
Restriction Enzymes: Type I, II, III. Klenov Fragment, commonly used restriction enzymes resulting blunt ends and cohesive ends.

Stringent and relaxed plasmids.

Bacterial resistance to antibiotics; submarine gel electrophoresis and blotting principles.

Introduction to foreign DNA into plasmids, cosmids and lamda DNA.

Principles of using linkers and adaptors.

Detection of cloned genes by transformation experiments.

Introducing cDNA as probe; kinasing experiments and incorporating 32 labelled DNA.

Text Books


Reference Books

PAPER 3.2. Marine Living Resources.

Marine animal resources: crustaceans, mollusks and finfish resources - their utilization and rational exploitation.
Culture of live plant feeds; sea ranching of algae.
Culture of live animal feeds; rotifers, cladocerans, brine shrimp (*Artemia*); sea ranching of economically important marine animals.

Text Books

1. Jhingran V. G. Fish and Fisheries of India (2nd ed.)
2. Prossar C.L. Comparative animal physiology
**Paper 3.3: Bioactive Marine Natural Products – I**

Bioactivities of Marine Natural Products. An introduction to the of marine natural products; Antibiotic-tumor, repellent, anti-parasitic, Microbial, antifouling. Commercial potential and development of marine natural products.

Chitosan as a biomaterial.

Algae products: carrageenan, algin, B-carotene and vitamins.

Marine microorganisms as a new biomaterial resources (marine microalgae, fungi and bacteria).

Dinoflagellates as a source of bioactive compounds: A brief introduction of isolation, chemistry and pharmacology of saxitoxin, brevitoxin and cigatoxin Tunicromes.

Isolation techniques: Liquid – Liquid extraction, membrane separation methods and Chromatography (TLC, HPLC) and conventional techniques.

Characterization techniques: IR, UV, NMR, and mass spectra.

Books:


References:

**Paper 3.4: Marine Pollution**

Marine Pollution: Definition by GESAMP, major sources of pollution, dynamics, transport paths and agents.

Toxicology: Lethal and sub lethal effects of pollutants on marine organisms, evaluation of toxicity tolerance, bioassay.

Enzymatic removal of hazardous organic substances from aqueous effluents.

Sewage: Domestic, Industrial, agricultural and aquacultural discharges, their composition and fate in the marine environment, toxicity and treatment methods, sewage disposal system.

Environmental Impact Assessment Methods of aquaculture activities.

Oil pollution: Sources and fate of oil, composition and toxicity of oil, biological effects treatment procedures.

    Thermal and radioactive pollutants: Source and characteristics, strategies for disposal of RNA and Heated effluents, biological effects and alternative uses of waste dumping, mining and dredging operations, their effects on the organisms and marine environment.

**Text Books/References:**

2. A.M.Chakravarthy Biodegradation and detoxification of Environmental pollutants, CRC Press, 1928.
M.Sc. Marine Biotechnology

FOURTH SEMESTER

Paper 4.1: Genetic Engineering - II

Construction of cDNA libraries, Nick translation, probes using oligos, RNA, DNA and auto radiogram.


Mutagenesis – site specific mutagenesis study gene function. Nested Deletion maps construction.

Transfection, Transferring of genes into cells.

TRANSGENIC FISH

Construction of Genomic DNA libraries.

DNA Fingerprinting and Foot printing and chromosomal walking.

DNA sequencing; Sanger’s Dideoxy sequencing and Maxam & Gilbat sequencing.

Automated DNA sequencing using fluorescence.

Analysis of cloned genes.

PCR basic principles.

Introduction to oncogenes & oncogenesis – A molecular detail.

Movable genes – Transposons.

Biological risks, ethical, economical and legal issues.

Text Books:

Reference Books:
Paper 4.2: Immunology

- Introduction to Immune system: types of immunity.
- Antigens: Types and properties
- Immunoglobulins: Types, Structure and functions.
- Immunogenetics: Major histocompatibility gene complex.
- Genetic basis of antibody diversity.
- Molecular basis of B & T cells
- Mechanisms of cell mediated cytotoxicity.
- Compliment proteins and Cytokines
- Immunological techniques: Immunodiffusion, Immuno electrophoreses Immunoflourescene, ELISA and RIA.
- Production of Monoclonal antibodies.
- Disorders of immune system: Hypersenstivity reactions, Auto immune reactions, Immunodeficiency.
- Transplantation immunology and Tumour Immunology
- Immunotherapy: immunostimulants, Vaccines and antibodies.
- Immunology of fish and shellfish

BOOKS
4. I.M. Riott: Essentials of Immunology, Blackwell Publications
5. E. S. Golub: Immunology a synthesis, Sinave-Associates.
Paper 4.3 : Applications of Biotechnology

Biotechnology applications in Aquaculture: Chromosomal manipulations: gynogenesis, androgenesis, polyploidy and transgenics.

Hybridization: Production of new strains for broodstock improvement, hormonal control and induced breeding.

Preparation of Synthetic feeds: Composition, formulation and processing.

Tissue Culture: Culture techniques of plant (marine algae and mangroves) and animal (crustaceans, molluscs & fishes) tissues, preservation of germplasms, cryopreservation of tissue cultures, IN VITRO fertilization technique.

Gene manipulations to improve strains: Industrial applications of tissue culture techniques.


Books:
Paper 4.4. Bioactive Marine Natural Products - II

Bioactive marine natural products: Anti-tumour, tumour promoting, anti-inflammatory, cytotoxic, anti-neoplastic and analgesic compounds.

Nitrogen containing marine natural products: Amides, (Symbioramide, mycolamide – A), Tyrosin based metabolites (Aeroplisinin – 1), diagoamides – A and B, Indoles (Herbindoiles – A - C) Imadezoles (Girolline), Pyridines (Theonelladines), Peptides (didemnins, Dolastatins), ara – A, nucleosides (toyocamnins), swinholide and macrolides.

Non Nitrogenous Bioactive Compounds: polyketides (Dysidazirine, ficulinic acids-A and B, Duryne, Aliphatic esters, peroxides), prostanoides (clavulone –Il punaglandin-1, chloro, bromo and iodo vulones).

Polyethers (hemibrevitoxin B, lokadaicacid), macrolides (amphidinilide .A. swinholide A, bryostatins) Terpenes, laplysiterpenoid, geranyl hydroquinone.


Books:

References:
Paper 4.5: Environmental Monitoring and Biodeterioration

Global environmental monitoring methods: Status and objectives, limitations for monitoring critical pollutants.

Role of biotechnology in environmental pollution control: Indicator organisms, Test organisms, Monitoring organisms, Enzymes.

Coastal developmental activities-environmental issues.

Micro and Macro fouling, corrosion of metals and alloys in the sea, effects of biofouling and bio deterioration on marine structures.

Protection methods against corrosion and fouling Application of biotechnology in controlling the bio deterioration of wood and synthetic substances in the sea.

Red tides: Cause character and effects on the organisms of Marine environment

Text Books/References: