returns and significance of marginal costs.

CO4: To understand the knowledge on macro-economics, sustainable development and impact of globalization.

CO5: To understand the clear knowledge on WTO, IPR and GMOs.

Semester IV

BFSC 401 Coastal Aquaculture and Mariculture

Course Outcomes

At the end of the course, the student will be able to:

CO1: To get Detailed knowledge on marine fish seed resources and breeding of fin fishes

CO2: To understand the Detailed knowledge on breeding of cultivable fin fishes.

CO3: To understand the Clear understanding on different types of finfish breeding

CO4: To understand the Knowledge on brood stock and spawn rearing and management.

CO5: To understand the Clear knowledge on breeding of major carps and other fin fishes

BFSC 402 Genetics and Breeding

Course Outcomes

At the end of the course, the student will be able to

CO1: To get Detailed knowledge on marine fish seed resources and breeding of fin fishes

CO2: To understand the Detailed knowledge on breeding of cultivable fin fishes.

CO3: To understand the Clear understanding on different types of finfish breeding

CO4: To understand the Knowledge on brood-stock and spawn rearing and management.

CO5: To understand the Clear knowledge on breeding of major carps and other finfishes

BFSC 403 Fish Nutrition and Feed Technology

Course Outcomes

At the end of the course, the student will be able to

CO1: To get Detailed knowledge on candidate species of live feeds including the plankton

CO2: To understand Detailed knowledge on biology, culture and culture techniques of live food organism like algae and diatoms.

CO3: Clear understanding on biology, culture and culture techniques of livefood organism rotifers and cladocerans

CO4: To understand knowledge on biology,culture and culture techniques of live food organism like tubifex, brineshrimp and chironomids

CO5: To understand the Clear knowledge on culture of baitandforagefishes

BFSC 404 Fish and Shell Fish Patholog

Course Outcomes

At the end of the course, the student will be able to

CO1: To get Detailed knowledge on general toxicology, toxicokinetics and toxico-dynamics

CO2: To understand Detailed knowledge on classification and testing of toxicants.

CO3: To get DetailedknowledgeCO3:Clearunderstandingonsystemictoxicologyandresponseto toxicants like heavy metals

CO4: To get In depth knowledge on phyto-toxicants

CO5: To understand the Clear knowledge on toxicity of drugs in Aquaculture, drug and toxicresidues

BFSC 405 Physiology of Finfish and Shellfish

Course Outcomes

At the end of the course, the student will be able to

CO1: To get detailed knowledge on Water as a biological medium. gas exchange and muscle physiology

CO2: To understand the detailed knowledge about Circulation, Excretion, Osmoregulation and Sense organs.

CO3: For clear understanding on energy and metabolisms

CO4: To get Knowledge on reproductive physiology of fin and shellfishes

CO5: To get clear knowledge on the effect of environmental factors on reproductive physiology of fin and shellfishes

BFSC 406 Fishery Oceanography

Course Outcomes

At the end of the course, the student will be able to

CO1: To get Detailed knowledge on oceanography and relative terminologies

CO2: To understand the detailed knowledge about physical oceanography

CO3: For Clear understanding on the physical properties of seawater

CO4: To get Knowledge on physical and chemical interactions in the oceans

CO5: To get Clear knowledge on inorganic, organic and nutrient properties of sea water

BFSC 407 AQUATIC POLLUTION AND COASTAL ZONE MANAGEMENT

Course Outcomes

At the end of the course, the student will be able to

CO1: To get Detailed knowledge on aquatic pollution and water quality parameters

CO2: To understand Detailed knowledge about organic and inorganic pollutants

CO3: For Clear understanding on the microbial and sewage pollutions in the coastal ecosystems

CO4: To get Knowledge on estuarine ecosystems and GIS

CO5: To get Clear knowledge on inorganic, organic and nutrient properties of sea water

BFSC 408 Fish Canning Technology

Course Outcomes

At the end of the course, the student will be able to

CO1: To get Detailed knowledge on canning and the various packaging materials
CO2: To Detailed knowledge about thermal, pasteurization and sterilization methods
CO3: For Clear understanding on complete canning of fish and fishery products
CO4: To gain Knowledge on process calculations and sterilization methods
CO5: To get Clear knowledge on various spoilage and the standards

Semester IV BFSC 409 FISHING GEAR TECHNOLOGY

Course Outcomes

At the end of the course, the student will be able to

CO1: To get Detailed knowledge on fishing gears and its types
CO2: To get Detailed knowledge about various kinds of materials used in fish gear materials
CO3: For Clear understanding on mesh numbering and calculations
CO4: To gain Knowledge on properties of netting materials
CO5: To get Clear knowledge on classification gears and its parts

V SEMESTER

BFSC-501 Finfish Hatchery Management

Course Outcomes

At the end of the course, the student will be able to

CO1: To Gain knowledge about nutritional requirements of cultivable fish and shellfish
CO2: To understand Forms and types of feeds
CO3: To understand process of preservation of feed
CO4: To operate Feeding devices and methods of feeding
CO5: To understand Non-conventional feed ingredients and anti-nutritional factors

BFSC-502 Introduction to Biotechnology and Bioinformatics

Course Outcomes

At the end of the course, the student will be able to

CO1: To Gain knowledge about cells and organs of the immune system.
CO2: To understand Antigen-antibody interactions.
CO3: To understand Sources of infection and transmission of diseases.
CO4: To understand the mechanism of action and modes of administration of vaccines.
CO5: To gain confidence in handling various serological methods in disease diagnosis.

BFSC-503 Pharmacology 3 (2+1)

Course Outcomes

At the end of the course, the student will be able to

CO1: To Gain knowledge about prevention and treatment of viral diseases and OIE listed diseases.

CO2: To understand Quarantine and health certification in aquaculture.

CO3: To understand Good and Best management practices

CO4: To understand the Importance of Biofilm, Biofloc, Periphyton in aquatic health management.

CO5: To understand molecular and antibody based diagnostic methods .

BFSC-504 Fish Toxicology

Course Outcomes

At the end of the course, the student will be able to

CO1: To Gain knowledge about Chemotherapy

CO2: To understand about Antiparasiticides: Ectoparasites, Endoparasites and Protozoans

CO3: To understand process of mechanism of action of Immuno-stimulants and Vaccines

CO4: To have a wide knowledge about Classification of Therapeutants

CO5: To understand mechanism of action of drug

BFSC-505 Fish Population Dynamics and Stock Assessment 3 (2+1)

Course Outcomes

At the end of the course, the student will be able to

CO1: To Gain knowledge about stock assessment. Segregation of stocks and Principles of stock assessment

CO2: To understand growth parameters and graphical models

CO3: To understand various estimation procedures for calculating total fishing and natural mortality

CO4: To understand the concept of Maximum Sustainable Yield and Maximum Economic Yield

CO5: To understand Biological symptoms of under fishing and over fishing

BFSC-506 Fish By-Products and Waste Utilization

Course Outcomes

At the end of the course, the student will be able to

CO1: To Gain knowledge about various storage and preservation methods oil from fish

CO2: To understand the applications of Fish protein concentrate.

CO3: To understand the various Utilization of seaweeds.

CO4: To understand the economical use of fish

CO5: To obtainBiochemical and pharmaceutical products from shrimp waste

BFSC-507 Microbiology of Fish and Fishery Products

Course Outcomes

At the end of the course, the student will be able to

CO1: To understand the Sources and types of microorganisms in fish and fishery products

CO2: To understand the methods of Enumeration of microorganisms in food by conventional and rapid techniques

CO3: To understand the Microbiology and spoilage of fresh, semi processed and processed fish and fishery products

CO4: To clearly understand the occurrence, growth, survival, pathogenicity and prevention of pathogens

CO5: To understand the biological hazards associated with fish and fishery products

BFSC-508 Aquaculture Engineering

Course Outcomes

At the end of the course, the student will be able to

CO1: To Gain complete knowledge about farm construction

CO2: To understand various Earth work calculation processes

CO3: To understand process of Design of ponds, pond geometry; shape, size, bottom slope of pond, and construction of dykes

CO4: To have confidence in Site selection, planning and construction of coastal aqua farms

CO5: To understand about the various hatchery accessories like pumps, aerators and filters

BFSC-509 Fishing Craft Technology

Course Outcomes

At the end of the course, the student will be able to

CO1: To Gain knowledge about Basic geometric concepts and important terminologies of fishing vessel.

CO2: To understand various rules in construction of fishing gears

CO3: To understand the advantages and disadvantages of boat building material

CO4: To understand fouling and boring organisms and to prevent them.

CO5: To understand the Introduction of Outboard and inboard engines.

VI SEMESTER

BFSC-601 Shellfish Hatchery Management

Course Outcomes

At the end of the course, the student will be able to

CO1: To understand about Role of physical, chemical, soil and water parameters in fish health.

CO2: To understand the various Pathological processes

CO3: To understand the mechanism of parasite, bacteria, virus and fungus disease development process.

CO4: To have a complete knowledge about non-infectious diseases

CO5: To identify the clinical symptoms in disease diagnosis

BFSC-602 Microbial and Parasitic Diseases of Fish and Shellfish

Course Outcomes

At the end of the course, the student will be able to

CO1: To Gain knowledge about Gene and chromosome as basis of inheritance

CO2: To understand Sex determination using chromosomes

CO3: To understand Mutation, Chromosomal structure and aberrations

CO4: To carry outcross breeding and hybridization in different fishes

CO5: To understand Cryopreservation of gametes

BFSC-603 Therapeutics in Aquaculture

Course Outcomes

At the end of the course, the student will be able to

CO1: To Gain knowledge about Gene regulation and expression in prokaryotes and eukaryotes

CO2: To understand the applications of Recombinant DNA technology in vaccines production

CO3: To understand the techniques of DNA sequencing,

CO4: To have an idea about bioprocess engineering and bio prospecting.

