

FISHERIES SCIENCE
(P.G DEGREE STANDARD)

SUBJECT CODE: 329

UNIT- I: FISH TAXONOMY, ANATOMY, BIOLOGY, CAPTURE FISHERIES, FISH STOCK ASSESSMENT & POPULATION DYNAMICS

Systematics – Commercially important aquatic fauna and flora – marine plants, corals, crustaceans, molluscs, echinoderms, finfishes, turtles and marine mammals - external morphology – Biochemical taxonomy – Anatomy of finfish, shrimps, crabs, bivalves, gastropods and cephalopods - circulatory, respiratory, nerves, urinogenital, endocrine and skeletal systems- sensory organs- reproductive biology, maturity stages, gonado somatic index, ponderal index, fecundity, sex ratio and spawning - eggs and larval stages and developmental biology -Fish biology – food and feeding habits – age and growth length/weight relationship – reproduction, maturation, breeding, spawning, fecundity, eggs and larvae and development – fish physiology, functions of different organ systems of finfish and shellfish- GIS and remote sensing in marine capture Fisheries, Fisheries laws and legislation ;Fisheries resources – important capture fisheries of the world, India, Tamil Nadu – Distribution, population dynamics, stock assessment, modeling, MSY, MEY – conservation of aquatic organisms – endangered aquatic animals and their conservation migration of fishes.

UNIT-II: INLAND AQUACULTURE, COASTAL AQUACULTURE MARICULTURE & AQUACULTURE ENGINEERING

Freshwater aquaculture – site selection – construction of fish farms – cultivable species, carp, tilapia, murrel, catfish, freshwater prawn – culture techniques, monoculture, composite fish culture, - pre-stocking and post/stocking management – integrated fish farming – polyculture - sewage – fed fish culture - Role of cage and pen culture in enhancement of fish production from reservoirs - principles of organic cycling & detritus food chain,- use of agro - industrial waste & biofertilizer in aquaculture - cultivation of aquatic macrophytes in aquaculture - ornamental fish culture and breeding techniques of live bearers -barbs, gold fish, tetras, cichlids, Gouramis, fighter fishes and indigenous ornamental fishes – water recirculation system – commercial fish feed formulation, feeding methods – Fish food organisms - green algae, blue green algae, spirulina, diatoms, infusoria, rotifers, cladocerans,

tubifex, artemia & earthworms; Coastal aquaculture- site selection – construction of fish farm – cultivable species, finfish- seabass, mullet, milk fish, grouper, cobia, snappers, Ayu, pearl spot; shellfish - tiger shrimp, white shrimp, mud crab, lobster, mussel, oyster, clam; seaweeds – culture techniques – cages and pens – Management of coastal aquaculture farms – sea ranching; Mariculture -open water cages- candidate species for mariculture; Aquaculture Engineering- land survey, survey equipments-types of dykes- types of ponds-types of canals-aerators – pumps.

UNIT-III: FISH GENETICS, FISH BIOTECHNOLOGY, FISH PATHOLOGY & AQUATIC HEALTH MANAGEMENT

Modern trends in fish genetics – hybridization cryopreservation of fish gametes – pleiotropism, lethal genes- mutation-sex linked genes-chromosomal structure - aberrations- manipulation techniques- genetically and environmentally induced abnormalities -androgenesis - gynogenesis - polyploidy – genetic engineering – sex reversal – cloning – transgenic fishes – sex determination - cross breeding - cryopreservation of gametes; Fish pathology - Prognosis and diagnosis – bioremediation -probiotics- importance of biofilm, biofloc and periphyton in aquatic health management prophylactic measures – Molecular and immunological Techniques; Pharmacology- Drugs - principles of drugs action - adverse drugs effect - anti bacterial agents - antibiotics - antiseptics and disinfectants parasites – bacterial, fungal and viral diseases – therapeutants in aquaculture -pesticides, fungicides, algicides, hormones, anesthetics, flesh colour enhancer; Fish toxicology- phytotoxins -myco toxins - maximum residual limits; Fish immunology- antigens antibody interactions, defense mechanisms in fin fish and shell fish- vaccine development - whole cell vaccine - purified macro molecules -DNA vaccines-immuno - stimulants – ELISA.

UNIT- IV: FISH HATCHERY MANAGEMENT

Brood stock management of finfish and shellfish –induced breeding – hypophysation of fishes - fish pituitary glands in breeding technique - synthetic hormones - sexual maturity and breeding season of different species – breeding techniques for IMC, exotic crabs, mahaseers, trouts, tilapia, catfishes, grey mullets, milk fish, pearl spot,

seabass, seahorse, groupers, pacu, cobia and pompanos - off season breeding of carps -shrimp hatchery management – carp hatchery management – food and feeding of larval stages of important shellfishes – culture of fish food organisms- water quality management in hatcheries – nursery management – seed transport techniques.

