

Programme: M.Sc. Marine Biotechnology

Course Code: MBC 181

Title of the Course: MARINE MICROBIOLOGY & ECOLOGY

Number of Credits: 3

Effective from: 2019-2020

Course Objectives	The objective of this course is to provide information about the microbes available in aquatic environment, their role and interaction with the marine environment	
Learning Outcomes	<ul style="list-style-type: none">• Explain principle features of marine ecosystems and the microbial diversity in oceans;• Describe and discuss marine microbes in terms of physiological capability and their biogeochemical role.	
Content	<p>MODULE I</p> <ul style="list-style-type: none">• Classification of the marine environment.• Marine microbial habitats, Estuarine Ecosystems: Rocky shores, Sand dunes, Salt marshes, Deep sea, hydrothermal vents, mangroves and coral reefs.• Diversity of Marine microorganisms: Archaea, Bacteria, Cyanobacteria, Algae, Fungi, viruses, viroids and prions.• Characteristics of marine microorganisms.• Specialized microorganisms: Extremophiles: barophiles, thermophiles, psychrophiles, , halophiles actinomycetes, polyextremophiles, anaerobes.• An overview of the organization and cell structure of prokaryotes and archaea:<ul style="list-style-type: none">i) cell wall ii) outer membrane iii) cytoplasmic membrane iv) flagella & specialized movements in microbes v) cell inclusions iv) differences among the groups. <p>MODULE II</p> <ul style="list-style-type: none">• Techniques in Marine microbiology:• Sampling: Water, Sediments.• Direct observation and enumeration of microbes: Light and electron microscopy to study morphology and structure of microbes.• Culture based methods for isolation and identification of microbes. Phenotypic and Genotypic testing, polyphasic methods of identification. Chemotaxonomy, Metagenomics.• Bergey's manual & identification of marine bacteria. <p>MODULE III</p>	<p>12 hours</p> <p>12 hours</p> <p>12 hours</p>

	<ul style="list-style-type: none"> ● Microbial nutrition: i) autotrophic & heterotrophic modes, ii) defining culture media to support growth, iii) selective and differential culture media. ● Bacterial growth kinetics: i) growth curve, the mathematical expression of growth & measurement of growth ii) synchronous growth iii) factors affecting growth iv) chemostat & turbidostat. ● Flagella and specialized moments in microbes, Chemotaxis, Phototaxis, Bioluminescence and indicator species and Biological Rhythms. 	
References/ Reading	<ol style="list-style-type: none"> 1. Munn, C.B. , (2004) Marine Microbiology: Ecology and Applications, BIOS Scientific Publisher. 2. Krichman, D.L., (2000), Microbial Ecology of the Oceans. Wiley-Liss, New York. 3. Paul, J., (2001) Methods in Microbiology : marine Microbiology, Academic Press. 4. Gram, L., (2009) Microbial Spoilage of Fish and Seafood, Springer 5. Pelczar M.J. Jr., Chan E.C.S. and Kreig N.R. (2001) Microbiology, (5th Edition) CBS Publishers. 6. Josep M Gasol and David L Kirchman (2018) Marine ecology of the oceans, (3rd edition), John Wiley and Sons. Inc 7. Surajit Das Hirak Dash (2018) Microbial Diversity in the Genomic Era, Elsevier 8. Horikoshi K, Antranikian G, Bull A T, Robb F T and Stetter, K O (2011) Extremophiles Handbook, Springer 9. Madigan, Martinko, Bender, Buckley & Stahl and Thomas Brock (2017) Brock Biology of Microorganisms, Pearson 	