CO5: To understand Molecular visualization and Sequence analysis

BFSC-604 Fish Products and Value Addition

Course Outcomes

At the end of the course, the student will be able to

CO1: To Gain knowledge about Theory of salting, methods of salting wet salting and dry salting.

CO2: To understand the Quality standard for salted and dry fish.

CO3: To understand Hurdle technology in fish preservation and processing.

CO4: To carryout methods of preparation of various fish paste products like fish sausage, fish ham, surimi, fish cake, kamaboko

CO5: To understand Value addition to Diversified fish products

BFSC-605 Fish Packaging Technology

Course Outcomes

At the end of the course, the student will be able to

CO1: To Gain knowledge about Printing for packaging and print identification

CO2: To understand Closures of packaging, heat seals and bottle closure

CO3: To understand various Packaging requirements of fresh fish, frozen fish canned fish

CO4: To widely apply the knowledge of Packaging for retail sale and storage

CO5: To understand Safety and legislation aspects of packing. Labelling and bar coding

BFSC-606 Quality assurance of Fish and Fishery Products

Course Outcomes

At the end of the course, the student will be able to

CO1: To Gain knowledge about Quality changes during processing

CO2: To understand Assessment of food safety

CO3: To understand General requirements for export of fish and fishery products to the EU

CO4: To understand Interpretation of test reports and limits

CO5: To understand Use of additives in seafood processing as quality enhancers

BFSC-607 Fishing Technology

Course Outcomes

At the end of the course, the student will be able to

CO1: To Gain knowledge about Deck layout of different fishing vessels.

CO2: To understand Constructional details of single boat purse seine; two boat purse seine and method of operation. .

CO3: To understand Operation of gillnet

CO4: To understand the Selectivity in fishing gear and by catch reducing devices.
CO5: To understand Fishing equipment

BFSC-608 Navigation and Seamanship
Course Outcomes
At the end of the course, the student will be able to
CO1: To Gain knowledge about finding adjustable and non-adjustable errors
CO2: To understand different buoyage systems.
CO3: To understand about Radar, parts and functions of radar
CO4: To operate and use Life saving appliances life jackets, life buoys
CO5: To understand how to secure the vessel from storm

BFSC-609 Fisheries Administration and Entrepreneurship Development
Course Outcomes
At the end of the course, the student will be able to
CO1: To Gain knowledge about powers of functionaries of department of fisheries
CO2: To understand International environmental legislation and its impact on fisheries..
CO3: To understand the International Law of Seas and international commissions of fisheries and their impact.
CO4: To apply commercialization of ideas and innovations.
CO5: To understand Characteristics of Indian fisheries processing and export industry.

BFSC-610 Fisheries Co-operatives, Marketing and Business Management
Course Outcomes
At the end of the course, the student will be able to
CO1: To Gain knowledge about Basic accounting procedures, profit and loss account
CO2: To understand the functioning of Fish markets and other marketing infrastructure in India
CO3: To understand Export and import policies relevant to fisheries sector.
CO4: To operate Accounting procedures of fish business entity
CO5: To understand Globalisation and the emerging business and the Social Responsibility of Business.

B.VOC (AQUACULTURE)
(Three – Year) Programme

Semester-I

AQCC 101 Communicative English
Course Outcomes:
At the end of the course, the student will be able to:
CO1:To understand the definition of Reading, Different techniques in Reading, Levels of Reading and also Academic Reading.
CO2: To understand the Listening skills – Barriers to Listening, Signposting, Gambits.
CO3:To understand the different tips of writing like Essay writing, Thesis writing, Abstract writing, and also Linkage and Cohesion.
CO4:To understand the communication skills i.e. Speaking, different barriers of Speaking.
CO5: To understand the different Numerical and Verbal Aptitude. Grooming and Dressing – Attending meeting and how to face interviews.

AQCC 102 Life Coping Skill
Course Outcomes
At the end of the course, the student will be able to
CO1: To understand the Self Esteem and Personality development Strengths and Weaknesses. Dos and Don'ts to Develop.
CO2: To understand the perception of life transforming from soft to tough mind and also Weak to Strong men/women.
CO3: To understand the Concept of goals, goals setting and striving for goals.
CO4:To understand how to cope with depression, fear and failure.
CO5: To understand the leadership qualities and the courage of a good leader.

AQCC 103 Introduction to Computer
Course Outcomes
At the end of the course, the student will be able to
CO1: To understand the Basics of Computers like Introduction to computers, Input and Output devices, Applications of Computers.
CO2:To understand the techniques of MS Word Creating and Editing Document and also different shortcuts, Mail merge, Macros etc.
CO3: To understand the MS Excel and MS Power point i.e. different formulas in Excel and also creating tables, and also slide presentation.
CO4:To understand the different accessories used in computers i.e. Light pen, Mouse etc.
CO5:To understand the communication in Computers LAN, WAN, MAN and also Internet, E-mail.

AQCC 104 Biology Of Cultivable Shell and Finfishes
Course Outcomes
At the end of the course, the student will be able to
CO1: To understand the general characters and classification of Fishes, Crustaceans and Molluscs.
CO2: To understand the different food and feeding habitats, Age and growth determination in Fishes.
CO3: To understand the different metabolic activities like digestion, respiration and excretion in fishes, Crustaceans and Molluscs.
CO4: To understand the Maturation, Spawning and Fecundity in Fishes.
CO5: To understand the Parental care, Breeding and Migration in Fishes.

AQCC 105 Principles and Methods in Aquaculture
Course Outcomes
At the end of the course, the student will be able to

CO1: To understand the History, Significance and Scope of Aquaculture, different Aquaculture Practices.
CO2: To understand the general concepts of Ecology, Biogeochemical cycles, Fertilization and maturing, physic-chemical parameters of Soil and water.
CO3: To understand the different types of ponds, positioning and maintenance of ponds.
CO4: To understand the criteria for selection of species and cultivable fresh water fishes.
CO5: To understand the brackish water and marine water cultivable fishes and culture practices.

Semester II

AQCC 201 Soft Skills and Personality Development

Course Outcomes:

At the end of the course, the student will be able to

CO1: To understand the skills of Listening and Barriers to Listening, effective listening skills.
CO2: To understand the Speaking and Conversation skills, components of a full conversation.
CO3: To understand the essentials of Spoken English and giving interviews.
CO4: To understand the Presentation skills, oral presentation and asking questions.
CO5: To understand the personality development like attitude, Motivation etc.

AQCC 202 Brackish Water Aquaculture and Mariculture

Course Outcomes

At the end of the course, the student will be able to

CO1: To understand the Introduction to Brackish water aquaculture and different types of Aquaculture systems.
CO2: To understand the different species cultured in Brackish water aquaculture and their culture practices.
CO3: To understand the Crustacean species cultured in Aquaculture, their Biology and their culture practices.
CO4: To understand the culture of Mollusks and their importance as well as the culture of seaweeds and importance.
CO5: To understand the Open sea farming, cage farming, present and current status of Mari culture.

AQCC 203 Hatchery Technology in Aquatic Organisms

Course Outcomes

At the end of the course, the student will be able to

CO1: To understand the Breeding of Fin and Shell fishes.
CO2: To understand the seed production and Hatchery management of Carps.
CO3: To understand the production of Common carp seeds and other fishes, their breeding techniques.
CO4: To understand the seed production of Crustaceans and mollusks and also hatchery operations.
CO5: To understand the hatchery management and the design of shrimp hatcheries.

AQCC 204 Freshwater Aquaculture

Course Outcomes

At the end of the course, the student will be able to

CO1: To understand the different fresh water organisms and their culture practices.
CO2: To understand the culture of crustaceans, mollusks and frog.
CO3: To understand the importance of fish in stable environment, sewage aquaculture, fish in relation to public health.
CO4: To understand the Reservoir fisheries and major reservoirs in India.
CO5: To understand the various types of Integrated Fish farming Rice cum fish culture, Duck cum fish culture, pig cum fish culture etc.

AQCC 205 Culture of Live Fish Food Organisms

Course Outcomes

At the end of the course, the student will be able to

CO1: To understand the different live food organisms for the culture of Fresh, Brackish water and marine fishes.

CO2: To understand the mass culture of diatoms, dianoflagellates and periphyton.

CO3: To understand the Biology, reproduction and feeding habits of Zoo plankton.

CO4: To understand the biology and economic significance of Artemia, biology and mass culture of Polychaetes.

CO5: To understand the culture of Earthworms, Bait fish and Forage fish, Chironomids.

AQCC 301 Disaster Management

Course Outcomes

At the end of the course, the student will be able to:

CO1: To understand the Basic concepts of Disaster.

CO2: To understand the various types of Disaster – Natural and manmade hazards in Aquaculture and fisheries.

CO3: To understand the Disease management strategies.

CO4: To understand the response and recovery systems during the disaster.

CO5: To understand the different agencies involved in Disaster management.

AQCC 302 Aquaculture Nutrition and Feed Management

Course Outcomes

At the end of the course, the student will be able to

CO1: To understand the basic principles of Nutrition for Fishes and Shrimps.

CO2: To understand the nutritional requirements of Cultivable fishes and shrimps

CO3: To understand the feed formulations.

CO4: To understand the feed preservation and feed management.

CO5: To understand the different types of feeds.

