

Faculty of Ocean Science and Technology

Subject Code: B1810

Marine Microbiology

Module. 1	Microbiology: Characteristics of bacteria; prokaryotes and eukaryotes; Fungi- molds and yeasts, viruses, Microscopy- general principles, different types of microscope; Cultivation of microbes; growth of bacteria; types of media; Bacterial modifications, mutation and genetics; microbial metabolism, Bacteriophages, Control of microorganisms, sterilization, sterilization methods, antimicrobial activity, antibiotic and therapeutic agents. Microbial diseases, Immunology.
Module. 2	Biochemistry: Biomolecules and their conformation -protein, Lipid, Carbohydrates, Aerobic and Anaerobic degradation, metabolism, principle of bioenergetics, Biological oxidation and reduction, classification and mode of action of proteins: proteins and amino acids, Biosynthesis, Enzymes: Classification, structure, activity, kinetics and inhibition. Hormone action, regulation and biosynthesis. Lipids, Biosynthesis of fatty acids. Inter relation of carbohydrates, lipids and proteins. Bioenergetics, Cell cycle and cell growth control; Cell signaling and signal transduction
Module .3	Marine Environment: Oceanography, Coastal Ecosystems, Importance of Oceans, Ecological Divisions of the Sea, Physical and chemical properties of seawater, Eutrophication and its impact, effects of physical and chemical factors on organisms, aquatic microbial food webs, microbial loop, adaptation and survival of microorganisms, Importance of extreme environments, ecology and diversity of extremophiles, Drugs from the sea, Biomaterials from the sea.
Module. 4	Marine Drugs: Concepts of drugs and their classification, Drugs from microorganisms, Modern methods of drug discovery-High throughput screening technology, natural products for lead identification, medicinal compounds from marine flora and fauna, Drug design, Docking, Classification, synthesis, mode of action, structure-activity relationship, biosynthesis, Methods of biological evaluation of drugs,.
Module. 5	Biotechnology: Molecular structure of genes and chromosomes; DNA: Replication, Transcription, Translation, Protein synthesis, Gene expression, Regulation of gene expression, Proteomics, Genomics (Genome & Human genome project), Genetic engineering, Cloning, Transgenics, DNA Fingerprinting, Regulatory controls in prokaryotes and eukaryotes; Molecular basis of genetic disease and applications, Genetic improvement and disease control, Diagnostic aids.
Module .6	Statistics: Basic Concepts, Biological data, Collection, Classification, Measures of location: Mean (arithmetic, geometric, harmonic) quartiles, quintiles, measures of dispersion: range, Variance, Standard Deviation, Coefficient of variation; Discrete probability distributions: Introduction to the concept of correlation: Pearson correlation coefficient, and its properties; Spearman ranks correlation coefficient, regression coefficients, fitting of regression lines to bi-variate data. Discrete probability distributions: Binomial, Geometric, Negative Binomial and Poisson distributions. Continuous probability distribution: Normal distribution and its properties, applications of normal distribution
Module. 7	Marine Microbial Ecology: Microbial ecosystem, Marine microbial diversity, Microbial communities and ecosystems, species diversity indices, genetic/molecular diversity indices, Microbial interactions and associations, culture-based and culture independent methods, epifluorescent microscopy, biomarkers, PCR, real-time PCR, molecular fingerprints, FISH, DNA sequencing, pyrosequencing, Phylogenetic analysis, Biogeochemical cycling.