

Session 2025-26			
Part A			
Subject	Botany		
Semester	3 rd		
Name of the Course	Plant Physiology		
Course Code/ID	240/BOTL/CC/301		
Course Type: (CC/MCC/MDC/CC - M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A3		
Level of the course (As per Annexure-I)			
Pre-requisite for the course(if any)			
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to: <ol style="list-style-type: none">1. Students will acquire an understanding of various physiological process in plants.2. Students will develop a comprehensive knowledge of plant hormones.3. Students will learn about photomorphogenesis and its significance.4. Students will gain a conceptual understanding of plant growth and senescence, including the natural aging process of plants.5. Students will be able to demonstrate practical aspects and learn the basic concepts of various physiological and biochemical process of plant.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Theory			
Max. Marks: 75 Internal Assessment Marks: 25 End Term Exam Marks: 50	Time: 2 Hours		
Practical			
Max. Marks: 25 Internal Assessment Marks: 5 End Term Exam Marks: 20	Time: 2 Hours		
Part B- Contents of the Course			
Instructions for Paper-Setter Nine questions will be set in all. All questions will carry equal marks. Question No.1 will be short answer type covering the entire syllabus and will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each unit. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.			

Bohmer

Devi

Unit	Topics	Contact Hours
I	Plant water relations: water absorption, water potential and its components, transpiration, factor affecting transpiration, anti-transpirants; role of micro and macro nutrients. Photosynthesis: significance; photosynthetic pigments; action spectra and enhancement effects; concept of two photosystems; Z-scheme; photo phosphorylation; Calvin cycle; C4 pathway; CAM plants; photorespiration.	12
II	Respiration: Respiration: ATP– the biological energy currency; aerobic and anaerobic respiration; