

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-409	Credit Hours	3 (2-1)
Course Title	ABIOTIC DISEASES OF PLANTS				
Course Introduction					
In this course, we will explore the various environmental challenges that impact plant health and productivity. The course will cover a wide range of abiotic stresses including temperature fluctuations, soil moisture variations, light conditions, pollution, mineral deficiencies, soil salinity, and improper cultural practices. We will delve into the symptoms and differentiation of abiotic stresses from biotic diseases, as well as the roles of macro and micronutrients in plant nutrition. This course will provide hands-on experience in collecting and preserving samples from plants affected by abiotic stresses, conducting experiments to understand their physiological effects, and implementing management strategies to mitigate their impact on plant health. By combining theoretical insights with practical applications, students will gain essential skills to effectively manage abiotic stresses and enhance plant resilience in diverse environmental settings.					
Learning Outcomes					
On the completion of the course, the students will be able:					
1. To identify and characterize various abiotic stress factors affecting plant health, including temperature fluctuations, soil moisture variations, light conditions, pollution, mineral deficiencies, and soil salinity.					
2. To differentiate between symptoms caused by different types of abiotic stresses and biotic diseases, enabling accurate diagnosis and effective implementation of management strategies.					

3. To apply practical techniques for assessing and managing abiotic stresses in plants, including soil testing, nutrient management, irrigation practices, and soil improvement strategies.
4. To analyze case studies and research findings to develop comprehensive strategies for mitigating abiotic stresses and enhancing plant resilience in agricultural and environmental settings.

Course Content		Assignments/Readings
Week 1	<u>THEORY</u> Unit-I: 1.1 Introduction to abiotic diseases of plants 1.2 Historical perspective and significance of abiotic diseases in agriculture 1.3 Differentiating abiotic diseases from biotic diseases	Marschner, H. (Ed.). (2011). Marschner's Mineral Nutrition of Higher Plants (3rd ed.). Academic Press.
	<u>PRACTICAL</u> Methods for identifying symptoms of abiotic diseases in plants	
Week 2	<u>THEORY</u> Unit-II: 2.1 Types of abiotic stresses: temperature fluctuations, soil moisture variations, light conditions, pollution, mineral deficiencies, soil salinity, improper cultural practices 2.2 Effects of abiotic stresses on plant physiology and growth	Taiz, L., Zeiger, E., Møller, I. M., & Murphy, A. (2015). Plant Physiology and Development (6th ed.). Sinauer Associates.
	<u>PRACTICAL</u> Techniques for assessing abiotic stress factors in plants	
Week 3	<u>THEORY</u> Unit-III: 3.1 Physiological mechanisms of plants under	Datnoff, L. E., Elmer, W. H., & Huber, D. M. (2007). Mineral Nutrition and Plant

	abiotic stress 3.2 Genetic and molecular responses to abiotic stresses	Disease. The American Phytopathological Society.
	<u>PRACTICAL</u> Molecular and biochemical techniques for studying plant responses to abiotic stresses	
Week 4	Unit-IV: 4.1 Soil salinity problems and management strategies 4.2 Soil pH and its impact on plant health 4.3 Pollution and its effects on plants <u>PRACTICAL</u> Soil testing techniques for assessing salinity and pH levels	
Week 5	<u>THEORY</u> Unit-V: 5.1 Macro and micronutrients: roles and deficiencies 5.2 Symptoms and management of nutrient deficiencies and toxicities in plants <u>PRACTICAL</u> Nutrient analysis and fertilization techniques	<u>Reading</u> Internet PowerPoint slides And research articles
Week 6	<u>THEORY</u> Quiz test Unit-VI: 6.1 Best practices for irrigation and water management 6.2 Crop rotation and cover cropping strategies 6.3 Improving soil structure and fertility <u>PRACTICAL</u> Field demonstrations of cultural practices to	Agrios, G. N. (2005). Plant Pathology (5th ed.). Academic Press. <u>Assignment (Practical)</u> Pot experiment to determine

