Programme: M.Sc. (Microbiology)

Course Code: MIO 112

Title of the Course: EXTREMOPHILIC MICROORGANISMS [T]

Number of Credits: 3

Effective from Academic Year: 2018-19

Prerequisites	The student should have knowledge of microorganisms and their diversity.	
Objective:	This course gives insights about the extreme habitats, extremophilic microorganisms, their adaptations and biotechnological potentials.	
Content:		
1.	Concept of extremophiles v/s conventional microbial forms	**(01)**
2.	Extreme habitats in universe, extreme communities in following econiches: deserts, rhizospheres, ore deposits/ mining areas (Fe, Mn, Cu), animal systems, deep biosphere (terrestrial and marine), hydrothermal vents.	**(02)**
3.	Significance in biogeochemical cycling, industry, pharma and degradation of xenobiotics	**(02)**
4.	Key Molecular components, Unique : physiological features, adaptation strategies and enzymes of various extremophilic types:	
A.	Anaerobes: oxygen toxicity and regulation in *Clostridium, Moorella thermoacetica*, Wood Ljungdahl pathway	**(12)**
B.	Barophiles/Peizophiles: mechanism in barophily, alpha proteobacteria	
C.	Cryophiles, Psychrophiles: (cold shock proteins and regulation) *Polaromonas*	
D.	Thermophiles: heat shock proteins, rho factors and regulation, *Aquifex, Tepidomonas, Rhodothermus*	
E.	Alkaliphiles/ basophiles: *Alkalimonas, Nesterenconia*	**(12)**
F.	Acidophiles: *Picrophilus, Ferroplasma*	
G.	Halophiles: *Halomonas*	
H.	Osmophiles: Osmophilic *Lactobacilli, Schizosaccharomyces pombe*	
I.	Oligotrophs: *Pelagibacter*	
J.	Xerophiles: *Wallemia*, extreme cyanobacteria	**(07)**
K.	Radiophiles: *Deinococcus radiodurans*	
L.	Metallophiles: *Geobacillus*	
M.	Xenobiotic users: *Pseudomonas*	
N.	Endoliths: *Chroococcidiopsis, Halothece*	
Pedagogy:	Lectures/tutorials/assignments/self-study	
References/ Readings	Brock, T. D., Thermophilic Microorganisms and Life at High Temperatures, Springer, New York.	

	Horikoshi, K. and Grant, W. D., Extremophiles-Microbial Life in Extreme Environments, Wiley, New York.	
	Ventosa, A., Nieto, J. J. and Oren, A. (1998) Biology of moderately halophilic aerobic bacteria. Microbiology and Molecular Biology Reviews, 62, 504–544.	
	Rainey, F. A. and Oren, A., Extremophile Microorganisms and The Methods to Handle Them. In: Extremophiles, Methods in Microbiology, Vol. 35, Elsevier, Amsterdam.	
Learning Outcomes	Apply the knowledge to study the extremophilic microorganisms and tap their unique properties for ecological and industrial applications.	