

SEMESTER I

Name of the Programme: M.Sc. Marine Biotechnology

Course Code: MBT-500

Title of the Course: MARINE MICROBIOLOGY & ECOLOGY

Number of Credits: 3

Effective from AY: 2022 - 23

Pre-requisites for the Course:	No prerequisite is required.		
Course Objectives:	The objective of this course is 1. to provide information about the microbes available in the aquatic environment, 2. understand their role, and their interaction with the marine environment		
Content:	<u>MODULE I</u> • 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: actinomycetes anaerobes. • Extremophiles: barophiles, thermophiles, psychrophiles, halophiles, polyextremophiles, • An overview of the organization and cell structure of prokaryotes and Archaea: cell wall ii) outer membrane iii) cytoplasmic membrane iv) flagella & specialized movements in microbes v) cell inclusions iv) differences among the groups.		15
	<u>MODULE II</u> • Techniques in Marine Microbiology: • Sampling: Water, Sediments. • Direct observation and enumeration of microbes: Light and • Electron microscopy to study the morphology and		15

	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.	15
	<u>MODULE III</u> • 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 movements in microbes, Quorum sensing, Chemotaxis, Phototaxis, Bioluminescence and indicator species, and Biological rhythms.	
Pedagogy:	Lectures, tutorials, assignments	
References/ Readings:	1. C.B. Munn, Marine Microbiology: Ecology and Applications, CRC Press, 2020. 2. D. Surajit, D. Hirak Ranjan, Microbial Diversity in the Genomic era, Elsevier, 2018. 3. D.L. Kirchman, J.M. Gasol, Microbial ecology of the Oceans. Wiley-Blackwell, New York, 2018. 4. J. Paul, Methods in Microbiology: Marine microbiology, Academic Press, 2001 5. K. Horikoshi, G. Antranikian, A. Bull, T. Robb, F. T. Stetter, K. O, Extremophiles handbook, Springer, 2011. 6. L. Gram, Microbial Spoilage of Fish and Seafood, Springer, 2009 7. M.T. Madigan, D.H. Buckley, W.M. Sattley, D.A. Stahl, Brock Biology of Microorganisms, Pearson Publisher, 2021. 8. M.J. Pelczar, E.C.S. Chan and N.R. Kreig, Microbiology, CBS Publishers, 2001.	
Course		

Outcomes:	1. The course explains the different features of marine ecosystems and the microbial diversity in oceans. 2. The students will get an overview of the concepts and techniques used in Marine Microbiology. 3. The students will be able to understand the morphology, nutrition and classification of various microbes and analyze their growth characteristics. 4. They will be able to discuss marine microbes in terms of physiological capability and their biogeochemical role.
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