



Institute of Botany
Faculty of Life Sciences
University of the Punjab, Lahore
Course Outline
Semester – V



| Programme | BS Botany | Course Code | Bot-307 | Credit Hours | 2 |
|--|--|-------------|---------|--------------|---|
| Course Title | Plant Microbe Interactions (Theory) | | | | |
| Introduction | | | | | |
| <p>The course is organized to provide basic knowledge of different microbes including bacteria, fungi and viruses, their importance and interactions with plants. This is aimed to understand the interactions of microbes associated with crops to evaluate plant-microbe interactions and demonstrate beneficial and hazardous impacts on plants. This course provides information about the intricate relationship between microbes and plants, exploring their symbiotic, pathogenic, and endophytic interactions. It will cover their taxonomy, physiology, and ecology, as well as the molecular mechanisms underlying microbe-plant interactions. Emphasis will be placed on the ecological and agricultural significance of these interactions.</p> | | | | | |
| Learning Outcomes | | | | | |
| <p>By the end of this course, students will be able to:</p> <ul style="list-style-type: none"> • Understand the diversity and roles of microorganisms associated with plants. • Understand the importance of the plant-microbe interactions. • Use biological techniques to study plant-microbe interactions | | | | | |
| Course Contents | | | | | |
| <ul style="list-style-type: none"> • Introduction about microorganisms with reference to plants • Bacteria: History, characteristics, taxonomy, genetics and classification. • Structure and types of bacteria • Recombination in Bacteria – Transformation, Transduction and Conjugation • Role of bacteria in mineral transformations with special emphasis on nitrogen transformations • Importance of bacteria with special reference to application in agriculture i.e., Plant microbe interaction and biotechnology • Hazardous impact of bacteria on plants: Symptoms and control of major bacterial diseases in plants. • Plant-microbe interactions and microbe-microbe interactions with reference to bacteria and their impact on soil fertility. • General structure of viruses, types of viruses and modes of viral multiplication and classification. • Symptomatology and Metabolism of virus-infected plants. • Virus transmission and dissemination • Molecular biology of plant virus transmission. • Symbiotic pathogenic and Endophytic Fungal-Plant Interactions: Mycorrhizal associations (arbuscular, ectomycorrhizal, ericoid), Benefits for plants and fungi, Ecological significance of mycorrhizas, their role in agriculture and forestry. Major fungal diseases, Disease epidemiology and management, Plant defense mechanisms against fungal pathogens, Global epidemics caused by parasitic fungi, Molecular basis of plant-pathogen interactions. • Endophytic Fungal-Plant Interactions: Endophytic fungi and their diversity, Benefits for plants and fungi, Role of endophytes in plant growth promotion and stress tolerance, Endophytes in biocontrol and sustainable agriculture. • Soil Fungi: Types, their role in rhizosphere. • Applied Aspects of Fungal-Plant Interactions | | | | | |

| Programme | BS Botany | Course Code | Bot-308 | Credit Hours | 1 |
|---|----------------------------------|-------------|---------|--------------|---|
| Course Title | Plant Microbe Interactions (Lab) | | | | |
| Lab Course Contents | | | | | |
| <ul style="list-style-type: none"> • Methods of sterilization of glassware and media preparation. • Growth of bacteria, sub-culturing and identification of bacteria on morphological and biochemical basis (using available techniques). | | | | | |
| <ul style="list-style-type: none"> • Microscopic observation of bacteria. Different types of staining like simple and Differential (capsule, spores, and Gram-staining). • Microscopic study of Actinomycetes and Cyanobacteria. • Observation of symptoms of some viral infected plant specimens. • Observation of symptoms of some fungal infected plant specimens. • Isolation and Staining of Mycorrhizal Fungi • Assessment of impact of mycorrhizal fungi on plant growth and nutrient uptake in different soil conditions. • Isolation and Culturing of Endophytic Fungi; Identification Techniques and Evaluation of Plant Growth Responses | | | | | |
| Textbooks and Reading Material | | | | | |
| <ol style="list-style-type: none"> 1. Smith, S. E., & Read, D. J. (2008). <i>Mycorrhizal Symbiosis</i> (3rd ed.). Academic Press. 2. Prell, H. H., & Day, P. (2001). <i>Plant-Fungal Pathogen Interaction: A Classical and Molecular View</i>. Springer. 3. Vidhyasekaran, P. (2007). <i>Fungal Pathogenesis in Plants and Crops: Molecular Biology and Host Defense Mechanisms</i> (2nd ed.). CRC Press. 4. Stacey, G., & Keen, N. T. (Eds.). (1996). <i>Plant-Microbe Interactions</i> (Vol. 1). Springer. 5. Mukerji, K. G., Chamola, B. P., & Upadhyay, R. K. (Eds.). (2000). <i>Biocontrol of Plant Diseases</i>. CRC Press. 6. Pommerville, J. C. (2013). <i>Fundamentals of Microbiology</i> 10th Ed. Jones & Bartlett Publishers. 7. Kathleen, P. T., B. Chess (2018). <i>Foundations in Microbiology: Basic Principles</i>. 10th Ed. McGraw-Hill US Higher Ed. 8. Bisen, P. S., Debnath, M., & Prasad, G. B. (2012). <i>Microbes: Concepts and Applications</i>. John Wiley & Sons. 9. Tortora, G. J., Funke, B. R., & Case, C. L. (2007). <i>Microbiology: An Introduction</i> 9th Ed. Pearson 10. Pommerville, J. C. (2004). <i>Alcamo's Fundamentals of Microbiology</i>. 7th Ed. Jones & Bartlett Publishers. 11. Ingraham, J. L., & Ingraham, C. A. (2004). <i>Introduction to Microbiology: a case history Approach</i>. 3rd Ed. Thomson Brokks/Cole 12. Arora, D. R. (2004). <i>Textbook of Microbiology</i>, CBS Publishers and Distributors, New Delhi. 13. Black, J. G. (2005) <i>Microbiology - Principles and Exploration</i>, John Wiley and Sons, Inc. 14. Prescott, L. M., Harley, J. P. and Klein, D. A. (2005). <i>Microbiology</i> McGraw-Hill Companies, Inc. 15. Ross F. C. (1995). <i>Fundamentals of Microbiology</i>. John Willey & Sons, New York.\ | | | | | |
| Teaching Learning Strategies | | | | | |
| <ul style="list-style-type: none"> • Lectures • Group Discussion • Laboratory work • Seminar/ Workshop | | | | | |
| Assignments: Types and Number with Calendar | | | | | |
| <ul style="list-style-type: none"> • Lecture Based Examination (Objective and Subjective) • Assignments • Class discussion • Quiz • Tests | | | | | |
