

**CHAUDHARY RANBIR SINGH UNIVERSITY, JIND**

**Undergraduate Programs**

**Course: CC-M4(V)**

<b>Session 2024-25</b>			
<b>Part A – Introduction</b>			
Subject	<b>Biotechnology</b>		
Semester	<b>IV</b>		
Name of the course	<b>Plant Tissue Culture</b>		
Course Code	<b>B24-BTY-406</b>		
Course Type: (CC/MCC/MDC/CC-M/ DSEC /VOC/DSE/PC/AEC/VAC)	<b>CC-M4(V)</b>		
Level of the course (As per Annexure-I)	<b>400-499</b>		
Pre-requisite for the course (if any)	<b>NA</b>		
Course Learning Outcomes(CLO):	<p>After completing this course the students will learn:</p> <ol style="list-style-type: none"> <li>1. About history of plant tissue culture, totipotency and somatic embryogenesis, lab equipment, safety, and sterilization techniques.</li> <li>2. To prepare plant tissue culture media, establish and maintain suspension and callus cultures, and understand their applications in secondary metabolite production and genetic engineering.</li> <li>3. Micropropagation techniques, including axillary bud proliferation, nodal culture, and shoot tip culture. They'll also understand the design, construction, and environmental control of polyhouses and greenhouses for plant tissue culture applications.</li> <li>4. The importance of hardening micropropagated plants, understand various hardening methods, and grasp the process of acclimatization. They'll also explore applications like haploid production, seedless plant propagation, cryopreservation, and genetic engineering in plant tissue culture.</li> </ol> <hr/> <ol style="list-style-type: none"> <li>5. Students will gain practical experience in setting up a plant tissue culture lab, preparing media, establishing suspension and callus cultures, working with in vitro cultures, visiting a greenhouse, and hardening micropropagated plants.</li> </ol>		
Credits	Theory	Practical	Total
	2	2	4
Contact Hours	2	4	6
<b>Max. Marks:100</b>			<b>Time: 3h (theory), 4h (practical)</b>

<b>Internal Assessment Marks: 30 (15 Theory + 15 Practical)</b>		
<b>End Term Exam Marks:70 (35 Theory + 35 Practical)</b>		
<b>Part B- Contents of the Course</b>		
<b>Units</b>	<b>Topics</b>	<b>Contact Hours</b>
Unit 1	Introduction to Plant Tissue Culture: Definition, scope, and significance of plant tissue culture, Historical development of plant tissue culture, Basic principles and concepts of totipotency and somatic embryogenesis. Laboratory Organization and Safety: Essential equipment and materials for a plant tissue culture laboratory, Safety measures and precautions in the laboratory, Sterilization techniques for laboratory equipment and materials	<b>8</b>
Unit 2	Plant Tissue Culture Media: Composition of plant tissue culture media (MS, Murashige and Skoog), Preparation of various types of plant tissue culture media, Autoclaving and sterilization of media. Suspension and Callus Cultures: Establishment and maintenance of suspension and callus cultures, Applications of suspension and callus cultures (secondary metabolite production, genetic engineering)	<b>8</b>
Unit 3	Micropropagation: Principles and techniques of micropropagation, Axillary bud proliferation, nodal culture, and shoot tip culture, In vitro rooting and acclimatization. Polyhouse and Greenhouse Technology: Design and construction of polyhouses and greenhouses, Environmental control systems in polyhouses and greenhouses, Applications of polyhouses and greenhouses in plant tissue culture	<b>7</b>
Unit 4	Hardening of Micropropagated Plants: Importance of hardening, Methods of hardening, Acclimatization to field conditions. Applications of Plant Tissue Culture: Production of haploids and doubled haploids, Propagation of seedless plants, Cryopreservation of plant germplasm, Genetic engineering of plants	<b>7</b>
Practical	Practicum: 1. Introduction to plant tissue culture laboratory set-up. 2. Preparation and sterilization of plant tissue culture media (e.g. MS media). 3. Establishment of suspension and callus cultures from different plant materials. 4. In vitro cultures from different plant materials (e.g., nodal segments, shoot tips). 5. Visiting a local polyhouse/greenhouse facility. 6. Hardening of micropropagated plants using different methods (e.g., misting chambers, cold frames).	<b>60</b>
<b>Suggested Evaluation Methods</b>		
<b>Internal Assessment:</b>		<b>End Term End Term</b>

<p>➤ <b>Theory</b></p> <ul style="list-style-type: none"> <li>• Class Participation: 4</li> <li>• Seminar/presentation/assignment/quiz/class test etc.: 4</li> <li>• Mid-Term Exam: 7</li> </ul> <p>➤ <b>Practicum</b></p> <ul style="list-style-type: none"> <li>• Class Participation: 5</li> <li>• Seminar/Demonstration/Viva-voce/Lab records etc.: 10</li> <li>• Mid-Term Exam: NA</li> </ul>	<p><b>Examination:</b></p> <p>➤ <b>Theory</b></p> <ul style="list-style-type: none"> <li>• Written Examination: 35</li> </ul> <p>➤ <b>Practicum</b></p> <ul style="list-style-type: none"> <li>• Practical Examination: 35</li> </ul>
<p><b>Part C-Learning Resources</b></p>	
<p><b>Recommended Books/e-resources/LMS:</b></p> <ol style="list-style-type: none"> <li>1. Plant Tissue Culture: Techniques and Applications by Gamborg, Miller, and Ojima</li> <li>2. Plant Tissue Culture: Theory and Practice by Bhojwani and Razdan</li> <li>3. Plant Cell and Tissue Culture by Pais</li> <li>4. Micropropagation: Theory and Practice by George and Rao</li> <li>5. Plant Tissue Culture: A Laboratory Manual by Paul and Vasil</li> <li>6. Plant Tissue Culture: A Practical Approach edited by Davey and Putter</li> <li>7. Plant Biotechnology by S.K. Jain</li> <li>8. Plant Tissue Culture and Biotechnology by S.C. Maheshwari and V.K. Bhatia</li> <li>9. Handbook of Plant Cell and Tissue Culture edited by P.V. Ammal</li> <li>10. In Vitro Culture of Plants by Murashige and Skoog</li> </ol>	