Title of the Course: MARINE MICROBIOLOGY [P]

Course Code: MIC-630

Number of Credits: 1, Practical

Contact hours: 30

Effective from Academic Year: 2022-23

Prerequisites	It is assumed that students should have a basic understanding of the unique physico-chemical characteristics of seawater and the different microbial groups in marine environments.	
Objective:	• Students will learn different methods of sampling and analysis of physico-chemical parameters of estuarine and coastal environments. • Students will analyze the marine samples for isolation and enumeration of microorganisms. • Students will understand the different biochemical processes in marine microorganisms.	
Content:		**(30)**
1.	Sampling methods for collection of water and sediment samples from estuarine and coastal environments.	
2.	Analysis of physico-chemical parameters of seawater- Temperature, Salinity, Dissolved Oxygen, pH, Suspended matter, Nutrients; Nitrate, Nitrite, Phosphate, Silicate.	
3.	Isolation and enumeration of microbes from estuarine and coastal environments - Microscopic count of water column bacteria, Total count (epifluorescence method-DAPI), Bacterial respiration, community respiration and net production	
4.	Assessment of salt requirement of marine isolates from different ecosystems.	
5.	Denitrification by marine bacterial isolates.	
6.	Study of biofilm formation by microorganisms.	
Pedagogy:	Experiments in the laboratory	
References/ Readings	Belkin, S. and Colwell, R. R., Ocean & Health: Pathogens in the Marine Environment, Springer. (2005)	
	Grasshoff, K., Ehrhardt, M. and Kremling, K., Methods of Seawater Analysis, Verlag Chem., Weinheim. (1999)	
	Hunter-Cevera, J., Karl, D. and Buckley, M., Marine Microbial Diversity: the Key to Earth's Habitability, American Academy of Microbiology. (2005)	
	Intergovernmental Oceanographic Commission, Protocols for the Joint Global Ocean Flux Study (JGOFS) Core Measurements. DOI: https://doi.org/10.25607/OBP-1409 Intergovernmental Oceanographic Commission Manuals and Guides : 29 -JGOFS Report; 19. (1994)	
	Meller, C. B., Wheeler, P. A., Biological Oceanography, Wiley-Blackwell Publishers. (2012)	
	Gasol, J.M. and Kirchman, D. L., Microbial Ecology of the Oceans, Wiley- Blackwell Publishers. (2018).	
	Munn, C., Marine Microbiology: Ecology and Applications, Garland	

	Science, Taylor and Francis, N.Y. (2003)	
	Nybakken, J. W. and Bertness, M. D., Marine Biology: an Ecological Approach, Benjamin Cummings, San Francisco. (2005)	
	Parsons, T. R., Maita, Y. and Lalli, C. M., Manual of Chemical and Biological Methods for Seawater Analysis, Pergamon Press, New York. (1984)	
	Strickland, J. D. H. and Parsons, T. R., A Manual of Seawater Analysis, Queen's Printer and Controller of Stationery, Ottawa. (1972)	
	Sournia, A., UNESCO Monographs on Oceanographic Methodology, Vol. 6, Phytoplankton Manual, UNESCO Publishing, Paris. (1978)	
	Tomas, C. R., Identifying Marine Phytoplankton, Academic Press, San Diego, CA. (1996)	
Course Outcomes	● Sampling and analysis of physico-chemical parameters of estuarine habitat ● Analyse samples from marine and coastal habitat for isolation and enumeration. ● Connect microorganisms with marine and coastal habitats. ● Asses metabolic rates in marine bacterial isolates.	