Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

Shri Vaishnav Institute of Science
Department of Life Science
B.Sc. (Major - Biotechnology)

SEMESTER V

COURSE CODE	Category	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BSCBT501	**Major**	**Plant Physiology**	60	20	20	30	20	4	-	2	6

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment shall be based following components: Quiz / Assignment / Project / Participation in Class, given that no component shall exceed more than 10 marks.**

Course Objectives:

1. To understand the catabolic and anabolic processes and synthesis of chemical energy in plants.
2. To comprehend the importance and functioning of photosynthesis and respiration.

Course Outcomes:

1. Students will understand the basic physiology of plants.
2. Students will understand the importance of water mineral nutrition in plant growth and development.
3. Students will understand the process of photosynthesis and respiration metabolism.
4. Students will understand photomorphogenesis.

UNIT-I: Plant-water relations

Osmosis, plasmolysis, deplasmolysis, adsorption; Absorption of water; Ascent of sap; Concept of water potential; Transpiration, mechanism of opening and closing of stomata; Factors affecting transpiration and its importance.

UNIT-II: Mineral nutrition

Essential elements, macronutrients and micronutrients; Transport of ions across cell membranes; Active and passive transport carriers, channels and pumps.

UNIT-III:Photosynthesis

Photosynthetic pigments (Chlorophyll a, Chlorophyll b, xanthophylls, carotenes, phycobilins); Photosystem I and II, reaction center, antenna molecules; Primary light reactions; Electron transport chain and mechanism of ATP synthesis; Phosphorylation; Calvin cycles; C3, C4 and CAM pathways of carbon fixation; Photorespiration.

Chairperson
Board of Studies
Life Science

Chairperson
Faculty of Studies
Science

Controller of Examinations
SVVV, Indore

Registrar
SVVV, Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

Shri Vaishnav Institute of Science
Department of Life Science
B.Sc. (Major - Biotechnology)

BSCBT501 Plant Physiology

UNIT-IV: Photosynthesis
Glycolysis, Krebs cycle, electron transport system and oxidative phosphorylation in Mitochondria, Glyoxylate, Oxidative Pentose Phosphate Pathway.

UNIT-V: Nitrogen metabolism
Plant growth and Photomorphogenesis; Phytochrome structure and function; Photoperiodism; Physiology of flowering and vernalization; Plant movements; Autonomic and Paratonic movements.
Biological nitrogen fixation, Nitrate Metabolism, Synthesis of amino acids, Reductive and Transamination.

PRACTICAL
1. Plasmolysis and deplasmolysis
2. Differential permeability
3. Transpiration
4. Stomatal Physiology
5. Isolation and absorption spectra of chlorophyll and carotenoids
6. Separation of chlorophyll and carotenoids by paper chromatography
7. Isolation of chloroplasts and demonstration of Hill activity
8. Scotomorphogenesis and photomorphogenesis
9. Regulation of growth and pigment synthesis by Phytochrome.
10. Gravitropic and phototropic movement

Chairperson
Board of Studies
Life Science

Chairperson
Faculty of Studies
Science

Controller of Examinations
SVVV, Indore

Registrar
SVVV, Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

Shri Vaishnav Institute of Science
Department of Life Science
B.Sc. (Major - Biotechnology)

SEMESTER V

COURSE CODE	Category	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		Th	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BSCBT502	**DSE**	**Genetic Engineering**	60	20	20	30	20	3	-	1	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment shall be based following components: Quiz / Assignment / Project / Participation in Class, given that no component shall exceed more than 10 marks.**

Course Objectives:

1. Study of tools used in genetic engineering including various methods
2. Construction of genomic libraries
3. Applications of genetic engineering

Course Outcomes:

1. To understand the principles of genetic engineering
2. Understanding the techniques and the tools used in genetic engineering
3. Understanding genetic transformations and their applications

UNIT – I

Genetic engineering: Isolation of genomic and plasmid DNA from bacteria, Isolation of genomic DNA from plant and animal cells.

Restriction enzymes, introduction of DNA into living cells, methods of gene transfer, expression and detection of clones.

Recombinant DNA technology – cloning vectors (pUC 19, phage λ, cosmid and M13);

UNIT – II

Introduction to Principles and applications of blotting technique: Western , Southern and Northern Blots and Polymerase Chain Reaction.

Principles and applications: Maxam Gilbert's and Sanger's DideoxyDNA Sequencing techniques,

UNIT – III

Transformationmethods for bacteria, plant and animal cells; Screening of transformants-selection markers (antibiotic resistance and genes of essential metabolism), translation, insertional inactivation and alpha complementation for recombinant selection, reporter genes (GUS assay, luciferase)

Chairperson
Board of Studies
Life Science

Chairperson
Faculty of Studies
Science

Controller of Examinations
SVVV, Indore

Registrar
SVVV, Indore

BSCBT502 Genetic Engineering

UNIT–IV

Construction and Screening of Genomic and cDNA Libraries; Cloning- conventional & recombination based; Construction of genomic libraries; Chromosome walking and chromosome jumping for positional cloning of genes; Construction of EST and cDNA libraries

UNIT–V

Applications of Genetic Engineering

Gene down regulation- using antisense RNA, dsRNA and co-suppression, Knock-in and knock- out technology; Genome editing by CRISPR-Cas 9

Site directed mutagenesis (PCR based methods); Detection and diagnosis of genetic diseases; Gene therapy – ex vivo, in vivo

PRACTICAL [Genetic Engineering]

1. PCR based amplification of DNA.
2. Restriction digestion of genomic or lambda DNA and size determination of the fragments on agarose gel.
3. Double digestion of DNA and restriction mapping, problems on restriction mapping.
4. Purification of DNA from agarose gel.
5. Isolation of DNA from bacterial cell
6. Isolation of DNA from plant cell
7. Preparation of competent cells.
8. Transformation of E. coli, and calculation of transformation efficiency.
9. Replica plate techniques.
10. Screening of recombinant transformants by alpha complementation / insertional inactivation.
11. Confirmation of clone by colony PCR.

BOOKS:

1. Brown, T. A. (2018). Genomes4 (4th Ed.). New York: Garland Science Pub.
2. Brown, T. A. (2020). Gene Cloning and DNA Analysis: An Introduction. (8th Ed.). Wiley-Blackwell.
3. Green, M. R., & Sambrook, J. (2012). Molecular Cloning: A Laboratory Manual. Cold Spring Harbor. (4th Ed.). NY: Cold Spring Harbor Laboratory Press.
4. Glick, B. R., & Patten, C. L. (2017). Molecular Biotechnology: Principles and Applications of Recombinant DNA. (5th Ed.). American Society for Microbiology press.
5. NichollD. S.T. (2015). An Introduction to Genetic Engineering. (3rd Ed.). Cambridge University Press.
6. Primrose, S. B., & Twyman, R. M. (2006). Principles of Gene Manipulation and Genomics. (7th Ed.). Oxford: Blackwell Scientific Publications.