

Semester	4		
Course Code:	MIBI 22542		
Course Name:	Laboratory aspects of Environmental and Agricultural Microbiology		
Credit Value:	2		
Core/Optional	Core		
Hourly Breakdown	Theory	Practical	Independent Learning
	-	70 hrs	30 hrs
Course Aim/Intended Learning Outcomes:			
Upon successful completion of this course student will be able to;			
<ul style="list-style-type: none"> • Employ a variety of laboratory techniques, including isolation, enumeration and functional assays in studying ecology of microorganisms, • Demonstrate how microbial diversity is assessed and identify methodological issues associated with each technique, • Apply the standard procedures for the detection and quantification of coliforms, microbial source tracking etc., • Assess the standard techniques of assessing BOD, COD, Suspended solids and some other selected parameters in wastewater, • Use the different physiological techniques to assay microorganisms in the environment, • Apply techniques to evaluate the microbial biodegradation of compounds, ecotoxicity of various pollutants in the environment, • Demonstrate how the airborne microorganisms are sampled and analysed, • Test hypotheses in environmental microbiology via experimental design, analyse results and discuss outcomes in the light of the current body of knowledge, • Demonstrate effective written and verbal scientific communication skills, • Apply laboratory techniques to identify and study diseases caused by plant pathogens and • Isolate disease causing plant pathogens from diseased plants using laboratory methods. 			
Course Content:			
Environmental Microbiology:			
The laboratory course is designed to familiarize students with how research in environmental microbiology is designed, performed, analyzed, and communicated.			
<i>Sampling:</i> Environmental sample collection and processing. <i>Microbial ecology:</i> Transient and resident microbial flora of different environments, Winogradsky column, microbial biofilms. <i>Microbial Quality of water:</i> Detection and enumeration of indicator microorganisms, coliforms & <i>E. coli</i> , Membrane filter techniques, MPN counts Physico-Chemical characteristics of polluted water (BOD, COD), Microbial risk assessment, quality control, and microbial source tracking. <i>Microorganisms and pollutants:</i> Introduction to toxicity bioassays. Tolerance and accumulation of metals / organic compounds by bacteria, fungi and algae. Enrichment & isolation of bacteria and fungi capable of degrading organic compounds. Studying metal-microbe interactions. <i>Aeromicrobiology:</i> Sampling and analysis of airborne microorganisms.			
Agricultural microbiology:			
<i>Plant disease diagnosis:</i> Isolation and examination of plant pathogenic fungi, Plant disease diseases caused by bacteria, mycoplasmas and viruses. Identification of plant pathogens using cultural, biochemical and molecular biological techniques – Detection of plant pathogens using ELISA and PCR.			
<i>Soil Microbiology:</i> Laboratory estimation of soil microbial populations and qualitative and quantitative analysis of important microbiological processes in soil.			
Teaching /Learning Methods:			
Laboratory practicals, demonstration classes, assignments and computer assisted learning.			
Assessment Strategy: End of the course unit examination			
Continuous Assessment		Final Assessment	
0%		100%	
Details: N/A	Theory (%)	Practical (%)	Other (%)
	-	100	-
Recommended Reading:			
<ul style="list-style-type: none"> • Pepper, I, Gerba, C, P, (2004). <i>Environmental Microbiology, A Laboratory Manual</i>, 2nd Edition, Academic 			

Press. Philadelphia, Pennsylvania,

- Pepper, I.L., Gerba, C.P., Gentry, T.J. and Maier, R.M., (2011). *Environmental microbiology*. Academic press.
- Baird, R.B., Eaton, A.D. and Rice, E.W. (2017) *Standard Methods for the Examination of Water and Wastewater*. 23rd Edition, American Water Works Association.
- Metcalf and Eddy, Inc. (2002). *Wastewater Engineering: Treatment, Disposal, and Reuse*. 4th Edition, McGraw-Hill, New York.
- Agrios, G. N. (2005) *Plant Pathology*, 5th Edition, Elsevier Academic Press. (ISBN: 9780120445653)