

SEMESTER - III

CODE	COURSE TITLE
18BOUC303	ANATOMY AND EMBRYOLOGY

Category	CIA	ESE	L	T	P	Credit
Core	25	75	55	5	-	4

Preamble

To study histological and anatomical tools for identification of plants

To understand the anomaly existing in anatomical characters

To study the developmental stages in angiospermic embryos

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Gain knowledge of anatomical features of plant cells, tissues, organs and their function	K1
CO2	Interpret the basic pattern of plant growth and analyse the relationships between primary and secondary growth	K2 , K3
CO3	Develop skills in sectioning, staining of fresh plant materials	K2 , K3
CO4	Analyse the structure and development of gametes, fertilization and embryo development	K2
CO5	Develop the ability for the application of acquired knowledge in histochemistry for the identification of different tissues	K3, K4

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	S	M
CO2	S	M	S	S	M
CO3	S	S	S	M	M
CO4	S	S	S	S	M
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT – I

12 Hrs.

Anatomy- Meristem –Types –Structure and theories of root and shoot apex - General account of simple tissues : parenchyma-collenchyma- sclerenchyma-complex tissues: xylem – phloem- Vascular cambium Stomata : structure and types –Trichomes.

UNIT – II

12 Hrs.

Primary structure-Internal structure of root : dicot – monocot- stem : dicot – monocot - Nodal anatomy - leaf - dicot – monocot.

UNIT – III

12 Hrs.

Secondary structure- Secondary thickening- Dicot root - stem - Anomalous secondary thickening in dicot root: Successive cambia (*Beta vulgaris*)-Anomalous secondary thickening in dicot stem: Cortical vascular bundles (*Nyctanthes*)-Medullary vascular bundles (*Piper*) - Anomalous secondary thickening in monocot stem- primary thickening meristem in arborescent monocots (*Dracaena*).

UNIT – IV

12 Hrs.

Embryology -Structure and development of anther- development of male gametophyte - structure and types of ovules, development of female gametophytes (Monosporic – *Polygonum*- Bisporic – *Endymion* and Tetrasporic – *Adoxa*)- Fertilization - Double fertilization.

UNIT – V

12 Hrs.

Endosperm : Types of endosperm - Nuclear, Cellular, Helobial - Ruminant - Embryo : Structure and development of dicot embryo (*Capsella*) - Structure and development of monocot embryo (*Najas*).

Text Books

Sl. No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Pandey, B.P.	Plant Anatomy	S.Chand & Company Ltd., New Delhi	2005, Revised Edition
2.	Vashishta, B.R.	Plant Anatomy	S.Chand & Company Ltd., New Delhi	2007, Revised Edition
3.	Bhojwani, S.S. and Bhatnagar, S.P.	The Embryology of Angiosperms	Vikas Publishing House Pvt Ltd., New Delhi.	2007, Revised Edition

Reference Books

Sl. No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Fahn, A.	Plant Anatomy	Robert Maxwell, M.C., New York,	1982, Revised Edition
2.	Katherine Esau	Plant Anatomy	Wiley Eastern Private Ltd., New Delhi	1974, 2 nd Edition
3.	Maheswari .P	An Introduction to the embryology of Angiosperms	McGraw-Hill Book Company, Inc. New York	1994, Revised Edition

Pedagogy

Lecture- Chalk & Talk, PPT, Quiz, Assignment, Seminar, Micro preparations

Web Resource

<https://www.siyavula.com/read/science/.../plant...tissues/04-plant-and-animal-tissues-0...>

https://www.researchgate.net/.../326761664_The_ratio_of_trichomes_to_stomata_is_ass...

https://www.researchgate.net/.../301729019_The_Stem_and_Root_Anatomy_of_Sanmig..

www.biologydiscussion.com/stems.../dicot-stem/secondary-growth...dicot-stem.../703...

