

Faculty of Fisheries

Subject Code: A1703

Fish Processing Technology

Module. 1	Amino acids – structure and quality of protein, digestibility, primary, secondary, tertiary, quaternary structure of protein and denaturation of protein. Fish oil, body oil, liver oil, fatty acid composition of fish oils, PUFA and HUFA in fish oil, rancidity, antioxidants and vitamins.
Module. 2	Functional properties of seafood proteins, Assessment of protein quality- Biological value, protein efficiency ratio, Net protein utilization. Post mortem changes in fish, rigor mortis, K-value, TMAO and its decomposition products, demethylase. Non-protein nitrogenous compounds in fish. Biogenic amines.
Module .3	Staining of bacteria, nutrition of bacteria, effect of environment on bacteria, growth phase of bacteria and microbial changes during icing, freezing and curing. Food borne infection/intoxication caused by major pathogens associated with seafood. Major seafood toxins Hurdle technology, Food preservation by use of radiation Irradiation: Radiation sources, units, dose levels, radappertization, radacidation, radurization.
Module. 4	Factors affecting quality of fresh fish, handling of fish and board fishing vessels, chill storage of fish, shelf life, storage method, insulated boxes, heat load calculation and ice as a cooling medium. Freezing – freezing curve for fish, Crystallization, homogeneous and heterogeneous nucleation, super cooling, eutectic point, physical changes during freezing, different types of freezers, quality changes during frozen storage and unit steps in freezing. Chemical treatment prior to freezing: antioxidants, cryoprotectants and other additives, theories of cryopreservation, glazing.
Module. 5	Rate of drying, unit steps in drying of fish, defects in dried products, mechanical driers and solar driers. Principles of thermal processing. Canning preservation of fish, sterilization and commercial sterilization, defects in canned products and unit steps in canning. Heat resistance of bacteria and spores, decimal reduction time, thermal death time, "Z" and "F" values, 12D concept, heat penetration, cold point, can size, shape, contents. Absolute sterility, statistical sterility, commercial sterility, pasteurization and sterilization. Spoilage of canned food. Flexible packing, retort pouch processing of fish and fishery products principles and techniques.
Module .6	Fish By-Products and Utilization of Fishery Waste- Fish silage, Fish hydrolysates: Fishmeal and different fisheries products, chitin, chitosan, fish sauce and fish silage. Miscellaneous by-products: Fish maws and isinglass, pearl essence, fertilizer, beche-de-mer, processing of snail meat and jelly fish. Modified atmosphere packaging, transportation of fish and value added products.
Module. 7	Quality assurance in fishery products. HACCP – principles of HACCP and its implementation. Water quality and standards. National and International standards: ISO 9000: 2000 series of quality assurance system, <i>Codex alimentarius</i> , USFDA and EU regulations for fish export trade. Factory sanitation and hygiene: National and international requirements, SSOP, Sanitary and Phytosanitary measures.

Faculty of Fisheries

Subject Code: A1702

Fisheries Resource Management

Module. 1	World Fisheries - Present status of world fisheries utilization and demand. Major fishing nations of the world, major fishing regions, present trend of marine capture fisheries. Important finfish and shellfish resources in demersal and pelagic systems; conservation strategies.
Module. 2	Marine Fisheries of India -Pelagic demersal fishery resources, their exploitation area, season, important species, Production, potential resources, efforts, determination of age, mortality, yield per recruit, maximum sustainable yield and stock-recruitment relationship.
Module .3	Inland Fisheries of India - Inland fisheries resources of India, riverine fisheries Of India, Management and development of reservoir and lakes fisheries resource of India. Their conservation and management.
Module. 4	Fishery Hydrography - Hydrology of the continental shelf around India, Fisheries oceanography, physico-chemical and biological parameters related to fisheries, primary production, thermocline, carbon cycle, nitrogen cycle, phosphorus cycle, food chain and web, micronutrients in the water and soil. Pollution aspects.
Module. 5	Principles of management of fisheries resources objectives of management, issues and challenges of managing multi-gear fisheries. Mud bank fishery- wedge bank fishery-Commonly used tools for input and output regulation. Sustainability: Principles, social economic ecological biological and legal issues. Fisheries co-management. Marine Biodiversity of selected areas including coral reef conservation.
Module .6	Fisheries and fishing methods in open waters: Inshore fisheries (up to 50 m depth), offshore fisheries (50-200 m depth) High sea fisheries (beyond 200m) up to outer limit of EEZ and in International waters. Conservation aspects: Biodiversity principles, categorization of species into endangered, indeterminate and extinct varieties- managing the highly exploited fishery resources.
Module. 7	Extension, Economics Statistics -Extension techniques for marine fisheries, and economics of capture fisheries and statistical method in management of capture fisheries.