AQCC 303 Inland and Marine Fisheries

Course Outcomes

At the end of the course, the student will be able to

CO1: To understand the riverine ad cold water fisheries.

CO2: To understand the Reservoir and Estuarine fisheries.

CO3: To understand the Pelagic resources in the Marine Environment.

CO4: To understand the Demersal resources in the Marine Environment.

CO5: To understand the Deep sea resources in the Marine Environment.

AQCC 304 Aquatic Ecology and Biodiversity

At the end of the course, the student will be able to

CO1: To understand the definition of Ecology and Ecosystem.

CO2: To understand the structure and components of Ecosystem.

CO3: To understand the ecology of different communities.

CO4: To understand the different coastal ecosystems.

CO5: To understand the conservation of Habitats – Endangered species.

AQCC 305 Soil and Water Quality Management

Course Outcomes

At the end of the course, the student will be able to

CO1: To understand the different parameters of Water – Temperature, pH, Turbidity, Chlorinity etc.
CO2: To understand the analytical methods of water quality parameters.
CO3: To understand the different characteristics of soil
CO4: To understand the soil management.
CO5: To understand the amendments of soil.

Semester-IV

AQCC 401 Entrepreneurship

Course Outcomes

At the end of the course, the student will be able to

CO1: To understand the Accounting and Finance, starting a venture.
CO2: To understand the Marketing and Negotiations/ strategies.
CO3: To understand the Information technology for Business administration, Importance of IT.
CO4: To understand the leadership qualities, Team work qualities, managerial skills.
CO5: To understand the Fundamentals of Entrepreneurship, Role of Knowledge center, R&D.

AQCC 402 Genetics and Biotechnology

Course Outcomes

At the end of the course, the student will be able to

CO1: To understand the Introduction to Genetics and Principles of Fish Genetics.
CO2: To understand the present Breeding and Quarantine methods in Aquaculture.
CO3: To understand the cryopreservation of gametes and Hybridization techniques.
CO4: To understand the Genetic manipulations.
CO5: To understand the DNA technology and DNA replication techniques.

AQCC 403 Pathology in Aquaculture

Course Outcomes

At the end of the course, the student will be able to

CO1: To understand the Introduction to pathology and parasitology – Fish diseases.
CO2: To understand the different types of Fungal and diseases in Fin fishes in Aquaculture.
CO3: To understand the Bacterial, Protozoan and Metazoan diseases in Aquaculture.
CO4: To understand the Nutritional diseases and Immunology.
CO5: To understand the Management of Fish diseases..

AQCC 404 Fish Processing Technology and Quality Control

Course Outcomes

At the end of the course, the student will be able to

CO1: To understand the different Fish processing and Freezing techniques.
CO2: To understand the preservation of Fin fish / Shell fish processing.
CO3: To understand the By-products of Fishes.
CO4: To understand the Value added By-products.
CO5: To understand the Quality Control.

AQCC 405 Anatomy of Finfish and Shellfish

Course Outcomes

At the end of the course, the student will be able to

CO1: To understand the External Anatomy of Fishes.
CO2: To understand the Circulatory system of Teleost, Elasmobranch and Crustaceans.
CO3: To understand the Respiratory system of Teleost, Elasmobranch and Crustaceans.
CO4: To understand the Reproductive system of Teleost, Elasmobranch and Crustaceans.
CO5: To understand the Nervous system of Teleost, Elasmobranch and Crustaceans.

Semester-V

AQCC 501 Limnology

Course Outcomes

At the end of the course, the student will be able to

CO1: To understand the different inland water types: Streams, rivers, lakes and ponds.
CO2: To understand the Plankton, types of plankton and distribution of plankton and Primary production.
CO3: To understand the Nekton – Benthos and Periphyton composition and classification.
CO4: To understand the classification of lakes and production of lakes.
CO5: To view the different logic environments.

AQCC 502 Molluscs and Seaweed Culture

Course Outcomes

At the end of the course, the student will be able to

CO1: To understand the biology of Molluscs, life history, food and feeding, age and growth.
CO2: To understand the Molluscan seeds from natural resources, collection of seeds and transport.
CO3: To understand the hatchery production of Molluscan seed, breeding and spat collection.
CO4: To understand the culture practices of Molluscs.
CO5: To view the culture practices of Seaweeds.

AQCC 503 Aquaculture Engineering

Course Outcomes

At the end of the course, the student will be able to

CO1: To understand the Land Survey.
CO2: To understand the Fresh water and Coastal Aqua farm types.
CO3: To understand the flow of water, water pipes, types of water pipes, feeding channels.
CO4: To understand the types of Aerators used in Aquaculture.
CO5: To view the types of soils and the characteristics of soil.

ELECTIVE -1 Fish Immunology

Course Outcomes:

At the end of the course, the student will be able to

- ✓ clear understanding of immunology
- ✓ clear knowledge on immune mechanism and the immune-globulins
- ✓ complete knowledge on immune response and the vaccine development

ELECTIVE -IIMARINE BIOLOGY

Course Outcomes:

At the end of the course, the student will be able to

- ✓ gain knowledge on divisions in marine environment
- ✓ clear knowledge on primary producers and benthic ecosystem of ocean
- ✓ complete knowledge on diversity of nektons and marine mammals

ELECTIVE -III AQUACULTURE IN RESERVOIR

Learning Outcomes:

At the end of the course, the student will be able to

- ✓ Detailed knowledge on reservoirs and its characters
- ✓ Clear understanding of fish production trends and its management strategies
- ✓ Complete knowledge on cage, pen and infrastructures facilities for the interventions

Semester-VI

AQCC 601 Ornamental Fish Breeding and Culture

Course Outcomes

At the end of the course, the student will be able to

CO1: To understand the Introduction to Aquarium, Ornamental and Aquarium accessories.
CO2: To understand the Setting up of an Aquarium and Aquarium management practices.
CO3: To understand the Fresh water ornamental fishes, Culture and Breeding.
CO4: To understand the Marine Ornamental Fishes, Culture and Breeding.
CO5: To view the common parasites affecting ornamental fishes, bacterial fishes and disease management.

AQCC 602 Aquaculture Extension and Economics

Course Outcomes

At the end of the course, the student will be able to

CO1: To understand the Introduction to Extension Education.
CO2: To understand the Extension strategies and methods.
CO3: To understand the characteristics of Technology Transfer FFDA, BFDA.
CO4: To understand the Markets and their kinds, importance of MPEDA in Exports and Imports.
CO5: To view the definition and strategies of economics, Law of demand etc.

ELECTIVE-I Fish Microbiology And Quality Assurance

Course Outcomes

At the end of the course, the student will be able to

- ✓ Knowledge on the history and importance of microorganisms in fish foods
- ✓ Detailed knowledge on intrinsic, extrinsic and food borne pathogens
- ✓ Knowledge on fish spoilage and fish processing plant sanitation

ELECTIVE-II Disease Management in Aquaculture

Course Outcomes

At the end of the course, the student will be able to

- ✓ Detailed insights in to diseases in aquaculture and its mechanism
- ✓ Clear knowledge on protozoan, bacterial, viral and fungal diseases in aquaculture system
- ✓ Knowledge on nutritional, parasitic and its preventive measures

ELECTIVE III Fish Preservation Technology

Course Outcomes

At the end of the course, the student will be able to

- ✓ Detailed insights in to fish handling, chilling and freezing
- ✓ Clear knowledge on drying, smoking, canning and freeze drying

Knowledge on quality control, by-product, packing and export of fish foods

MASTER OF SCIENCE IN OCEAN SCIENCE AND TECHNOLOGY
(5 YEAR INTEGRATED)

I SEMESTER

IOST13MARINE INVERTEBRATES & PROCHORDATES

Course Outcome:

On completion of this course, students should be able to:

CO1: Gain fundamental knowledge about marine invertebrates and prochordates

CO2: Understand the classification, functional morphology and life history of protozoans and sponges.

CO3: Describe about crustaceans their evolution

CO4: Describe about molluscs evolution

C**O**5:Explain life cycle of Ehinodermates and Prochordates

IOST 14 MARINE VERTEBRATES

Course Outcome:

CO1: Study and impart knowledge about the marine vertebrates

CO2: Students can be specialized in identifying the vertebrate specimens

CO3: Learn about the biology of fish, reptiles and birds

CO4: Learn the origin of reptiles

CO5:Gain adequate knowledge on the general characteristics of marine mammals and their economic importance

IANM 16 - ANCILLARY MATHEMATICS - I

Course outcome:

After completing this course, students should be able to

CO1: Understands the theory of equations

CO2: Understands the basic concepts of matrices

CO3: Can able to solve the solution of simultaneous linear algebraic equations

CO4: To compute the numerical derivatives for numerical differentiation

CO5: To solve the solution of ordinary differential equations

IOST 23MARINE PLANTS

Course outcome:

Upon successful completion of this course, students should be able to

CO1: Learn the general characteristics of marine microbial flora

CO2: Gain knowledge on the marine phytoplanktons and their role in the marine environment.

CO3: To acquaint knowledge on the seaweeds and their economic importance

CO4: To highlights the physiology and phylogeny of seagrasses

CO5: To understand the distribution of mangroves and their habitats

IANM 25 ANCILLARY MATHEMATICS - II

Course Outcome:

After completing this course, students should be able to

CO1: To get the solution of Algebraic and Transcendental Equations.

CO2: To understand the numerical integration methods.

CO3: To solve the ordinary differential equations.

CO4: To understand the empirical laws and curve fitting.

