	Plasmids, transposons and insertion elements, AT-rich-islands, Modifications in tRNA and rRNA structure. Novel 7S rRNA.	
3.3	Gene organization in Archaea: Operons (*fdh, his and mcr*). DNA repair in archaea.	
Pedagogy:	Lectures/tutorials/assignments/self-study	
References/ Readings	Barker, D. M.,Archaea: Salt-lovers, Methane-makers, Thermophiles and Other Archaeans, Crabtree Publishing Company.	
(Latest editions)	Blum, P., Archaea: New Models for Prokaryotic Biology, Academic Press.	
	Boone, D. R. and Castenholz, R. W., Bergey's Manual of Systematic Bacteriology: The Archaea and The Deeply Branching and Phototrophic Bacteria, Springer Science and Business Media.	
	Cavicchioli, R., Archaea**:** Molecular and Cellular Biology, ASM Press.	
	Corcelli, A. and Lobasso, S., (2006) Characterization of Lipids of Halophilic Archaea. Methods in Microbiology, 35: 585-613.	
	Garrett, R. A. and Hans-Peter, K., Archaea: Evolution, Physiology and Molecular Biology, John Wiley and Sons.	
	Howland, J. L., The Surprising Archaea: Discovering Another Domain of Life, Oxford University Press.	
	Munn, C., Marine Microbiology: Ecology and Applications, Garland Science, Taylor and Francis Group, N.Y.	
	Rothe, O. and Thomm, M., (2000) A simplified method for the cultivation of extreme anaerobic archaea based on the use of sodium sulfite as reducing agent,Extremophiles. 4: 247-252.	
	Woese, C. R., Fox, G. E., (1977) Phylogenetic structure of the prokaryotic domain: the primary kingdoms. Proc Natl Acad Sci USA. 74: 5088–5090.	
Learning Outcomes	1. Comprehending the ecology, physiology and biochemistry of the domain Archaea. 2. Understanding of the Principle of Archaeal Genetics. 3. Envisage the application of Archaea and archaeal bioactive compounds in Industry.	

Programme: M.Sc. (Microbiology)
Course Code: MIPC-408
Title of the Course: ARCHAEA - ECOLOGY, PHYSIOLOGY, BIOCHEMISTRY AND GENETICS [P]
Number of Credits: 1, Practical
Contact hours: 30
Effective from Academic Year: 2022-23

Prerequisites	It is assumed that students have basic knowledge of 3 domains of life and basic microbiology techniques.	
Objective:	To introduce the methods in sampling and isolation of archaea from different econiches; identification of archaea and study of archaeal bio-molecules.	
Content:		**(30)**
1.	Isolation and culturing of halophilic archaea.	

2.	Identification of the isolates	
2.1	Biochemical tests for characterization of the halophilic archaea.	
2.2	Extraction of archaeal pigment and characterization using UV-Vis spectroscopy.	
2.3	Cellular lipids - Extraction and chromatographic resolution of lipids.	
3.	Screening for hydrolytic enzymes.	
Pedagogy:	Hands-on experiments in the laboratory, video, online data	
References/ Readings	As given under Theory Course MITC-408	
Learning Outcomes	1. Skill development for Isolation, culturing of Archaea and identification of archaea. 2. Screening the archaea for bioactive molecules.	

Discipline Specific Optional Courses

Programme: M.Sc. (Microbiology)
Course Code: MITE-401
Title of the Course: ENVIRONMENTAL MICROBIOLOGY AND BIOREMEDIATION [T]
Number of Credits: 3, Theory
Contact hours: 45
Effective from Academic Year: 2022-23

Prerequisites	It is assumed that the students have a basic knowledge of ecosystem structure and environmental pollution.	
Objective:	To introduce the concepts of microbial diversity, community structure, role of microorganisms in biogeochemical cycles, sustainable development and bioremediation.	
Content:		
1.	**Microbial Ecology**	**(15)**
	Ecosystems: Concept of ecosystem, habitat, econiche. Components and functioning of ecosystem, Microbial interactions with biotic environment. Ecological pyramids, energy flow, food chain and food web. Concepts of microbial guild, *r* and *k* selection concept, role of microbes in ecological succession. **Microbial diversity in ecosystem and Community structure:** The expanse and estimates/measurement of microbial diversity- Rank-abundance curve (species richness and eveness), indices of diversity (Shannon index, simpson index, Gini-simpson index), Culture based microbial diversity, Newer high throughput approaches (extinction culture, diffusion chamber/ichip, gel micro droplet method, co-culture method, flow cytometry) for exploring microbial diversity from	