	mitigate abiotic stresses	effect of temperature variations on plant growth
Week 7	<u>THEORY</u> Unit-VII: 7.1 Integrated pest management (IPM) principles applied to abiotic diseases 7.2 Sustainable agriculture practices for reducing abiotic stress impacts	<u>Assignment (Theory):</u> Topics will be assigned to individual or group of students.
	<u>PRACTICAL</u> Implementing IPM strategies in field settings	
Week 8	<u>THEORY</u> Unit-VIII: 8.1 Biotechnological approaches for enhancing plant tolerance to abiotic stresses 8.2 Remote sensing and GIS applications in monitoring abiotic stresses	Boyer, J. S. (1982). Plant Productivity and Environment. Chapman and Hall.
	<u>PRACTICAL</u> Use of remote sensing tools for assessing plant health under stress conditions	
Week 9	MID-TERM EXAMINATION	
Week 10	<u>THEORY</u> Unit-IX: 9.1 Impact of climate change on abiotic stress patterns 9.2 Future trends and innovations in abiotic stress research	<u>Assignment (Theory):</u> Graded discussion on impact of abiotic stresses on economic yield of crops Task: Investigate recent literature to assess the

	<u>PRACTICAL</u> Data collection and analysis of climate change impacts on plant health	effectiveness of GMOs in suppressing abiotic diseases
Week 11	<u>THEORY</u> Unit-X: 10.1 Case studies of successful abiotic stress management in agriculture 10.2 Applications of research findings in real-world scenarios <u>PRACTICAL</u> Field trips and case study discussions	<u>Reading</u> Grattan, S. R., & Grieve, C. M. (1999). Salinity-Mineral Nutrient Relations in Horticultural Crops. Scientia Horticulturae, 78(1-4), 127-157.
Week 12	Unit-XI: 11.1 Group discussions on current issues and research trends in abiotic stress management <u>PRACTICAL</u> Preparation and presentation of research findings	
Week 13	<u>THEORY</u> Group Discussion Unit XII: 12. 1 Measures to mitigate temperature stress on plants <u>PRACTICAL</u> Experiment to analyze effect of temperature variations in plant growth	1. Chaves, M. M., Flexas, J., & Pinheiro, C. (2009). Photosynthesis Under Drought and Salt Stress: Regulation Mechanisms From Whole Plant to Cell. Annals of Botany, 103(4), 551-560.
Week 14	REVISION/TEST <u>THEORY</u> Effects of abiotic stresses on plant physiology	<u>Assignment (Practical)</u> Pot experiment to determine effect of nutrient level

	<u>PRACTICAL</u> Abiotic stress affected plants sampling	variations on plant growth
Week 15	<u>THEORY</u> Unit XIII: Management strategies for abiotic stresses <u>PRACTICAL</u> Abiotic stress prediction models	1 Seki, M., Umezawa, T., & Shinozaki, K. (2007). Regulatory Network of Gene Expression in the Drought and Cold Stress Responses. Current Opinion in Plant Biology, 10(3), 296-302.
Week 16	<u>THEORY</u> Unit XIV: 14.1 Review of course content and key learnings 14.2 Evaluation of student comprehension and practical skills <u>PRACTICAL</u> Final assessment and feedback	1. Bohnert, H. J., & Jensen, R. G. (1996). Strategies for Engineering Water-Stress Tolerance in Plants. Trends in Biotechnology, 14(3), 89-97. 2. Research articles
	FINAL TERM EXAMINATION	
Textbooks and Reading Material		
Suggested Readings		
BOOKS		
1. Bergstron, L. and H. Kirchmann. 1998. Carbon and Nutrient Dynamics in Natural and Agricultural Tropical Ecosystem. CAB Inc. UK.		
2. Haard, N.F. and D.K. Salunkle. 1980. Symptoms on Post Harvest Biology and Handling of Fruits and Vegetables. The AUI Publishing Co. Inc. West Post Connecticut, USA.		
3. Hill, M.K. 2004. Understanding Environmental Pollution, 2nd Ed., Cambridge Press, UK.		
4. Shurtleff, M.C. and C.W. Averre. 1997. The Plant Disease Clinic and Field Diagnosis of Abiotic Diseases. American Phytopathological Society Press, St. Paul, Minnesota, USA.		
5. Tandov, H.L.S and R.N. Roy. 2004. Integrated Nutrient Management. A Glossary of		

Terms. FAO, UN, Rome.

6. Resources will be shared during class

Teaching Learning Strategies

1. Class lectures
2. Discussions
3. Practical demonstrations
4. Hands on training where applicable

Assignments: Types and Number with Calendar

Assignments

Types and Number with calendar

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.