https://en.wikipedia.org/wiki/Double_fertilization

<https://botany.org/PlantTalkingPoints/Endosperm.php>

SEMESTER IV

CODE	COURSE TITLE
18BOUC404	CELL BIOLOGY AND TISSUE CULTURE

Category	CIA	ESE	L	T	P	Credit
Core	25	75	55	5	-	4

Preamble

To study the structure and functions of Cell organelles

To know the mechanism of Gene expression and Protein synthesis

To understand the techniques related to tissue culture

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Describe the structures and functions of cell organelles	K1, K2
CO2	Understand the mechanism of DNA replication and protein synthesis	K2
CO3	Analyse the various factors determining the hereditary from one generation to another	K1, K2
CO4	Acquire combined knowledge and perform research work on molecular and cellular biology	K3, K4
CO5	Ability to gain knowledge in tissue culture techniques and apply the skill to develop rare, biologically important plants	K3, K4

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	M	M
CO2	S	M	M	S	S
CO3	S	S	M	S	S
CO4	S	M	M	S	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT – I

12 Hrs.

Cell Organelles- Structure and function of cell wall, Plasma membrane (Unit Membrane - Fluid Mosaic Model) - Endoplasmic reticulum- Ribosome - Mitochondria.

UNIT – II

12 Hrs.

Cell Organelles – Structure and function of Chloroplast- Nucleus- Chromosome : structure and types- Lysosomes –Dictyosomes- Vacuoles.

UNIT – III

12 Hrs.

Nucleic acids and Cell division - Structure and Replication of DNA. Structure - types of RNA- Protein synthesis - Mitosis - Meiosis.

UNIT – IV

12 Hrs.

Plant Tissue Culture – Laboratory organization – Tools and techniques - pH meter, autoclave, plant growth chamber, laminar air flow bench, thermometer, hygrometer and luxmeter - Sterilization techniques - Preparation of medium –.Macronutrients- micronutrients- Explants preparation: selection-sterilization- inoculation.

UNIT – V

12 Hrs.

Tissue culture Techniques – Types: liquid culture - Suspension culture- solid culture- Callus culture – Organogenesis: Meristem culture - Anther culture –Protoplast: isolation and culture –Production of artificial seeds and its application.

Text Books

Sl. No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Razdan, M.K.	Introduction to plant tissue culture	Oxford & IBH publishing Co. Pvt. Ltd.,	2008, 2 nd Edition, New Delhi
2.	Verma, P.S. and Agarwal, V.K.	Cytology	S. Chand & Company Ltd., New Delhi,	1983, Revised Edition
3.	Dubey, R.C.	A text book of Biotechnology	S. Chand & Company Ltd., New Delhi	2009, Revised Edition
4.	Ramawat, K.G.	Plant Biotechnology	S. Chand & Company Ltd., New Delhi	2004, Revised Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Purohit, S.S.	Biotechnology Fundamentals & Applications	Agrobios (India), Jodhpur	2005, 4 th Edition
2.	Trevan, M.D., Boffey, S., Goulding, K.H., Stanbury, P.	Biotechnology - The Biological principles	Tata McGraw-Hill publishing company Ltd., New Delhi,	2002, Revised Edition
3.	Power, C.B.	Cell biology	Himalaya Publishing House, Nagpur, Second	2012, Revised Edition

Pedagogy

Lecture- Chalk & Talk, PPT, Quiz, Assignment, Seminar, Micro preparations

Web Resource

<https://www.toppr.com/guides/biology/the-fundamental-unit-of-life/cell-organelle/>

<https://www.khanacademy.org/science/biology/cellular-molecular-biology/mitosis/a/cell-cycle-phases>

<https://www.nature.com/scitable/topic/nucleic-acid-structure-and-function-9>

<https://vlab.amrita.edu/?sub=3&brch=187&sim=1100&cnt=1>

<https://www.apsnet.org/edcenter/K->

[12/TeachersGuide/PlantBiotechnology/Documents/PlantTissueCulture.pdf](https://www.apsnet.org/edcenter/K-12/TeachersGuide/PlantBiotechnology/Documents/PlantTissueCulture.pdf)