CO5: Learning the assignment problem

IOET 11 ELECTIVE COURSE - I: CHEMISTRY

Course Outcome:

After successful completion of this course, students should be able to

CO1: Know about the mineral wealth in India

CO2: To gain an in-depth knowledge on physical chemistry

CO3: To gain an in-depth knowledge on organic chemistry

CO4:To obtain knowledge on the kinetics and catalyst

CO5:Know about the industrial chemistry

IOST 33 OCEAN AND COASTAL ECOLOGY

Course Outcome:

After successful completion of the work, the students can able to

CO1: Know the basic knowledge on the marine ecology and uniqueness of coastal organisms

CO2: To study the coastal ecology

CO3: To study the ocean ecology

CO4: To understand the coral reef ecosystem

CO5:Acquaint deep knowledge on coral ecology, estuarine shorelines and different zones in the marine environments

IANP 35 ANCILLARY PHYSICS - I

Course Outcomes:

Upon successful completion of this course, students should be able to:

CO1: Gain adequate knowledge on the theories and law with respect to mechanics and matter

CO2: Familiarized with the law of thermodynamics and diffusion process.

CO3: Acquaint knowledge on the properties of sound, waves, acoustics

CO4: To understand the optics properties.

CO5:Comprehend the properties of light and the effects of biological radiations on biological systems.

IOET 21 ELECTIVE COURSE-II: STATISTICS

Course Outcome:

Upon successful completion of this course, students should be able to

CO1: Understand the basic concept of statistics and interpretation of qualitative and quantitative data

CO2: Learn the basic concept of sampling and dispersion of biological charaters

CO3: To acquaint knowledge on the correlation and regression coefficients and equality of variances

CO4: To interpret the large amount of data in a simpler way

IOST 43 PHYSICAL OCEANOGRAPHY

Course Outcome:

After successful completion of this course, students should be able to

CO1: Understand the physical properties of sea water and their physic-chemical characteristics

CO2: Acquaint knowledge on the waves, wave generation and their theories behind it

CO3: Know about the wave velocity and coastal sediment transport

CO4: Understand the concept behind small amplitude waves and finite amplitude waves

CO5: To gain knowledge on the Ocean tides and currents

IOST 44 CHEMICAL OCEANOGRAPHY

Course Outcome:

Upon successful completion of this course, students should be able to

CO1: Understand the Chemical system of the ocean

CO2: Acquaint knowledge on the chemical composition of the seawater
CO3: Know about ozone depletion and global warming
CO4: Gain in-depth knowledge on the seasonal variations in the nutrients and organic matters
CO5: Understand the role of nutrients and the productivity

IANP 45 ANCILLARY PHYSICS – II

Course Outcome:

Upon successful completion of this course, students should be able to
CO1: Understand the basic knowledge behind the electricity and the transformers
CO2: Learn the concept of magnetism and applications of Ferrites in computer memory
CO3: To acquaint knowledge nuclear physics
CO4:To acquaint knowledge on the modern and wave mechanics
CO5:To understand the concepts behind nuclear physics and laser physics

IOET 31 ELECTIVE COURSE - III:CYTOLOGY, GENETICS AND IMMUNOLOGY

Course Outcome:

After completing this course, students should be able to
CO1: Understand the structural organization of cell.
CO2: Learn about the changes and variations in the chromosome structures and number.
CO3: To acquaint about the applied advanced genetics
CO4:To understand the vertebrate's immunology.
CO5:To understand the invertebrate's immunology.

IOST 51 BIOLOGICAL OCEANOGRAPHY

Course Outcome:

Upon successful completion of this course, students should be able to
CO1: Understand the biological system of the marine environment
CO2: Acquaint deep knowledge on phytoplankton and zooplankton
CO3: Know about nekton and their characteristics
CO4: Gain in-depth knowledge on the benthic environment and their organisms
CO5: Know about the biological process involved during primary production and marine environment

IOST 52 ATMOSPHERIC SCIENCE AND METEOROLOGY

Course Outcome:

Upon successful completion of this course, students should be able to
CO1: Acquire solid foundation in the application of physical, chemical and mathematical principles to a broad range of atmospheric phenomena
CO2: Basic concepts involved in the analysis of weather phenomena on a global and local scale
CO3: Understand cloud physics and dynamic meteorology.
CO4: To acquaint about the general circulation in the atmosphere
CO5:Address the tropical meteorology and satellites used for meteorological studies.

IOST 53 MARINE GEOLOGY

Course Outcome:

Upon successful completion of this course, students should be able to
CO1: basic concepts in earth science Understand.
CO2: Determine particle morphology and grain-size and texture.
CO3: Learn about the major coastal deposits, landforms and marine mineral resources.
CO4: To understand the marine deposits in the coastal region,
CO5: Acquire the knowledge in marine resources

IOST 54 MARINE POLLUTION

Course Outcome:

After successful completion of the work, the students can able to

CO1: Know the major pollutants in the marine environment

CO2: Acquaint deep knowledge on Sewage, industrial, agricultural and domestic discharges in the marine environment

CO3: Know about Heavy metal pollution and the impacts of dredging and mining in the marine environment

CO4: Gain in-depth knowledge on oil pollution, thermal pollution.

CO5: The environmental impact assessment on protecting the marine environment,

IOST 55 COMPUTER APPLICATIONS – III

CourseOutcome:

Upon completion of this course the students will be able to

CO1: Learn the software languages used in the field of remote sensing

CO2: Perform the coding software efficiently such as MATLAB and programming languages

CO3: Understand the MATLAB basic learning principles and perform independently

CO4: Develop the hydrodynamic modeling

CO5: Develop the two and three dimension plots.

IOST 61 FLUID MECHANICS

Course Outcome:

Upon the completion of this course the students will be able to

CO1: Learn the basic principle involving in fluid mechanics

CO2: Understand the concepts of fluid static

CO3: Understand the concepts of fluid kinematics

CO4:Develop engineering skill on the construction of harbor, jetties, etc., for employability

CO5: Acquire the basic principles of fluid mechanisms and how machines operate with the help of fluid mechanisms.

IOST 62 WAVES AND TIDES

Course Outcomes:

Upon the completion of this course the students will be able to

CO1: Learn the wave characteristics and its estimations

CO2: Understand the concepts tide generation and its characteristics

CO3:Understand the conceptsLong waves

CO4: Understand the concepts Wind waves

CO5: Acquire the basic knowledge about the coastal currents generated by tides

IOST 63 INSTRUMENTATION AND ANALYTICAL METHODS

Course Outcome:

After culmination of the course the students will be able

CO1: Learn and efficiently use on site marine field instruments

CO2: Study the principles and basic concepts of different microscopes

CO3: Learn the working principles of Spectrometer and analyze environmental parameters using the same

CO4: Comprehend and perform the techniques involves in extraction of different compounds efficiently using the Centrifugation and chromatography method.

CO5: To know the techniques to operate instrument in research vessels

IOST 71 COASTAL AND MARINE RESOURCES

Course Outcomes:
Upon the completion of this course the students will be able to
CO1: Learn the marine resources and its availability
CO2: Understand the concepts of marine resources and importance
CO3: Learn about Living marine resources
CO4:Understand the concepts of resource exploration and exploitation
CO5: Acquire the basic information necessary to formulate their own opinions on ocean-related environmental issues in future.

IOST 72 SURVEY TECHNOLOGY OF COASTAL ENVIRONMENT
CourseOutcome:
Upon completion of this course the students will be able to comprehend
CO1: The basic concepts in surveying using different methods
CO2: Surveying methods deals with tides and theodolite surveying and principles and concept
CO3: To solving abilities, creativity, and innovation for coastal construction
CO4: To incorporate survey technology in coastal environment
CO5:The advanced measurements of GPS and its applications

IOST 73 SATELLITE OCEANOGRAPHY
Course Outcome:
After completion of this course the students will be able to
CO1: Comprehend the basic principles and concepts of remote sensing
CO2: Obtain information regarding the spatial features deals with basics of spatial features
CO3: Perform independently image processing and data analysis and obtain spatial data from different resources
CO4: Have complete knowledge on the importance of the remote sensing applications in the field of meteorology and oceanography
CO5: Gather the knowledge about the applications of remote sensing in various subject

IOST 74 MARINE INSTRUMENT FOR OCEANOGRAPHIC MEASUREMENTS
Course Outcome:
After completion of this course the students will be able to
CO1: Comprehend the basic principles and concepts of available oceanographic instruments and sensors.
CO2: Obtain information regarding the fixed, buoy and ship based platform
CO3: Acquiring knowledge in wide range of surveying equipments.
CO4: Understand complete knowledge on the data analysis in the field of meteorology and Oceanography.
CO5: Understand the concept of marine sensor

IOST 75 AIR - SEA INTERACTION
Course Outcome:
On successful completion of this course students will be able to
CO1: The basic principle deals with understanding in atmosphere, structure and the mechanism of solar radiation
CO2: Understand the role of atmosphere, humidity and wind pattern in hydrological cycle and rainfall pattern
CO3: Will have knowledge on air pressure, wind pressure and the role of Coriolis effect in determining the wind effect and pressure.
CO4: Comprehend the role of weather forecasting in cyclone and thunderstorms especially withstorm surges and EL-Nino

CO5: Acquire the knowledge in climate modeling

IOST 76 INTEGRATED COASTAL ZONE MANAGEMENT

Course Outcome:

After completion of this course the students will be able to

CO1: Comprehend the basic principles maintaining the functional integrity of the coastal resource systems

CO2: Obtain information regarding reducing resource-use conflicts in coastal area