UNIT-V:LIMNOLOGY,AQUATIC ECOLOGY & BIODIVERSITY, OCEANOGRAPHY AND AQUATIC POLLUTION & COASTAL ZONE MANAGEMENT

Physico – chemical features of freshwater systems – ponds-lakes- streams -rivers - indices of productivity of lakes - estimation of primary productivity - fresh water aquatic plants ; Aquatic ecology: Energy flow - food chain - nutrient cycle -animal relationships: symbiosis, commensalism , parasitism prey predator relationship, host parasite relationship; Aquatic biodiversity: species diversity – genetic diversity- habitat diversity - diversity indices -ecological niches - lagoons , estuaries, mangroves, coral reefs, flood plains, coastal wet lands, conservation of marine habitats; Oceanography: Physico – chemical characteristics of sea water - SST- TS- diagrams - waves, tides, currents - drift currents- Ekman spirals, upwelling - gradient currents - thermocline - Major oceanic currents of the world - EL Nino, tsunami — oceanic sediments – manganese nodules; Aquatic pollution – sewage & domestic wastes - sewage treatment - BOD - COD - Eutrophication - red tides - pesticide pollution - organo chlorine and organo phosphate pesticides - PCB - bioaccumulation - heavy metal pollution - bioremediation and phyto-remediation - oil pollution - beach cleaning, microbial pollution - Bio-corrosion -thermal pollution - radioactive pollution; Integrated coastal zone management - GIS – impacts of human activities on costal and ocean area.

UNIT- VI: FISHING GEAR AND CRAFT TECHNOLOGY & EQUIPMENT ENGINEERING

FAO classification of fishing gears – gear materials - properties of netting material - twist -breaking strength - tensile strength -yarn numbering systems - direct and indirect - tex -denier -metric - runnage -selection of gear materials for different gears - Designing and fabrication of gears: gill nets, trawls, longlines, purse seines, fish traps, trolling lines, light fishing, electrical fishing, fishing gear accessories - floats, sinkers, buoys and anchors -shakles, thimbles - otter boards -G link- killey's eye -

shaping of webbing by braiding, cutting - all bar cut -T cut , N cut, selvedge; Craft technology: Law of floatation- Archimedes principle- form co-efficient - Simpson's rule, ships equilibrium, trim, list, TTC, moment of change of trim by 1 cm, gross tonnage, net tonnage, backbone assembly of wooden board, steel board construction, FRP boat construction, deck layout of trawler, gill netter, longliner, purse seiner, views of boat- profile view-half breadth plan view, sectional view, off set table -water plane area, bulk head, stern tube, types of propeller, types of rudder, facilities required for boat building yard. Equipment engineering: deck equipments, winch, power block, net hauler, longline hauler, squid jigger; Electronic equipments: echo sounder, SONAR, RADAR, Radio telephone & GPS.

UNIT – VII: MARINE ENGINES, NAVIGATION AND SEAMANSHIP

Types of diesel engines – two stroke and four stroke engine; starting, ignition, fuel supply, cooling, lubrication systems - Operation and maintenance; Navigational charts - Mercator projections- earth co-ordinates - Chart reading and fixing position - bearing , position , fix, light house - chart symbols- dead reckoning - piloting - parts of magnetic compass - magnetic errors - sextant - rules of the road applicable to fishing vessels-navigational lights - life saving devices- life jacket, life buoy, life buoyant apparatus, life raft and life boat - weather warning signals - storm signals- man over board procedures, distress signals -fog signals -navigational code flags-IALA buoyage system, cardinal and lateral marks, colours.

UNIT- VIII: FISH BIOCHEMISTRY AND FISHERIES MICROBIOLOGY

Fish biochemistry – proximate composition of fish - protein metabolism- de-amination - de-carboxilation - free amino acids - essential amino acids -types of fish protein - non- protein nitrogen in fishes - fatty acids -PUFA - oxidation of fatty acids -Millard reaction; Fisheries Microbiology: microbial spoilage of fresh fish- indicators of microbiological quality- food borne pathogens- *Vibrio cholerae*, *V.parahaemolyticus*, *E.coli*, *Salmonella*, *Listeria monocytogenes*, *Clostridium botulinum*, *C perfringens*, *Campylobacter* and *staphylococcus aureus* - their occurrence, growth, survival, pathogenicity and toxins , Scombroid toxin, ciguatera toxin and puffer fish toxin , mycotoxin; microbial spoilage of canned & frozen products.

UNIT- IX: FISH PROCESSING, FISH BY PRODUCTS, FISH PROCESSING EQUIPMENTS & FISH QUALITY ASSURANCE

Hygienic handling of fish –freshness testing- Rigor Mortis –fish processing methods: Drying, salt curing, smoking, icing, RSW, freezing, glazing, thawing, types of freezers - contact plate freezers - freeze drying, transportation of frozen fish – canning -Fish by products: fermented fish products, Fish sausage, Extruded products, battered and braided products; fish waste utilization: chitin, chitosan, fish hydrolysate, FPC, fish ensilage, fish maws, isinglass, shark fin rays, fish gelatin, seaweeds, agar agar, algin, carageenan, fish meal, fish oil; application of microwave technology in product development; Fish processing equipments: deboner, deskinner, fish sausage machine, canning machineries; Fish quality assurance: Application of HACCP concept in surveillance and quality assurance programmes for raw, frozen, canned, cured, irradiated, cooked and chilled, MAP and freeze dried products; Fish packaging technology: Types of packages and packing materials, Testing, labeling– packaging for retail sale and storage. Transport and handling devices – safety and legislation aspects of packing, labeling and bar coding.

UNIT- X: FISHERIES ECONOMICS, MARKETING & EXTENSION

Economics of marine capture fisheries and fish production systems –domestic and export marketing – Contribution of fisheries to GDP-marine fishery regulations – importance of cooperatives – fishermen associations, NGOs and SHGs in fisheries development – Fisheries Co - management -types of primary and secondary data for statistical analysis for policy making – fisheries investment projects, finance and project planning – socio-economics of fisherfolk. Fisheries extension methods - Extension service for fisheries development – important fisheries development schemes and organizations – training follow up programmes – entrepreneurship development.
