

Institute of Microbiology and Molecular Genetics
Faculty of Life Sciences
University of the Punjab, Lahore
Course Outline



Programme	BS	Course Code	MMG 207	Credit Hours	3(2+1)
Course Title	SOIL, AGRICULTURE AND ENVIRONMENTAL MICROBIOLOGY				
COURSE INTRODUCTION					
<p>This course introduces the students to the most recent developments in soil microbiology. The students will gain knowledge concerning the role of soil microorganisms both harmful and beneficial roles played by them such as decomposing dead organic matter, enriching the soil with nutrients, increasing water infiltration, improving soil texture. They will understand the ecological interaction of microorganisms with each other and within the ecosystem.</p>					
LEARNING OUTCOMES					
<p>On the completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1. Describe that soil is an excellent habitat for microbes with reference to balancing of ecosystem. 2. Apply the knowledge about the application of this subject in the reclamation of affected soils. 3. Have enhanced comprehension in the field of soil, agricultural and environmental microbiology 4. Comprehend the major principles of environmental microbiology and the relationship of microbes to environmental processes and other living organisms. 					
COURSE CONTENT					
<p>Elements of soil formation and conservation, Soil microbial population and methods of study with their advantages and disadvantages, Introduction to soil ecology, Plant-microbe interactions and their impact on soil fertility, Biotechnological potentials of soil microorganisms, Importance of the subject in the agricultural development of Pakistan, Problems of salinity and water-logging and the methods of their reclamations, Microbe's role in regulatory mechanism of plant gene expression, Green Revolution, Interaction of environmental pollutants with microorganisms, Role of micro-organisms and the underlying biological principles in elemental cycles, Biodegradation, Bioremediation, Municipal Wastewater Treatment, Drinking Water Treatment</p>					
PRACTICALS					
<p>Study of role of microbes in soil structure and improvement, symbiotic and antagonistic effects of microbes' soil / crop, improvement by microbes, reclamation of saline and water – logged soils. Determination of biochemical aspects of microbial interaction with plants. Use of bacteria as natural fertilizers, Detoxification of metals, Microbial interactions with different pollutants, Use of bioremediation techniques.</p>					
TEXTBOOKS AND READING MATERIAL					
<ol style="list-style-type: none"> 1. Mishra, B.B., Nayak, S.K., Mohapatra, S. & Samantaray, D. (2021). <i>Environmental and agricultural microbiology: applications for sustainability</i>. John Wiley & Sons. 2. Malik, J.A. (2021). <i>Handbook of Research on Microbial Remediation and Microbial Biotechnology for Sustainable Soil</i>. IGI Global. 3. Dion, P., Nautiyal, C.S. & Dion, P. (2019). <i>Microbiology of Extreme Soils</i>. Springer Singapore. 					

4. Yadav, A.N. (2021). *Soil Microbiomes for Sustainable Agriculture*. Springer International Publishing.
5. Singh, D.P., Gupta, V.K. & Prabha, R. (2019). *Microbial Interventions in Agriculture and Environment*. Singapore: Springer.
6. Ahmad, I., Ahmad, F. & Pichtel, J. (2011). *Microbes and Microbial Technology: Agricultural and Environmental Applications*. Springer Science & Business Media.
7. Rao and Subba, N.S. (2000). *Soil Microbiology*. CBS Publishers & Distributors.
8. Paul, E. A. (2007). *Soil Microbiology, Ecology and Biochemistry*. Elsevier, Germany.

ASSESSMENT

Sr. No.	Elements	Weightage	Details
1.	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.
2.	Formative Assessment	25%	Continuous assessment includes Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on activities, short tests, projects, practicals, reflections, readings, quizzes etc.
3.	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, fieldwork , report writing etc.