PARVATHANENI BRAHMAYYA
SIDDHARTHA COLLEGE OF ARTS & SCIENCE
Autonomous
Siddhartha Nagar, Vijayawada–520010
Re-accredited at 'A+' by the NAAC

Course Code				**23BOMAL234**			
Title of the Course				**PLANT BIOTECHNOLOGY**			
Offered to: (Programme/s)				**B.Sc Hons Botany**			
L	**4**	**T**	**0**	**P**	**0**	**C**	**3**
Year of Introduction:	**2024- 25**			**Semester:**			**3**
Course Category:	**MAJOR**			**Course Relates to:**	**GLOBAL**		
Year of Revision	**NA**			**Percentage**	**NA**		
Type of the Course:				**Employability , Skill developement**			
Crosscutting Issues of the Course :				**Environment and Sustainability**			
Pre-requisites,if any				**Basics of PlantTissue culture Techniques**			

Course Description:

The course deals with the study of plant life and application of technical approaches to biological environments and living organisms.

Students undertaking this course will be introduced to concepts and applications of modern plant biotechnology in agriculture. Areas to be covered include: Introduction to plant biotechnology;

Tissue culture media and preparation; Sterilisation techniques; In vitro micropropagation; Application of tissue culture to plant breeding; Introduction to molecular biology; Genome organization, structure and function; Basic molecular techniques; PCR based techniques; Genetic markers; Applications of molecular; Gene Cloning; Gene transfer in plants; Transgenics in crop improvement; and Impact of recombinant DNA technology.

Course Aims and Objectives:

S.NO	COURSE OBJECTIVES
1	To familiarize the students with the key developments in the sphere of Plant Biotechnology.
2	To understand the basics principles of Plant Tissue culture Techniques.
3	To Learn Basic Sterilization Techniques used in Plant Tissue culture.
4	To acquire Knowledge of secondary metabolites and Biotransformation Techniques.
5	To Know the Applications of Transgenic plants.

Course Outcomes

At the end of the course, the student will be able to…

CO NO	COURSE OUTCOME	BTL	PO	PSO
CO1	To understand the basics principles of plant sciences and molecular biology	**K1**	2	**1**
CO2	To have a knowledge of laboratory techniques used in plant biotechnology.	**K2**	2	**1**
CO3	To understand the industrial applications of biotechnology in developing new products.	**K2**	2	**1**
CO4	To undertake research in plant biotechnology.	**K3**	2	**1**
CO5	Gain basic knowledge on trait improvement in plants.	**K4**	2	**1**

CO-PO MATRIX									
CO NO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**
CO1		**1**						**1**	
CO2		**2**						**2**	
CO3		**2**						**2**	
CO4		**3**						**3**	
CO5		**3**						**3**	

Course Structure:

Unit – 1 (Basic techniques in plant tissue culture) **(12Hrs)**

1. Plant Tissue Culture: Definition, scope and Significance; infrastructure and equipment required to establish a tissue culture laboratory.

2. Sterilization Techniques; formulation of media for plant tissue culture.

3. Concept of totipotency;initiation and maintenance of callus cultures; induction of morphogenesis in vitro.

4. Somatic embryogenesis and organogesis;factors affecting somatic embryogenesis and organogesis synthetic seeds and their Applications.

Applications:

Assignment 1 : Basics of PlantTissue culture protocols.

Assignment 2: Laboratory safety Rules and Guidelines.

Activity 1: MS media(Murashige – Skoog) composition and preparation

Activity 2: Preparation of callus cultures

Specific Resources:

https://passel2.unl.edu/view/lesson/a2f44b5b9a27/1

https://byjus.com/biology/plant-tissue-culture/

Unit-2 Organ and haploid culture Techniques **(12Hrs)**

1. Importance and applications of meristem culture, zygotic embryo culture, endosperm culture.

2. Micro propagation and it's uses, commercial exploitation of micro propagation.

3. Production of haploids using anther, pollen and unfertilized ovule cultures characterization and applications.

Applications

Assignment 1: Prepare PPT on Different culture Techniques

Assignment 2: Prepare PPT on Micro propagation and it's applications

Specific Resources:

https://byjus.com/biology/tissue-culture/

https://www.geeksforgeeks.org/micropropagation/

Unit -3 Cell and protoplast cultures. **(12Hrs)**

1. Cell suspension-continuous and batch cultures; mass cultivation of plant cell using bioreactors.

2. Production of secondary metabolites from cell cultures, strategies used for enhanced production of secondary metabolites. Biotransformation using plant cell cultures.