CO3: Have knowledge on an importance of the coastal environment

CO4: Know the value of coastal ecological economics and benefits

CO5: Understand complete knowledge on the Integrated Coastal Zone Management

IOST 81 GEOGRAPHIC INFORMATION SYSTEMS

CourseOutcome:

Upon successful completion of this course the students will be able to

CO1: Comprehend the Geographic Information Systems and its basic principles and Concepts

CO2: Learn and acquire adequate knowledge on GIS and its importance in spatial analysis

CO3: Acquire the knowledge in spatial and temporal images

CO4: Understand the GIS techniques in online modeling

CO5:Understand the application of GIS especially in exploring and Mapping of Marine Resources

IOST 82 RENEWABLE ENERGY SYSTEMS

Course Outcome:

After completion of this program the students will

CO1: Have adequate knowledge on the importance of renewable energy

CO2: Learn the importance of solar energy on renewable resource

CO3: Able to learn the significance of wind and geo thermal energy on renewable resource

CO4: Understand the tidal and wave renewable energy

CO5: Acquire the knowledge about the renewable energy sources in OTEC

IOST 83 DYNAMICAL OCEANOGRAPHY

CourseOutcome:

Upon completion of this course the students will be able to

CO1: Learn the statics and Kinematic process and their uses in mathematical modeling

CO2: Understand the role of Ekman's Transport and upwelling in ocean water current friction

CO3: Have adequate knowledge on major world ocean currents and its role in marine environment

CO5: Understand the thermohaline circulation

IOST 84 DISASTER MANAGEMENT

Course Outcome:

Upon completion of this course the students will have efficient knowledge on

CO1:Understand mitigation of the risk attached to disaster and its severity/consequences.

CO2: Knowthe preparedness to handle a disaster of any magnitude

CO3: Rehabilitation and reconstruction of the disaster-hit area

CO4: Creativity of knowledge in prompt or quick response to such a situation

CO5: Understanding evacuation and relief operations at a situation

IOST 85OCEAN MANAGEMENT

Course Outcome:

Upon completion of this course the students will have efficient knowledge on

CO1: Coastal zone importance and problems related to global coastal zone modificaitons

CO2: The importance of coastal zone regulations to mitigate the environmental issues

CO3: Prevention, management and mitigation from natural disasters
CO4:To study the coral management in marine environment
CO5: To study the mangrove management in coastal

IOET 41 ELECTIVE COURSE - IV: FISHERY TECHNOLOGY
Course Outcome:
After successful completion of this course, students should be able to
Co1: Familarize on the status of World and Indian fisheries
Co2: Know about the methods implemented during fisheries survey
Co3: Understand the population dynamics of fish species and know about the principle methods of fish explotation
Co4: Gain knowledge on the different types of net used for fishing
Co5: Understand the preservation and processing of fish species

IOST 91 : UNDERWATER ACOUSTICS AND OPTICS
CourseOutcome:

Upon culmination of the course successfully the students will be able to
CO1: Understand the fundamental principles of sound transmission in underwater
CO2: Learn the ocean optical parameters and their importance in analyses
CO3: To study the concept of array
CO4:Acquire knowledge in ocean optics
CO5:Comprhend the optical properties of Case I and Case II water

IOST 92 COASTAL AND ESTUARINE DYNAMICS
Course Outcome:
Upon successful completion of this course the students will be able to
CO1: Obtain efficient knowledge on coastal and estuarine profile and how to prevent the coastal erosion due to different factors
CO2: To study the sediment transport in marine environment
CO3: Understand the transportation of sediments via different medium and sea level changes due to various environmental parameters
CO4:Gain knowledge on estuarine characteristics and its dynamic nature
CO5:To study the concepts of estuarine sedimentation processes.

IOST 93 NUMERICAL MODELING FOR COASTAL PROCESSES
Course Outcome:
Upon successful completion of this course the students will be able to
CO1: Obtain efficient knowledge on hydrodynamic modeling in coastal environment.
CO2: Understand the different pollution scenarios using coastal modeling.
CO3: Gain knowledge on numerical modeling application in coastal processes and development
CO4: Understand the concept of numerical water quality models
CO5:To acquire the knowledge software numerical, ecological, and water quality, harbor layout and jetty for modeling in the port layout

IOST 94 ENVIRONMENTAL IMPACT ASSESSMENT
Course Outcome:
Upon completion of this course the students will be able to
CO1: Obtain thorough knowledge on legal and regulatory aspects of Marine environments.
CO2: Learn and assessed the impacts on different environmental plans.

CO3: Understand the NGO's roles and responsibilities in EIA and know about the Constitution and law.
CO3**:** Learn and Implement the environmental impact assessment plan in essential sectors.
CO4: Understand the concept of EIA essential sectors and issues
CO5:To study on environmental consequences of any development project and prediction in marine sector for industries, harbor, etc.,

IOET 51 ELECTIVE COURSE - V:COASTAL AQUACULTURE
Course Outcome:
Upon the culmination of the course program the students will be able to
CO1: Recognize the importance of coastal aquaculture and present status in India
CO2: Comprehend the importance of good yielding cultivable different species
CO3: To understand the concepts in shrimp culture technique
CO4: Learn the ornamental fish culture technique
CO5: Learn the various techniques and methods used in different culture systems

IOET 61 ELECTIVE COURSE – VI : PROJECT PLANNING, ANALYSIS AND MANAGEMENT
Course Outcome:
Upon completion of this course the students will be able to
CO1: Have thorough knowledge on project planning and survey
CO2: Learn the project selection factors
CO3: Learn the use of technology in feasibility such as Cost benefit analysis and Economic analysis
CO4: To understand the project finance
CO5:Learn and Implement the methods in project monitoring and evaluation efficiently

IOET 71 ELECTIVE COURSE – VII : MARINE RECREATION
Course Outcome:
Upon completion of this course the students will be able to
CO1: Have thorough knowledge of beach importance and needs.
CO2: Gain knowledge of the different recreational games and marine tourisms.
CO3: Learn and Implement the methods in safety assurances in the marine environment.
CO4: Acquire the knowledge about safety in marine recreation
CO5: To understand the marine recreational facilities

MARINE BIOLOGY AND OCEANOGRAPHY
(Two – Year) Programme

Semester-I 19MBOC101: INVERTEBRATES AND PROCHORDATES
Course Outcomes
At the end of the course, the student will be able to

CO1:	To understand the classification of Phylum: Coelenterates/Cnidaria and the development of metamorphosis.
CO2:	To understand the functional morphology of minor phyla and their classification & development.
CO3:	To understand the classification of Crustacea and Polychaetes with their developmental stages.
CO4:	To understand the classification and importance of Phylum Mollusca.
CO5:	To understand the classification of Echinodermata and Prochordata with their development.

19MBOC 102 – VERTEBRATES
(Functional morphology, Palaeontology, Developmental Biology and Evolution)
Course Outcomes
At the end of the course, the student will be able to

CO1:	To understand the origin of chordates by time scale and features.
CO2:	To understand the origin of Amphibia and Bony fishes.
CO3:	To understand the origin and adaptive radiation of Reptiles and Birds.
CO4:	To understand the evaluation of Marine Mammals and human.
CO5:	To understand the marine developmental stages of vertebrate's viz., fish, bird and mammals.

19MBOC 103 – CYTOLOGY, GENETICS AND IMMUNOLOGY
Course Outcomes
At the end of the course, the student will be able to

CO1:	To understand the microscopes- light, phase contrast and interference, darkfield, fluorescence, confocal electron 3TEM and SEM).
CO2:	To understand the principles of genetics, practical applications of genetics, hybridization of fishes and recent trends.
CO3:	To understand the normal and transformed cell lines as model genetic systems and advantages.
CO4:	To understand the non- specific immune response, Immunological factors- humoral and clotting.
CO5:	To understand the elements of Immunology, Antigen, antigenicity, epitopes and haptens.

19MBOC 104 – MARINE MICROBIOLOGY

Course Outcomes

At the end of the course, the student will be able to

CO1:	To understand the occurrence, distribution, structure and biology of marine bacteria.
CO2:	To understand the occurrence, distribution, structure and biology of marine cyanobacteria.
CO3:	To understand the occurrence, distribution, structure and biology of actinomycetes.
CO4:	To understand the occurrence, distribution, structure and biology of marine fungi.
CO5:	To understand the occurrence, distribution, structure and biology of marine viruses

19MBOC 105 – PHYSIOLOGY AND BIOCHEMISTRY

Course Outcomes

At the end of the course, the student will be able to

CO1:	To understand the physiology of feeding and feeding mechanism of marine organisms.
CO2:	To understand the physiology of biological rhythms of marine animals.
CO3:	To understand the physiology of nervous system in marine bony fishes and elasmobranchs.
CO4:	To understand the bioactive molecules and its importance from marine organisms.
CO5:	To understand the metabolisms of carbohydrates, amino acids and nucleic acid synthesis.

19MBOC 201 – PHYSICAL OCEANOGRAPHY

Course Outcomes

At the end of the course, the student will be able to

CO1:	To understand the history of Oceanography, origin of Oceans.
CO2:	To understand the heat budget of the oceans, sea level rise and global warming.
CO3:	To understand the sea water currents, waves and tides.
CO4:	To understand the origin and classification of estuaries and lagoons.
CO5:	To understand the origin and physical properties of sediments.

19MBOC 202 – CHEMICAL OCEANOGRAPHY

Course Outcomes

At the end of the course, the student will be able to

CO1:	To understand the origin of ocean salts, physical and chemical properties of water.
CO2:	To understand the concept of chlorinity and salinity of seawater.
CO3:	To understand the origin, importance and distribution of dissolved gases.
CO4:	To understand the dissolved and particulate organic matter.
CO5:	To understand the inorganic plant nutrients.

