

UNIVERSITY OF MADRAS
B.Sc. DEGREE PROGRAMME IN PLANT BIOLOGY
AND PLANT BIOTECHNOLOGY
SYLLABUS WITH EFFECT FROM 2023-2024

CORE XV PLANT BIOTECHNOLOGY AND MOLECULAR BIOLOGY

Title of the Course	PLANT BIOTECHNOLOGY AND MOLECULAR BIOLOGY						
Paper Number	Compulsory Elective						
Category	Core	Year	III	Credits	3	Course Code	339E6A
		Semester	VI				
Instructional Hours per week	Lecture	Tutorial		Lab Practice	Total		
	4	1		-	5		
Pre-requisite	To empower students recognize and appreciate the basic principles that sustain biotechnology as an interdisciplinary domain of learning and research.						
Learning Objectives							
C1	To know various aspects of biotechnology						
C2	To know the concept and techniques of plant tissue culture.						
C3	To familiarize with the gene transfer techniques.						
C4	To know about DNA replication and repair.						
C5	To familiarize with gene regulation.						
Course outcomes : On the completion of the course the students will be able to: CO:	Programme Outcomes						

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1. Recognize the fundamentals concepts of plant biotechnology and genetic engineering.	K1
2. Explain various steps in transcription, protein synthesis and protein modification.	K2
3. Elucidate gene cloning and evaluate different methods of gene transfer.	K3
4. Analyze the major concerns and applications of	K4

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transgenic technology.	
5. Develop their competency on different types of plant tissue culture.	K5
UNIT	CONTENTS
I	Biotechnology – definition, history and scope. Application of plant biotechnology in various fields. Agriculture - Biofertilizers, Biopesticides. Medicine – Antibiotics (Penicillin) Recombinant vaccines, insulin and interferons. Environment – Bioremediation and Biofuel. Industry – ethanol production (yeast), citric acid production (<i>Aspergillus niger</i>) and Proteases production (<i>Bacillus sps</i>).
II	Plant tissue culture - introduction, scope and importance, concept of totipotency, aseptic techniques in plant tissue culture. Composition of media, types of media, sterilization, explant preparation and inoculation. Callus induction and micropropagation. Application of plant tissue culture in agriculture, horticulture and forestry. Synthetic seed technology.
III	Vectors; plasmid, bacteriophage, viral vectors, cosmids. Restriction enzymes. Recombinant DNA technology, gene transfer – indirect method, <i>Agrobacterium</i> mediated gene transfer. Direct method – Biolistic method. Development of transgenic plants with reference to insect resistance, Pros and cons of GM food.
IV	Nature and function of genetic materials, Nucleic acid – base pairing – Chargaff's rule, DNA – structure and types, denaturation - renaturation. Replication of DNA in prokaryotes. RNA structure and types. DNA repair mechanism.
V	Transcription – Enzymology – RNA polymerase – classes of RNA molecules – transcription in prokaryotes. Protein synthesis – Genetic code – characters – codons and anticodons. Gene regulation in Prokaryotes – <i>lac</i> operon and <i>trp</i> operon
Extended Professional	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be

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<p>Component (is a part of internal component only, Not to be included in the External Examination question paper)</p>	<p>solved (To be discussed during the Tutorial hour)</p>
<p>Skills acquired from this Course</p>	<p>Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</p>
<p>Recommended Texts</p>	<ol style="list-style-type: none"> 1. Bhajwani, S and Razdan, 1984. Plant tissue culture. Theory and practice. 2. <u>Verma P.S and Agarwal V.K. 2010.</u> Molecular Biology. S Chand Publishers. 3. Ignacimuthu, S.J. 2003. Plant Biotechnology. Oxford & IBH Publishing, New Delhi. 4. Bhojwani, S.S and Razdan, M.K. 2004. Plant Tissue Culture, Read Elsevier India Pvt. Ltd. 5. Purohit, S.S. 2010. Plant tissue culture, Student edition, Jodhpur. 6. Bajaj, Y.P.S. 1987. Biotechnology in agriculture and forestry. Springer – Verlag
<p>Reference Books</p>	<ol style="list-style-type: none"> 1. Bernard R Glick and Jack J Pasternak. 2001. Molecular biotechnology-principles and applications of recombinant DNA, (2nd Edition), ASM Press, Washington, D.C. 2. Jogdand, SN. 1997. Gene biotechnology, Himalaya Publishing House, New Delhi. 3. Ernst L. Winnaccker. 2002. From Genes to Clones-introduction to gene technology, VCR Pub., Weintein. 1. James, D Watson et al., 1992. Recombinant DNA (2nd Edition), WH Freeman and Co., New York. 5. Maniatis and Sambrook. 2003. Molecular Cloning- A lab manual Vol.I, II & III, Coldspring Harbor Laboratory Press, New York. 6. Old, RW and Primrose, SB. 2001. Principles of Gene Manipulation-an introduction to genetic engineering, Black Well Science Ltd., New York. 7. Halder, T and Gadgil, V.N.1981. Plant cell culture in crop improvement. Plenum, New York. 8. Neuman, K.H., Barz, W and E. Reinhard. 1985. Primary and secondary metabolism of plant cell cultures – Springer – Verlag, Berlin.

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	<p>9. Barz, W., Reinhard, E and Zenk, M.H. 1977. Plant tissue culture and its biotechnology application – Springer – Verlag, Berlin.</p> <p>10. Hu, C.Y and P.J.Wang. 1984. Handbook of plant cell culture Vol.1. Mac million, New York.</p> <p>11. Hammond, J.C. McGarvey and V. Yusibov. 2009. Plant Biotechnology, Springer Verlag. New York.</p>
Web Resources	<p>1. http://www.freebookcentre.net/Biology/BioTechnology-Books.html</p> <p>2. https://books.google.co.in/books/about/Introduction_to_Plant_Biotechnology.htm?id=RgQLISN8zT8C</p> <p>3. https://www.kobo.com/us/en/ebook/plant-biotechnology-1</p> <p>4. https://www.kobo.com/us/en/ebook/plant-biotechnology-1</p> <p>5. https://www.worldcat.org/title/molecular-biology/oclc/1062496183</p> <p>6. http://www.freebookcentre.net/Biology/Molecular-Biology-Books.html</p> <p>7. https://www.amazon.in/Molecular-Biology-Multicolour-Verma-Agarwal-ebook/dp/B06XKVVWT3</p>

Mapping with Programme Outcomes:

Cos	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	3	2	1	2	2	1	3
CO 2	3	3	2	2	3	3	2	3	2	2
CO 3	3	2	3	3	2	1	2	1	3	3
CO 4	3	3	3	3	3	2	3	2	3	3
CO 5	3	3	2	3	2	3	3	3	2	3

S-Strong (3)

M-Medium (2)

L-Low(1)