3. Isolation, purification and culture of protoplast; methods used for protoplast fusion.

4. Somatic hybridization/ cybridization - selection systems for somatic hybrids/ cybrids, their characterization and applications.

Applications:

Assignment 1: Prepare PPT on Bioreactor.

Assignment 2: Prepare PPT on Secondary metabolites production

Specific Resources:

https://byjus.com/biology/tissue-culture/

https://www.geeksforgeeks.org/micropropagation/

Unit -4: Transgenic plants **(12Hrs)**

1. Transgenic plants - Definition, bio safety and ethical issues associated with transgenic plants.

2. Herbicide resistance (glyphosphate), insect resistance (alpha amylase inhibitor).

3. Virus resistance (coat protein mediated, nucleocapsidgene), disease resistance (antifungal proteins,PR protein).

Quality improvement (Golden rice), shelf-life enhancement (flavr savr tomato).

Applications:

Assignment 1: Prepare PPT on Transgenic plants

Assignment 2: Prepare PPT on insect resistance plants

Specific Resources:

https://www.geeksforgeeks.org/transgenic-plants/

Unit – 5 Advances in plant biotechnology (12Hrs)

1. Plant synthetic biology and it's applications; plant-based vaccines and therapeutics.
2. Biofortification and genetically modified foods.
3. Biodegradable plastics, polyhydroxybutyate.
4. Applications of plant biotechnology in bioenergy production and environmental remediation.

Applications:

Assignment 1: Prepare PPT on Bioremediation.

Assignment 2: Prepare PPT on genetically modified foods.

Specific Resources:

https://www.slideshare.net/slideshow/applications-of-plant-biotechnology/130591402

https://delhigreens.com/2020/08/20/5-uses-of-biotechnology-in-environmental-protection/

Text Books:

1. Ignacimuthu, S., (2003) Plant Biotechnology. Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi.
2. Kalyan Kumar De., (1997) Plant Tissue Culture - New Central Book Agency (P) Ltd., Calcutta.
3. Mascarenhas A.F., (1991) Hand book of Plant Tissue Culture. Indian Council of Agricultural Research. New Delhi.

References:

1. C. Neal Stewart Jr. (2018) Plant Biotechnology and Genetics: Principles, Techniques, and Applications John Wiley & Sons, Inc. in Hoboken, New Jersey, USA.
2. Adrian Slater, Nigel W. Scott, and Mark R. Fowler (2008) Plant Biotechnology: The Genetic Manipulation of Plants Oxford University Press in Oxford, UK.

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SEMESTER -END MODEL QUESTION PAPER

Course Code & Title of the Course:	**23BOMAL234**
Title:	**PLANT BIOTECHNOLOGY**
Offered to:	**B.Sc. Honours Botany**
Category: Major	**SEMESTER: 3**
Max. Marks	**70**
Max.Time	**3 Hrs**

Section A: Short Answer Questions

Answer All questions.

Each question carries 4 Marks. **Marks: 20**

Q1 (a) Describe the term totipotency, dedifferentiation and redifferentiation. K1

OR

(b) Describe the process of callus culture. K1

Q2 (a) Explain the importance and few applications of meristem. K2

OR

(b) Discuss the steps involved in embryo culture. K2

Q3 (a) Explain cell suspension culture - Batch and Continuous cultures. K2

OR

(b) Explain Cybridization. K3

Q4 (a) Explain about Golden rice as quality improvement. K2

OR

(b) What are transgenic plants? Explain with examples. K2

Q5 (a) Describe the Bio-fortification. K2

OR

(b) Explain about Bioremediation. K2

Section B: Long Answer Questions

Answer the following questions. Each question carries 10 Marks.Marks: 50

6 (a) Explain the Sterilization Techniques in detail. K2

OR

(b) What is somatic embryogenesis? Explain various factors affecting somatic embryogenesis. K2

7 (a) Define micro propagation. Describe its commercial exploitation of micro propagation. K1

OR

(b) Describe the haploid culture in detail. K1

8 (a) Define protoplast culture. Explain various methods of protoplast cultures. K2

OR

(b) Define hybrid. Explain the somatic hybrids and cybrids. K2

9 (a) Discuss about Herbicide resistant and insect resistant transgenic plants with suitable examples. K1

OR

(b) Discuss about virus resistant transgenic plants. K1

10 (a) Explain about various plant based vaccines and the therapeutic drugs with examples. K2

OR

(b) Explain various applications of plant biotechnology in production of bio energy and Bioremediation process. K2

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