Programme: M.Sc. (Microbiology)

Course Code: MIO 124

Title of the Course: MARINE MICROBIAL INTERACTIONS [T]

Number of Credits: 3

Effective from Academic Year: 2018-19

Prerequisites	Students must have a background about the basic concepts of Marine Microbiology, including properties of seawater, marine microorganisms.	
Objective:	The focus of this Course is to advance the understanding of the students of marine microbiology with special emphasis on the intricate associations between microorganisms and marine organisms, diseases of microbial origin in fish and invertebrates, and other beneficial and harmful aspects like bioremediation and HABs respectively.	
Content:		
1.	**Symbiotic associations**	**(12)**
	Symbiosis of microalgae with animals; Symbiosis of chemoautotrophic prokaryotes with animal; Light organ symbiosis in fish and invertebrates; Microbial symbionts of sponges; Symbiosis and mixotrophy in protists; Metabolic consortia and mutualism between prokaryotes.	
2.	**Microbial diseases of fish and invertebrates**	**(12)**
	Diseases of fish, bivalve mollusks, crustaceans, corals in fresh water/ sea water/ aqua culture: Bacterial – vibriosis, furunculosis, bacterial kidney disease, mycobacteriosis, streptococcosis, black band disease, white plague, white pox, Juvenile Oyster Disease (JOD). Viral – Infectious salmon anemia (ISA) virus, viral hemorrhagic septicemia virus (VHSV), lymphocystis virus, birnaviruses, viral nervous necrosis. Protistan – *Paramoeba perurans, Kudoa sp., Loma salmonae, Hematodinium* Diagnostic methods. Control of disease.	
3.	**Marine microbes - Beneficial and harmful**	**(12)**
	Beneficial aspects: Biodegradation and bioremediation of marine pollutants such as oil, persistent organics and plastics. Environmental monitoring using indicator microorganisms. Microbial enzymes and polymers. Harmful aspects: Harmful Algal Blooms (HABs). Biodeterioration, biofouling, bio-invasion – ballast waters.	

Pedagogy:	Lectures/tutorials/assignments/self-study	
References/ Readings	Grasshoff, K., Ehrhardt, M. and Kremling, K., Methods of Seawater Analysis, Verlag Chem., Weinheim.	
	Gatesoupe, F. J., (1999) The use of probiotics in aquaculture, Aquaculture, 180: 147-165.	
	Maier, R., Pepper, I. and Gerba, C., Environmental Microbiology, Academic Press.	
	Munn, C., Marine Microbiology: Ecology and Applications, Garland Science, Taylor and Francis, N.Y.	
	Nybakken, J. W. and Bertness, M. D., Marine Biology: an Ecological Approach, Benjamin Cummings, San Francisco, N.Y.	
	Parsons, T. R., Maita, Y. and Lalli, C. M., Manual of Chemical and Biological Methods for Seawater Analysis, Pergamon Press, New York.	
	Sharma, P. D., Environmental Microbiology, Alpha Science.	
	Sindermann, C. J., Principal Diseases of Marine Fish and Shellfish: Diseases of Marine Fish, Vol. 1, Gulf Professional Publishing.	
	Strickland, J. D. H. and Parsons, T. R., A Manual of Seawater Analysis, Queen's Printer and Controller of Stationery, Ottawa.	
	Toranzo, A. E., Magarinos, B. and Romalde, J. L., (2005) A review of the main bacterial fish diseases in mariculture systems, Aquaculture, 246(1): 37-61.	
Learning Outcomes	Explain the mechanisms underlying marine microbial communities and how they impact the environment.	