



DEPARTMENT OF HORTICULTURE
FACULTY OF AGRICULTURAL SCIENCES
University of the Punjab, Lahore

Programme	B.Sc. (Hons.) HORTICULTURE	Course Code	Hort- 407	Credit Hours	3(2- 1)
Course Title	Introductory Horticultural Plant Biotechnology				
Course Introduction					
<p>This course introduces students to the principles and applications of plant biotechnology in horticulture. Students will explore the intersection of biotechnology and horticulture, including the use of genetic engineering, gene editing, and other biotechnological tools to improve crop production, quality, and sustainability. On the other hand, focuses on the intricate mechanisms and processes that govern plant cellular behavior, including cell signaling, growth, division, differentiation, and survival.</p>					
Learning Outcomes					
<p>To enable students to understand:</p> <ul style="list-style-type: none"> • Basic concept and techniques in Plant Biotechnology. <ul style="list-style-type: none"> • Application of Genetic Engineering in Horticultural plant Research. 					
Course Content				Assignments/Readings	
Week 1	Unit-I				
	1.1 Introduction to the science of biotechnology				
	1.1 Biotechnological approaches to drought tolerance, salt tolerance and protein quality in various field crops.				
	1.3 Introduction to Gene structure and function				
Week 2	Unit-II				
	2.1 Basic molecular biology				
	2.2 Regulation of Gene expression and				
Week 3	Unit-III				
	3.1 Genetic Engineering concept and application				
	3.2 Molecular markers and marker assisted selection in plant breeding.				
	3.3 Gene Cloning				
Week 4	Unit-IV				

	4.1 Structure and function of Restriction Enzyme 4.2 Plasmid and its uses as a vector	
Week 5	Unit-V 5.1 DNA isolation from Plants and bacteria	
	5.2 Agrobacterium mediated plant transformation	
Week 6	Unit-VI 6.1 PCR	
	6.2 Real time PCR	
Week 7	Unit-VII 7.1 protein Blotting	
	7.2 RNA sequencing	
Week 8	Unit-VIII 8.1 Introduction to Bioinformatics	
	8.2 Application in Horticulture	
Week 9	Unit-IX 9.1 Intracellular vesicular traffic.	
	9.2 Intracellular vesicular traffic.	
Week 10	Unit-X 10.1 Mitochondria and their genome	
	10.2 Mitochondria and their genome	
Week 11	Unit-XI 11.1 Chloroplast and their genome	
	11.2 Chloroplast and their genome	
Week 12	Unit-XII 12.1 GMO	
	12.2 Plant micropropagation	

	Unit-XIII	
Week 13	131 MS Media	
	13.2 Somatic embryogenesis	
	Unit-XIV	
Week 14	14.1 structural diversity of extracellular matrix	
	14.2 Cell division ;mitosis, maturation division,crossing over.	
	Unit-XV	
Week 15	15.1 Molecular life of Plant	
	15.2 Resistance gene diversity	
	Unit-XVI	
Week 16	16.1 Gene regulation under Abiotic stress tolerance	
	16.2 Gene regulation under biotic stress tolerance	
PRACTICAL		
Week 1	Safety measures in the biotech laboratory Genomic DNA isolation from Plants and Bacteria	
Week 2	Introduction to aseptic techniques, autoclaving, sterilization	
Week 3	RNA isolation and Agarose gel electrophoresis	
Week 4	Use of laminar flow and fume hoods. Storage and weighing of chemicals,	
Week 5	Plasmid isolation and Restriction enzyme	
Week 6	Preparation of bacterial competent cells	
Week 7	Plasmid transformation in Bacteria	
Week 8	Gene transformation in Plants	
Week 9	Preparation of stock-solutions and MS media preparation	
Week 10	Plant tissue culture and somatic embryogenesis	
Week 11	Explant preparation for plant tissue culture	
Week 12	Callus induction media	
Week 13	Visit to research institutes	

Week 14	Analysis of transgenic plants	
Week 15	PCR	
Week 16	Real time PCR	
Textbooks and Reading Material		
<p>1. Lodish, H. 2004. Molecular Cell Biology. 5th Ed., John Wiley and Sons, New York, USA.</p> <p>2. Paul, C and K. Harry. 2004. Handbook of Plant Biotechnology. John Willy and Sons, New York, USA.</p> <p>3. Muglani, G. S. 2003. Advanced Genetics. Narosa Publishing House, New Delhi, India.</p> <p>4. Razdan, M. K. (Ed) 2003. Introduction to Plant Tissue Culture. 2nd Ed., Intercept, New York, USA.</p> <p>5. Brown, T. A. 2000. Essential Molecular Biology: A Practical Approach. Oxford University Press, New York, USA.</p>		
Teaching Learning Strategies		
<ol style="list-style-type: none"> 1. Lectures 2. Discussions 3. Presentations 4. Quiz 5. Assignments 		
Assignments: Types and Number with Calendar		
<ol style="list-style-type: none"> 1. Molecular identification of Horticultural Plants 2. Genome wide analysis of gene families in Plants 		
Assessment		

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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.

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