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Subject Code:A1701

Aquaculture, Fish Nutrition and Feed Technology and Aquatic Animal Health Management

Module. 1	<p>Sustainable aquaculture, Systems approach and its application in aquaculture, Aquatic resource and livelihood systems, Environmental issues , Socio-economic issues, Strategies for sustainability , Application of renewable energy in aquaculture , Seed certification, Sustainable use of antibiotics</p> <p>Soil and water quality management, Aquatic weed management, Waste water treatment practices, Impact of environment on aquaculture</p>
Module. 2	<p>Environmental and endocrine control of reproduction -Induced spawning: Methods of natural and artificial fertilization</p> <p>Hatchery technology and management - water quality and feed management - better management practices (BMPs) - packaging and transport of seed.</p> <p>Broodstock management - Selective breeding - Transportation of brood stock.</p>
Module .3	<p>Aquarium keeping: Design and construction of tanks; species-wise tank size requirement; heating, lighting, aeration and filtration arrangements; decorations used; common aquarium plants and their propagation; Feed, health and water quality management; prophylaxis; quarantine.</p> <p>Important cultivable finfishes: Distribution, biology, seed collection, nursery rearing, culture techniques, problems and prospects.</p> <p>Culture of crustaceans: Shrimp farming: systems of farming – extensive, semi-intensive and intensive; shrimp farming in undrainable ponds, low and zero water exchange systems; Mud crab fattening, production of soft-shell crabs; Lobster culture</p> <p>Integrated farming systems</p>
Module. 4	<p>Nutritional bioenergetics, Energy budgets, Energetic efficiency of fish production.</p> <p>Nutritional physiology, Feed Manufacture, Feed formulation and processing, On-farm feed manufacture, Feed storage</p> <p>Feeding Practices, : Feeding methods and scheduling, ration size, feed performance and economics</p> <p>Live feeds and their Mass culture techniques, culture of important microalgae, rotifers, artemia, cladocerans, copepods, oligochaetes, nematodes and insect larvae.</p> <p>Carbohydrates: Definition, classification and biological significance; Chemical reactions;</p> <p>Proteins: Definition, classification, biological significance and chemical reactions.</p> <p>Types of feed: Dry (pellets, flakes, powdered, micro-encapsulated, micro-bound and micro-coated diets) and non-dry.</p> <p>Feed storage: Hydro-stability of feed and their storage; Prevention of spoilage from rancidity, fungus and associated toxins; Fish disease vectors in feed , quality control; Feed value in relation to processing; Use of natural and synthetic carotenoids, Feed additives.</p> <p>Feed economics and evaluation criteria, Nutritional energetics, Energy budget equation, Micro-particulate diets ; Grow-out and finisher feeds. Feed intake: different techniques of assessing feed intake</p>
Module. 5	<p>Host-pathogen-environment relationship, Environmental stress. Response of fish to stress-Defence system in fish and shellfish: Organs and cells of immune system, innate immunity-cellular and humoral factors, inflammation response to diseases. Specific defence mechanisms-Antibody and cell mediated immunity in fish and shellfish.</p>
Module .6	<p>Parasitic and mycotic diseases of finfish and shellfish: General characteristics, Diagnosis, Life cycle, Prevention and treatment.</p> <p>OIE Listed bacterial and viral diseases of finfish and shellfish: General characteristics, Epizootiology, Clinical Signs, Diagnosis, Prevention and treatment.</p> <p>Non-infectious Diseases: Nutritional diseases, water, soil, environmental parameters and their effects on fish health. Disease in shrimp hatcheries and grow-out systems.</p>
Module. 7	<p>Diagnostic techniques in health management: Microbiological, haematological, histopathological, nucleic acid based and protein based techniques. Disease surveillance and reporting.</p> <p>Disease control and management: Environment management, antimicrobial and chemotherapeutic agents, prophylaxis- vaccines, adjuvants, immunostimulants and probiotics.</p> <p>Use and abuse of antibiotics in aquaculture, quarantine systems and fish health.</p> <p>Seed certification, SPF and SPR stocks - development and applications.</p>