19MBOC 203 – BIOLOGICAL OCEANOGRAPHY

Course Outcomes

At the end of the course, the student will be able to

CO1:	To understand the biological environment of sea.
CO2:	To understand the collection methods of phytoplankton and zooplankton.
CO3:	To understand the primary and secondary productions and its involvements.
CO4:	To understand the distribution and occurrence of seaweeds and seagrass.
CO5:	To understand the mangroves, salt marshes and sand dunes.

19MBOC 204 – COASTAL AQUACULTURE

Course Outcomes

At the end of the course, the student will be able to

CO1:	To understand the importance of coastal aquaculture.
CO2:	To understand the site selections and soil conditions.
CO3:	To understand the cultivable fin and shell fishes.
CO4:	To understand the natural seed resources and availability.
CO5:	To understand the various culture practices.

19MBOC 205 – FISHERIES SCIENCE AND STATISTICS

Course Outcomes

At the end of the course, the student will be able to

CO1:	To understand the morphology and outline classification of fishes.
CO2:	To understand the fundamental principles of population dynamics.
CO3:	To understand the marine fisheries of India and their survey methods.
CO4:	To understand the exploitation methods of marine fishes
CO5:	To understand the sampling techniques and biometry of marine fishes.

19MBOC 301 – MARINE ECOLOGY AND ZOOGEOGRAPHY

Course Outcomes

At the end of the course, the student will be able to:

CO1:	To understand the marine environment and ecological factors
CO2:	To understand the coastal ecosystem structure and function.
CO3:	To understand the group attributes, population density variation.
CO4:	To understand the structure composition and stratification.
CO5:	To understand the importance of biodiversity and its assessment.

19MBOC 302– MARINE BIOTECHNOLOGY, BIOINFORMATICS AND INSTRUMENTATION

Course Outcomes

At the end of the course, the student will be able to

CO1:	To understand the biotechnological tools and techniques.
CO2:	To understand the bioactive compounds from marine organisms.
CO3:	To understand the recombinant protein production.
CO4:	To understand the concept of bioinformatics and its applications.
CO5:	To understand the importance of chromatography and spectroscopy.

19MBOC 303 – POLLUTION AND TOXICOLOGY

Course Outcomes

At the end of the course, the student will be able to

CO1:	To understand the marine pollution and pollutants.
CO2:	To understand the various pollutants and their impact on coastal environment.

CO3:	To understand the heavy metal pollution and its impact.
CO4:	To understand the oil pollutions and its impact.
CO5:	To understand the thermal pollution and its impact on marine environment.

19MBOC 304 – Ocean Management

Course Outcomes

At the end of the course, the student will be able to

CO1:	To understand the law of the sea and the Geneva Convention.
CO2:	To view the biodiversity in global and national level.
CO3:	To understand the importance of coastal zone and coastal developmental activities.
CO4:	To understand the RS and GIS Technologies.
CO5:	To understand the RS and GIS Technologies- application in marine resources exploration.

19MBOC 401 – Ornamental Fish Culture & Aquarium Keeping

Course Outcomes

At the end of the course, the student will be able to

CO1:	To understand freshwater and marine aquarium status, ornamental fish trade, aquarium fishes and collection strategies.
CO2:	To view the culturing practices and hatchery techniques and live feed culture.
CO3:	To understand the designing of fish tanks, aeration, filtration and lighting setup in the aquarium tanks.
CO4:	To understand the setting of aquarium tanks and decoration in indoor and outdoor aquarium tanks.
CO5:	To understand the preparation of pellet feed and disease management in the aquarium fishes.

19 MBOE 305 Disaster Management

Course Outcomes

At the end of the course, the student will be able to

CO1:	To understand coastal hazards, risk assessment and disaster management strategies in India
CO2:	To understand the types of hazards in fisheries sector and other impact of natural disasters and assessment.
CO3:	To understand the disaster management strategies during the pre-disaster and post disaster periods.
CO4:	To understand the response and recovery systems at national, state and local, coordination between different agencies
CO5:	To understand the Prevalent national and global management practices in disaster managements.

19MBOE306 Marine Food Technology

Course Outcomes

At the end of the course, the student will be able to

CO1:	To understand the preservation and processing methods and type of preservatives in fish processing.

CO2:	To understand the packing methods, utilization and preparation of fishery by-products.
CO3:	To understand the spoilage of seafood caused by mircroorganisms and their controll measures.
CO4:	To understand the qulality management of fishery products and certification approaches for commerical applications.
CO5:	To understand the product development and nutrition promotion, consumer studies qualitative and quantitative research methods

19MBOE402 Microbial Technology

At the end of the course, the student will be able to

CO1:	To understand the isolation and screening of industrial important microbes and strain development for commercial agents.
CO2:	To understand the principles of bioprocess technology and optimization for product development
CO3:	To understand the recombinant protein product in microbes and their issues in commercial production.
CO4:	To understand the bioremediation of microbes and their significant role in toxic waste removal and ore leaching.
CO5:	To understand the application of microbes in food and healthcare industries, food processing and food preservation approaches.

19MBOE403 REMOTE SENSING & GIS

Course Outcomes

At the end of the course, the student will be able to

CO1:	To understand the principles and applications of remote sensing and types of sensors and their applications.
CO2:	To understand the application of remote sensing in the assessment of marine flora and ocean colour monitoring.
CO3:	To understand the principles and applications of GIS and mapping of marine resources by using the GIS tools.
CO4:	To understand the spatial Analysis, Integration and modelling strategies and concept of Web GIS.
CO5:	To understand marine resources exploration, Mapping and Marine Resources information System.

19 MBOE 106 Soft Skill Development

Course Outcomes

At the end of the course, the student will be able to

CO1:	To understand the communications skills.
CO2:	To understand the presentation skills, preparation and participation methods.
CO3:	To understand the technical writing skills.
CO4:	To understand the applications of computer and browsing search engines.

COASTAL AQUACULTURE
(Two – Year) Programme

19CAQC 101 Fundamentals of Marine Biology and Oceanography
CO1: Understand the classification of various coastal environments and their physico – chemical characteristics.
CO2: Understand basic concepts in physical, chemical and biological oceanography.
CO3: Comprehend the classification, method of collection, analysis and biomass estimation of Plankton- bloom forming plankton, primary production and Carbon sequestration of marine plankton
CO4: Know the classification and importance of Phylum Mollusca.
CO5: To have thorough understanding on the living and non-living resources of marine environment besides to know various types of marine pollution.

19 CAQC 102 Nutrition and Biochemistry
CO1: Understand various aspects of aquaculture nutrition.
CO2: Know the various the types of feed ingredients used in feed formulation besides various steps involved in it.
CO3: Understand different types of feed used and its storage in aquaculture.
CO4: Have thorough understanding on the types of live feed and their mass scale production in aquaculture
CO5: Understand biochemical make-up of feeds used in aquaculture

19 CAQC 103 Physiology, Cytology and Genetics
CO1: Have an understanding on the physiology of fish respiration and digestion.
CO2: Have knowledge on the osmoregulation and hormones of reproduction in fin and shellfishes.
CO3: Understand the physiological rhythms involved in marine animals.
CO4: Know various types of cells and tissues besides the methodology adopted for chromosome preparation.
CO5: To understand various aspects and application of genetics in aquaculture.

19 CAQC 104 Aquaculture Engineering
CO1: Know criteria for selection of site for brackish water farming.
CO2: Comprehend the general principles and procedures of elementary engineering survey, planning of survey in coastal region for shrimp farming
CO3: Know various components of a brackishwater farm.
CO4: Have thorough understanding on the various types of pumps and aerators.
CO5: Know various steps involved in site selection, farm designing, construction of different types of open-sea farming practices.

19 CAQC105 Aquarium Keeping and Management
CO1: Know the world status and criteria for selection of ornamental fishes.
CO2: Have thorough knowledge on the fabrication and designing of aquarium tank.
CO3: Understand the Aeration and filtration systems involved in aquarium maintenance.
CO4: Knowledge on the Setting up a tropical marine aquarium.
CO5: Thorough understanding on the basic health managements of ornamental fishes.

19CAQC201 Biology and Culture of Crustaceans
CO1: Get an overview of Crustacean Aquaculture.
CO2: Knowledge on the moulting and various aspects involved in shell fish hatchery management.

CO3: Knowledge on various culture practices: traditional, extensive, semi-intensive and intensive management practices of *Penaues monodon, P. indicus* and *Litopenaeus vannamei.*
CO4: Understanding on the culture and method of seed production of giant freshwater prawn, lobsters and crabs.
CO5: Better understanding on the production and economics of penaeid and non-penaeid shrimps in extensive and semi-intensive systems

19 CAQC202 Biology and Culture of Finfishes
CO1: Getting an overview of biology of finfishes
CO2: Knowledge on the resources, collection and transportation finfish seed.
CO3: Understanding on the techniques and management practices in finfish hatchery
CO4: Have thorough knowledge on the various aspects of fin fish culture.
CO5: Gather knowledge on the polyculture and ornamental fish culture

19CAQC203 Biology and Culture of Mollluscs and Seaweeds
CO1: Understand the overview of molluscan biology.
CO2: Know the resources, collection and transportation molluscan seed.
CO3: Thorough understanding on the molluscan hatchery and its types.
CO4: Understanding on various aspects of molluscan aquaculture.
CO5: Knowledge about seaweed culture and its importance.

