

# 21BICM101 FUNDAMENTALS OF PLANT BIOCHEMISTRY AND BIOTECHNOLOGY

Hours Per Week :

L	T	P	C
2	0	2	3

Total Hours :

L	T	P
30	-	30

## Course Description and Objectives:

This course is aimed at making the students comprehend the concepts of various biological processes and enable him to make use of the information in crop improvement and propagation

## Course Outcomes:

Upon completion of the course, the student will be able to achieve the following outcomes:

COs	Course Outcomes
1	Understand the structure and functions of various biochemical processes that are important for life
2	Students will learn about concepts and applications of Plant Biotechnology
3	Use of Biotechnological tools and plant tissue culture techniques in crop improvement and plant propagation

## SKILLS:

- ✓ *Isolation of DNA from plant tissue*
- ✓ *Handling of Centrifuge, Polymerase Chain Reaction (PCR) and Geldoc*
- ✓ *Determination of different enzymes activity in plants*



Source :

<http://www.minecampus.com/blog/2020/03/23/bachelor-of-technology-b-tech-biotechnology-engineering-top-colleges-eligibility-syllabus-salary-and-scope/>

**ACTIVITIES:**

- o Isolation of DNA from plant tissue
- o Titration methods for estimation of amino acids/ lipids
- o Sterilization techniques
- o Preparation of stock solutions for MS nutrient medium
- o Practice micro-propagation, hardening and

**UNIT - 1**

**Introduction:** Importance of Biochemistry - Properties of Water, pH and Buffer – Carbohydrates, Importance and classification - Structures of Monosaccharides - Reducing and oxidizing properties of Monosaccharides -Mutarotation, Structure of Disaccharides and Polysaccharides – Lipids, Importance and classification -Structures and properties of fatty acids - Storage lipids and membrane lipids

**UNIT - 2**

Proteins, Importance of proteins and classification, Structures - titration and zwitterions nature of amino acids – Structural organization of proteins – Enzymes, General properties and classification – Mechanism of action - Michaelis & Menten and Line Weaver Burk equation & plots - Introduction to allosteric enzymes

**UNIT - 3**

Nucleic acid lipids - Beta oxidation, Biosynthesis of fatty acids

**UNIT - 4**

Concepts and applications of plant biotechnology - Scope, organ culture, embryo culture, cell suspension culture, callus culture, anther culture, pollen culture and ovule culture, production of haploids and their applications in breeding - Micropropagation methods; organogenesis and embryogenesis - Synthetic seeds and their significance - Embryo rescue and its significance in overcoming sexual incompatibility

**UNIT - 5**

Protoplast isolation, Somatic hybridization and cybrids - Somaclonal variations and their use in crop improvement - Cryopreservation - Introduction to recombinant DNA methods - Physical (Gene gun method), Chemical (PEG mediated) and *Agrobacterium*-mediated gene transfer methods - Transgenics and their importance in crop improvement – PCR, qRT-PCR techniques and their applications - RFLP, RAPD, SSR, ISSR – Marker-Assisted Breeding in crop improvement – Biotechnology regulations

**LABORATORY EXPERIMENTS****LIST OF EXPERIMENTS**

1. Preparation of solutions, pH and buffers
2. Qualitative tests for carbohydrates
3. Qualitative tests for amino acids
4. Estimation of amylose content in rice
5. Estimation of reducing sugars by Nelson and Somogyi method
6. Total soluble sugars estimation by Anthrone method
7. Estimation of proteins by Lowry's or Bradford method
8. Extraction of oil from oil seeds by Soxhlet apparatus
9. Effect of pH, temperature and substrate concentration on enzyme action
10. Paper chromatography / TLC demonstration for separation of amino acids
11. Sterilization techniques
12. Composition of various tissue culture media and preparation of stock solutions for MS nutrient medium
13. Callus induction from various explants. Micropropagation of banana– Hardening and acclimatization
14. Demonstration of isolation of DNA and of gel electrophoresis technique
15. Demonstration of PCR Technique. Demonstration of DNA finger printing –RAPD and Restriction digestion

**REFERENCES:**

1. David L. Nelson, Michael M.Cox; W.H. Freeman. Lehninger - *Principles of Biochemistry*, 6<sup>th</sup> Edition
2. *Biochemistry*, U.Satyanarayana, U. Chakrapani, Books and Allied(P) Ltd, Kolkata
3. *Biochemistry*, S.N.Gupta, Rastogi Publications, First Edition, 2011
4. *Introduction to Plant Biotechnology* by H.S Chawla (3<sup>rd</sup> Edition), Oxford & IBH Publishing Co. Pvt Ltd., New Delhi