Department of Plant Pathology

Faculty of Agricultural Sciences

University of the Punjab, Lahore

Course Outline

Programme	B.Sc. (Hons.) Agriculture (Plant Pathology) 4 Year program	**Course Code**	**PP-306**	**Credit Hours**	3 (2-1)
Course Title	**INTRODUCTORY RANGE AND FOREST PATHOLOGY**				

Course Introduction

In this course, we will delve into the economic significance of forest and shade tree diseases, examining the profound impacts caused by both biotic and abiotic agents. We will explore the development and epidemiology of these diseases, gaining insights into effective management strategies essential for sustaining forest health and productivity. Additionally, we will study the vital role of mycorrhizae in forestry, understanding their symbiotic relationships with trees and their applications in enhancing ecosystem resilience. Practical components of the course will include field visits to forest plantations, where students will learn to identify disease symptoms, collect samples, and analyze causal agents. We will also focus on timber preservation techniques and seed health testing to ensure the quality of forest and shade tree seeds, crucial for successful nursery management. By combining theoretical knowledge with hands-on experience, students will acquire the skills needed to effectively manage tree diseases in Pakistan and contribute to the sustainable stewardship of forest resources.

Learning Outcomes

On the completion of the course, the students will:

1. Gain comprehensive knowledge about the diversity of pathogens affecting forest and shade trees, including both biotic and abiotic agents, and understand their economic implications.
2. Explore the developmental stages and epidemiology of forest and shade tree diseases, enabling them to formulate effective management strategies crucial for preserving forest

health and productivity.

3. Understand the significance of mycorrhizae in forestry, examining their symbiotic relationships with trees and their applications in enhancing ecosystem resilience and nutrient uptake.
4. Develop practical skills through field visits to forest plantations, where they will learn to identify disease symptoms, collect samples, and conduct analyses to determine causal agents.
5. 5. Acquire proficiency in timber preservation techniques and seed health testing, essential for maintaining the quality of forest and shade tree seeds and optimizing nursery management practices.

	Course Content	Assignments/Readings
Week 1	**<u>THEORY</u>** **Unit-I: Introduction to Forest and Shade Tree Diseases** 1.1 Economic importance of forest and shade tree diseases 1.2 Overview of biotic and abiotic agents causing tree diseases 1.3 General introduction to the role of beneficial microorganisms in sustainable forestry	Brasier, C. M., & Webber, J. F. (Eds.). (2010). *Plant Pathogen Ecology and Evolution*. CABI. 1.2 Overview of biotic and abiotic agents causing tree diseases
	<u>PRACTICAL</u> Visit to forest plantation; collection of diseased samples and identification based on symptoms 1.2 Identification of causal agents of important diseases of trees	**<u>Reading</u>** Internet PowerPoint slides And research articles
Week 2	**<u>THEORY</u>** **Unit-II** 2.1 Lifecycle and developmental stages of forest diseases	Sinclair, W. A., Lyon, H. H., & Johnson, W. T. (1987). *Diseases of Trees and Shrubs*. Cornell University Press.

	2.2 Epidemiological factors influencing disease spread in forests 2.3 Management strategies for forest nursery diseases	
	PRACTICAL Techniques for timber preservation and prevention of deterioration and preservation methods for specimens of tree diseases	**Reading** Internet PowerPoint slides And research articles
Week 3	**THEORY** **Unit-III** 3.1 Significance and ecological roles of mycorrhizae in forest ecosystems 3.2 Applications of mycorrhizal associations in sustainable forestry practices	Van der Heijden, M. G. A., & Sanders, I. R. (Eds.). (2002). *Mycorrhizal Ecology*. Springer.
	PRACTICAL Methods for seed health testing of forest and shade tree seeds. Application of seed treatments to enhance nursery seedling health	**Reading** Internet PowerPoint slides And research articles
Week 4	**THEORY** **Unit-IV** 4.1 Overview of major tree diseases affecting forests in Pakistan 4.2 Strategies for sustainable management and control of these diseases	Agrios, G. N. (2005). *Plant Pathology* (5th ed.). Academic Press.
	PRACTICAL Techniques for mass culturing of beneficial microorganisms, visit to research organizations for hands-on experience with fermenters	**Reading** Internet PowerPoint slides And research articles
Week 5	**THEORY** **Unit-V** 5.1 Role of microorganisms in bioremediation	Sutton, B. C. (1980). *The Coelomycetes: Fungi Imperfecti with Pycnidia, Acervuli, and Stromata*.

	and biodegradation of forest and agricultural waste 5.2 Factors influencing microbial degradation and management of agricultural and industrial waste	Commonwealth Mycological Institute. **Assignment** on case studies in Pakistan related to the total area under forests in different provinces in Pakistan with passage of time
	PRACTICAL Isolation and identification techniques for beneficial fungi from diverse sources	Related research papers **Assignment:** Isolation and identification of at least 10 beneficial fungal and bacterial cultures from shade trees
Week 6	**THEORY** **Unit-VI** 6.1 Microbial contributions to carbon, nitrogen, and other nutrient cycles in forests 6.2 Role of bacteria, cyanobacteria, and mycorrhizae in bio-geochemical cycling	Conradi, T., Eggli, U., Kreft, H. et al. Reassessment of the risks of climate change for terrestrial ecosystems. Nat Ecol Evol **8**, 888–900 (2024). https://doi.org/10.1038/s41559-024-02333-8
	PRACTICAL Demonstration of antagonism and biocontrol capabilities of beneficial microorganisms in lab conditions	Related research papers
Week 7	**THEORY** **Unit-VII** 7.1 Classification of soils based on microbiological properties 7.2 Impact of microbial diversity on soil health and fertility	**Reading** Internet PowerPoint slides And research articles
	PRACTICAL	C. A., & Van den Bosch, F.