19CAQC204 Health management in Aquaculture systems
CO1: Getting an overview of importance of marine microbiology and health management in aquaculture system.
CO2: Knowing methods of isolation, culture, microbial, nutrition, growth, activity, structure and biology of coastal bacteria and viruses
CO3: Knowledge on the incidence of various diseases of fin and shell fishes
CO4: Knowing the adoption of various modern techniques employed in disease diagnosis.
CO5: Learning about various preventive measures of diseases

19CAQC205 Post Harvest Technology
CO1: Thorough understanding on various aspects of processing and preservation i.e., handing of fishes, rigor mortis, quality assurance, HACCP concepts etc.
CO2: Knowledge on fish spoilage and its causative factors.
CO3: Understanding on the summary of drying and curing methods along with their merits and demerits.
CO4: Knowledge on freezing and canning methods along with their merits and demerits.
CO5: Thorough comprehension on various fish by-products with their uses.

19CAQC301 Instrumentation and Analytical Methods
CO1: Knowledge on the use of different field equipments in aquaculture
CO2: Thorough information on the microscopes and photomicrography along with different types of centrifuge, principle and their use in aquaculture
CO3: Understanding on the working principle and use of spectroscopy
CO4: Learning different types of electrophoresis and chromatography
CO5: Knowledge on the various types of microtome, whole mount preparation

19CAQC302 Biotechnology and Applied Marine Biology
CO1: Learning gene manipulation techniques involved in the aquaculture practices
CO2: Understanding on the pharmacological role of different marine organisms

CO3: Knowledge on the various disease diagnosis concepts used in aquaculture
CO4: Learning cell and tissue culture techniques and other biological products of biotechnology
CO5: Gathering knowledge on different marine resources and their management

19CAQC303 Aquaculture Information, Economics & Extension

CO1: Knowledge on land leasing policies for aquaculture and other technical consideration involved in setting up of a aquaculture farm
CO2: Learning about different financial and insurance agencies and steps involved in getting financial support and insurance coverage.
CO3: Knowledge on data collection and processing in different aquaculture practices.
CO4: Thorough knowledge on the use of internet and other media as a tool for collection of data in aquaculture.
CO5: Knowledge on extension education, rural development, socio – economics, marketing, internal and external markets and trade, demand and supply.

19CAQC304 Bioentrepreneurship

CO1: Understanding on the role of finance and accounting in an entrepreneurship.
CO2: Knowledge on various aspects of marketing.
CO3: Knowing the usefulness of information technology in an enterprise and other recent techniques of e-business.
CO4: Learning leadership, managerial skills and other concepts related to human resource development.
CO5: Gathering knowledge on fundamental of entrepreneurship and role of knowledge centres and R&D institutes in technology transfer.

19CAQC401 Plant and Animal cell Culture Technology

CO1: Learning structure and organization of animal cell, cell proliferation, cell differentiation, cell adhes on, senescence and cell transformation.
CO2: Thorough knowledge on cell culture media, cell lines and cell separation
CO3: Knowledge on an overview of animal cell culture.
CO4: Learn about plant tissue culture.
CO5: Gathering knowledge about explant, surface sterilization, plant growth hormones, micro propagation, somatic hybridization, plant transformation and applications of plant tissue culture.

19 CAQE 305 Disaster Management

CO1: To understand coastal hazards, risk assessment and disaster management strategies in India
CO2: To understand the types of hazards in fisheries sector and other impact of natural disasters and assessment.
CO3: To understand the disaster management strategies during the pre-disaster and post disaster periods.
CO4: To understand the response and recovery systems at national, state and local, coordination between different agencies
CO5: To understand the Prevalent national and global management practices in disaster managements.

19CAQE306 Marine Food Technology

CO1: To understand the preservation and processing methods and type of preservatives in fish processing.
CO2: To understand the packing methods, utilization and preparation of fishery by-products.
CO3: To understand the spoilage of seafood caused by mircroorganisms and their controll measures.
CO4: To understand the qulality management of fishery products and certification approaches for commerical applications.
CO5: To understand the product development and nutrition promotion, consumer studies qualitative and quantitative research methods

19CAQE402 Microbial Technology

CO1: To understand the isolation and screening of industrial important microbes and strain development for commercial agents.
CO2: To understand the principles of bioprocess technology and optimization for product development
CO3: To understand the recombinant protein product in microbes and their issues in commercial production.
CO4: To understand the bioremediation of microbes and their significant role in toxic waste removal and ore leaching.
CO5: To understand the application of microbes in food and healthcare industries, food processing and food preservation approaches.

19CAQE403 REMOTE SENSING & GIS

CO1: To understand the principles and applications of remote sensing and types of sensors and their applications.
CO2: To understand the application of remote sensing in the assessment of marine flora and ocean colour monitoring.
CO3: To understand the principles and applications of GIS and mapping of marine resources by using the GIS tools.
CO4: To understand the spatial Analysis, Integration and modelling strategies and concept of Web GIS.
CO5: To understand marine resources exploration, Mapping and Marine Resources information System.

19 CAQE 106 Soft Skill Development

CO1: To understand the communications skills.
CO2: To understand the presentation skills, preparation and participation methods.
CO3: To understand the technical writing skills.
CO4: To understand the applications of computer and browsing search engines.

MARINE BIOTECHNOLOGY
(Two – Year) Programme
(Dept. of Biotechnology (DBT), New Delhi approved syllabus)

19MBTC101 Biochemistry

CO1: Gain fundamental knowledge in biochemistry, cellular macromolecules and assemblies
CO2: Understand the enzyme catalysis and its arithmetic principles in reaction kinetics
CO3: Describe about major fundamental nutrient molecules like sugars, glycolipids etc.
CO4: Characterize lipids, DNA and RNA
CO5: Explain the role of cellular components in energy synthesis
CO6: Acquire the facts about the vitamins and the co-factors role in metabolism

19MBTC 102 Molecular Biology

CO1: Summarize the scientific principles of the molecular structure of DNA and organization of genome.
CO2: Narrate on fidelity of DNA replication and the mechanisms of its maintenance.
CO3: Explain RNA transcription and processing in prokaryotes.
CO4: Comprehend RNA transcription and processing in Eukaryotes in comparison with prokaryotic transcription
CO5: Highlight the protein translation and its post-transcriptional modification.

19MBTC 103 Fisheries Resources, Conservation and Oceanography

CO1: Understand status and trends of marine major organisms and their habitat.
CO2: Appreciate bio-communication in oceans with reference to food web dynamics and ecological function.
CO3: Accustom with factors influencing biodiversity and the need of conservation.
CO4: Appraise the factors necessitating the preservation of gametes and artificial insemination for propagation of marine life.
CO5: Acquaint the knowledge in physical, chemical and biological oceanography and their dynamics.

19MBTC 104 Marine Microbiology

CO1: Explain important features of microbial diversity with reference to different niches in Oceans.
CO2: Learn techniques of microbial culture, evaluation, maintenance preservation and storing for long time use
CO3: Describe and discuss marine microbes in terms of physiological competence and bio-geochemical role
CO4: Analyze microbial eco system function in pelagic and benthic marine habitats
CO5: Validate microbial pathogenesis, host pathogens interaction, diseases diagnosis and their economic important in food industry

19MBTC 105 Biostatistics

CO1: Understand how to summarize statistical data.
CO2: Apply appropriate statistical tests based on an understanding of study question, type of study and type of data.
CO3: Interpret results of probability correlation.
CO4: Appreciate correlation regression analysis
CO5: Describe statistical hypothesis.
CO6: Verify the significance of a data
CO7: Simulate experimental design for precise data collection.

19MBTC 106 Biophysical Principles and Analytical Techniques

Co1: Students will learn how to combine previously acquired knowledge of physical chemistry and biochemistry in order to understand biochemical processes at molecular level.
Co2: Student will clarify the rate, order and molecularity of a reaction.
Co3: Student will understand the role of biomolecules and their functional analyses.
Co4: Student will acquire knowledge in analytical techniques to evaluate protein molecules.
Co5: Student will describe the principle and application of sophisticated tools of microscopy in predicting structure and function elucidation of biological molecules

19MBTP 107 Practical – I (Biochemistry and Analytical Techniques)

CO1: Realize the concepts of biochemistry with easy to run experiments.
CO2: Familiarize with basic laboratory instruments and understand principle of measurements using those instruments with experiments in biochemistry.
CO3: Acquire to utilize the different types of chromatography in separation of bio-molecules like protein, lipid, carbohydrate, phenolics, terepenoids, alkaloids and other nitrogen-containing compounds.
CO4: Develop skills in utilization various laboratory tools in the isolation and evaluation of nucleic acids and protein.
CO5: Learn about the uses of different types of spectroscopy including mass spectroscopy in understanding of biomolecules and their function.

19MBTP 108 Practical – II (Microbiology and Experimental Methods in Fisheries)

CO1: Obey the bio-safety aspects of good laboratory practices in the culture of microbes.
CO2: Do enumeration of microbial cultures using different culture media.
CO3: Characterize microbes and their culture conditions from different sources of aquatic environment.
CO4: Utilize microscopy for evaluation of phytoplankton and zooplankton.
CO5: Validate primary productivity of different water bodies.
CO6: Distinguish different larval stages of both fin and shell fishes.
CO7: Gain the knowledge in using different crafts and gears.

19MBTC 201 Cell and Developmental Biology

CO1: Understand the major organelles and their physiological role in the maintenance of cellular architecture
CO2: Analyze macromolecular trafficking, chromatin organization and packaging,
CO3: Explain cell cycle and control mechanisms
CO4: Comprehend with cell motility and its role in functional organization of different tissues
CO5: Appreciate cell division components, the factors responsible in cell growth, embryonic development mechanisms and certain elements' role in deformities during growth.

19MBTC 202 Genetic Engineering

CO1: Acquire knowledge in utilizing the tools (i.e., DNA polymerases, nucleases, ligases, phosphorylases, labeled DNA/RNA markers, vector constructs selectable markers etc.,) of genetic engineering.
CO2: Gain facts on types of DNA vectors, strategies of cloning, expression of the gene, screening and isolation of the cloned gene
CO3: Know the method of specific gene amplification using PCR and the techniques involved in disease diagnosis
CO4: Learn the principles involved in cDNA construction, gene product evaluation and protein expression substantiation.
CO5: Learn gene silencing and gene editing technologies for the use in clinical and pharmacological applications.

19MBTC 203 Aquaculture Bioprocessing and Marine Pharmacology

CO1: Different methodologies in culture of micro-algae and their importance in aquaculture.
CO2: Learn the techniques involved in the processing of feed formulation for cultivable aquatic organisms.
CO3: Understand the techniques employed to get bioactive compounds from marine living resources
CO4: Gain knowledge in marine pharmacology.
CO5:Know about important marine sources for valuable products.

19MBTC 204 Fish Immunology and Health Management

CO1: Recognize immunological nature of shell and fin fishes in marine environment
CO2: Evaluate the humoral components of invertebrate immunity.
CO3: Learn about the techniques on early diagnosis of diseases and identification of causative agent.
CO4: Understand the importance of animal cell culture in the field of immunology
CO5: Progress in enduring health management strategies.

19MBTC 205 Aquatic Environmental Biotechnology

CO1: Identify interaction between marine organisms and environment
CO2: Categorize different types of pollutants and their effect on marine organisms.
CO3: Appreciate in developing biomarkers for different pollutants.
CO4: Recognize various type of biological materials causing fouling and their relevance to environment
CO5: Employ biotechnological management to come up with solutions against growing marine pollution

19MBTP 206 Practical – III (Molecular Biology and Genetic Engineering)

CO1: Apprehend the concept of operon model for predicting the use in genetic engineering.
CO2: Use PCR for gene amplification.
CO3: Gain hands-on experience on gene insertion, transformation and screening for recombinant clone.
CO4: Experiment the gene and protein expression
CO5: Understand the principles of His-taq expression of protein for column purification.
CO6: Learn hybridization technique to confirm the selection of precise clone.

19MBTP 207 Practical – IV (Aquaculture and Fish Immunology and Health Management)

CO1: Dissect and display the marine fin and shell fishes
CO2: Demonstrate the type of blood cells from the circulatory body fluids of marine animals.
CO3: Evaluate the pathology of cells by histology and explain host pathogen interaction.
CO4: Conduct experiments for specific antigen antibody reaction using different immune-assays
CO5: Perform cell culture and understand the principles of monoclonal antibody production.

19MBTP 208 Practical – V (Aquatic Environmental Biotechnology)

CO1: Assess water quality parameters in relevance to aquatic organisms dwelling in the niche
CO2: Assess economic loss caused by fouler and borers
CO3: Employ environmental management technologies to validate different kind of marine pollution.
CO4: Understand the usage of biosensors in evaluating environmental parameters
CO5: Utilize molecular tools in assessing the aquatic environment microbial diversity.

19MBTC 301 Marine Bioprocess Technology

CO1: Understand the principles of biochemical engineering.
CO2: Appreciate relevance of micro-organisms in bioprocessing technology.
CO3: Carry out stoichiometric calculations and specify models of their growth
CO4: Give an account of design and operations of various bioreactors.
CO5: Present unit operations together with fundamental principles for basic methods in production technique for bio-based products
CO6: Calculate yield and production rates in biological production process, and also interpret data.
CO7 Calculate the need for oxygen and oxygen transfer in bio-production process
CO8: Critically analyze any bioprocess from an economics/market point of view
CO9: Give an account of important microbial/enzymatic industrial processes in food and fuel industry.

19MBTC 302 Aquaculture Biotechnology

CO1: Explain fundamental principles of aquaculture.
CO2: Troubleshoot in resolving aquaculture issues.
CO3: Apply biotechnological methods in high yield aquaculture produce.
CO4: Acquire self-employability skills to start own farm or hatchery.
CO5: Identify role of aquaculture-biotechnology in societal development.

19MBTC 303 Bioinformatics

CO1: Basic theory and practical usage of computational tools\
CO2: Biological data analyzing skills
CO3: Phylogenetic positioning of a species
CO4: Drug designing strategies
CO5: Reasoning of cellular physiological changes

CO6: Targeting specific molecular interaction
CO7: Appreciate their relevance for investigating specific contemporary biological questions
CO8:Identification of species and their systematic position

19MBTC 304 Intellectual Property Rights, Bio-safety and Bioethics

CO1: Analyze the rationale of IPR and understand the importance of patents.
CO2: Understand IPR Policy of India and be familiar with broad outline of Patent regulations.
CO3: Understand different types of intellectual property rights in general and protection of products derived from biotechnology research and issues related to application and obtaining patents.
CO4: Gain knowledge of biosafety and risk assessment of products derived from recombinant DNA research and environmental release of genetically modified organisms, national and international regulations.
CO5: Comprehend ethical aspects related to biological, biomedical, health care and biotechnology research.

19MBTC 305 Bio-entrepreneurship

CO1: Gain entrepreneurial skills.
CO2: Evaluate the various operations involved in venture software creation,
CO3: Identify scope for entrepreneurship in biosciences and utilize the schemes promoted through knowledge centers and various agencies.
CO4: Acquire the knowledge pertaining to management
CO5: Build up a strong network within the industry.

19MBTP 306 Practical – VI (Marine Bioprocess Technology)

CO1: Appreciate utilization of micro-organisms for industrial use.
CO2: Carry out stoichiometric calculations and specify models of their growth.
CO3: Give an account of design and operations of various fermenters.
CO4: Calculate yield and production rates in biological production process, and also interpret data.
CO5: Give an account of important microbial/enzymatic industrial processes in food and fuel industry.
CO6: Use of bio-analytics for evaluating the quality of the product.

19MBTP 307 Practical – VII (Aquaculture Biotechnology)

CO1: Dissect and display various fish organs
CO2: Carryout artificial fertilization
CO3: Understand the stages of maturation
CO4: Acquire the knowledge of starting an aquaculture industry
CO5: Give an account of important microbial/enzymatic industrial processes in food and fuel industry.

19MBTP 308 Practical – VIII (Bioinformatics and Biostatistics)

CO1: Describe contents and properties of important bioinformatics databases, perform text- and sequence-based searches, analyze and discuss results in light of molecular biology knowledge.

CO2: Explain major steps in pairwise and multiple sequence alignment, explain its principles and execute pairwise sequence alignment by dynamic programming.
CO3: Predict secondary and tertiary structures of protein sequences.
CO4: Perform and analyze various statistical tools available to analyze the data.
CO5: Organize different modern statistic packages precisely for specific data appreciation.

19MBTE 309 Project Proposal Preparation and Presentation

CO1: Formulate a scientific question.
CO2: Have scientific approach to solve a problem.
CO3: Interpret, discuss and communicate scientific results in written form.
CO4: Gain experience in writing a scientific proposal.
CO5: Learn to present and explain their research findings to the audience effectively.

19MBTC 401 Research work/ Dissertation

CO1: In-depth knowledge of the chosen area of research.
CO2: Capability to critically and systematically integrate knowledge to identify issues that must be addressed within framework of specific thesis.
CO3: Competence in research design and planning.
CO4: Capability to create, analyze and critically evaluate different technical solutions.
CO5: Ability to conduct research independently.
CO6: Ability to perform analytical techniques/experimental methods.
CO7: Project management skills.
CO8: Report writing skills.
CO9: Problem solving skills.
CO10: Communication and interpersonal skills.

ELECTIVE 1: 19MBTE 402 GENOMICS AND PROTEOMICS

CO1: Students will able to acquire knowledge and understanding of the fundamentals of genomics and proteomics,
CO2: Student will describe basic aspects transcriptomics and metabolomics and their applications in various applied areas of biology.
CO3: Student will understand basic principles of genome project, comparative genome and functional genomics and proteomics

ELECTIVE 2: NANOBIOTECHNOLOGY

CO1: Describe basic science behind the properties of materials at the nanometer scale.
CO2: Appreciate the princi-ples behind advanced experimental and computational techniques for studying nano-materials.
CO3: Understand the preparation of nano-particles.
CO4 Acquire the knowledge in the application of nano-particles.
CO5 Realize the effect of nano-particle toxicity.

ELECTIVE 3: MOLECULAR DIAGNOSTICS

CO1: Understand various facets of molecular procedures for Diagnosis
CO2: Learn the use of modern molecular tools like micro-array for precise diagnostics
CO3: Utilize of cytogenetic techniques
CO4 Verify quality and quantum of the result
CO5 Apply immunogenic tools for early diagnosis and prognosis of human diseases.

ELECTIVE 4: MARINE FOOD TECHNOLOGY

CO1: Acquire practical knowledge of food technology for marine foods.

CO2: Understand the importance of food packaging.
CO3: Know about microbial food technology.
CO4 Assess the quality of packed food.

ELECTIVE 5: STEM CELL BIOLOGY

CO1: Account for basics of stem cell function.
CO2: Explain about embryonic stem cells.
CO3: Discuss the usage of stem cells.
CO4 Appreciate the role of stem cell in medical field.