	Techniques for isolation and identification of mycorrhizal species from agricultural soils	(Eds.). (2008). *Plant Disease Epidemiology: Challenges and Strategies for Management*. APS Press.
Week 8	**THEORY** **Unit-VIII** 8.1 Factors influencing soil microbial communities and strategies for optimizing soil health	**Reading** Internet PowerPoint slides And research articles
	PRACTICAL Techniques for mass culturing of mycorrhizae for agricultural applications	Perry, D. A., & Meurisse, R. T. (Eds.). (2010). *Restoration of Boreal and Temperate Forests*. CRC Press.
Week 9	**MID TERM EXAMINATION**	
Week 10	**THEORY** **Unit-IX** 9.1 Overview of applications of beneficial microorganisms in agriculture and forestry	Parks, C. G., & Miller, D. L. (1999). *Wood Deterioration and Preservation: Advances in Our Changing World*. American Chemical Society.
	PRACTICAL Experimental production of biofertilizers using nitrogen-fixing bacteria and phosphate-solubilizing bacteria	Related research papers
Week 11	**THEORY** **Unit-X** 10.1 Microbial metabolic pathways and their applications in agricultural and industrial processes	**Reading** Internet PowerPoint slides And research articles **Assignment:** compiling report of a study tour to any forest

	PRACTICAL Experiments to evaluate the impact of biofertilizers on plant growth under controlled conditions	Related research papers **Assignment:** report on group experiment related to the isolation of fungal pathogens from forest trees
Week 12	**THEORY** **Unit-XI** 11.1 Applications of cellulose-degrading fungi in paper and textile industries	**Reading** Internet PowerPoint slides And research articles
	PRACTICAL Experimental production of biopesticides using beneficial microorganisms like bacilli and Trichoderma spp.	Related research papers
Week 13	**THEORY** **Unit-XII** 12.1 Biotechnological applications of fungi in food industries such as cheese ripening and pickle production	**Reading** Internet PowerPoint slides And research articles
	PRACTICAL Experiments to evaluate the efficacy of biocontrol microbial agents against plant diseases compared to synthetic pesticides	Related research papers
Week 14	**THEORY** **Unit-XIII** 13.1 Types and applications of microorganisms isolated from forest trees, used as experimental tools in environmental and agricultural research	Brasier, C. M., & Gibbs, J. N. (2001). *Phytophthora: Fifty Years After*. APS Press.
	PRACTICAL Compilation of reports on the effects of beneficial microorganisms on plant growth and	Related research papers

	disease management in greenhouse conditions	
Week 15	**THEORY** **Unit-XIV** 14.1 Major diseases of forest trees	Smith, S. E., & Read, D. J. (2008). *Mycorrhizal Symbiosis* (3rd ed.). Academic Press. 3.2 Applications of mycorrhizal associations in sustainable forestry practices
	PRACTICAL Collection of forest disease samples	Related research papers
Week 16	**THEORY** **Unit-XV** 15.1 Cankers on forest trees	**Reading** Internet PowerPoint slides And research articles
	PRACTICAL Collection and isolation of canker causing microbes	Related research papers
	FINAL TERM EXAMINATION	

Textbooks and Reading Material

Textbooks

In the detail course outline, one may mention chapters of the textbook with the content topics

Suggested Readings

Books

tta. A.R. 2010. Text book of Introductory Seed Pathology. HEC Pakistan.

n, A.H. 1989. Pathology of Trees, Vol. II, Univ. of Agriculture, Faisalabad.

nion, P.D. 1991. Tree Disease Concepts, 2nd Ed. Prentice Hall.

rma, R.C. and G.N. Sharma. 2006. Challenging Problems in Horticultural and Forest Pathology. Indus Publishing Company, India.

rma, V.K. 2004. Trees and Protection of Environment. Deep and Deep Publication (Pvt.) Ltd. India.

uts, R.G. and T.G. Winter. 1994. Diagnosis of Ill-health in Trees. HMS Office. London.

ıter, F.H. and F.A. Baker. 1996. Principles of Forest Pathology. John Wiley & Sons. USA.
el, R. and J.J. Morell, 1992. Wood Microbiology: Decay and its Preservation. Academic Press, San Diego. California, USA.

1. It is preferable to use latest available editions of books. Mention the publisher & year of publication.
2. The References/ bibliography may be in accordance with the typing manual of the concerned faculty/subject. Preferably follow APA 7th Edition publication manual.

Teaching Learning Strategies

1. Provision of access to databases, research papers, and videos that showcase the latest developments in microbial agriculture.
2. Organizing visits to farms or research institutes where students can observe the application of microbial products in agriculture.
3. Assigning projects where students research specific beneficial microorganisms (e.g., mycorrhizal fungi, nitrogen-fixing bacteria) and their applications.
4. Inviting experts from academia, industry, or government agencies to share their experiences and insights into the application of beneficial microorganisms in agriculture.

Assignments: Types and Number with Calendar

Mentioned in course content

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, practical, 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, field work and report writing etc.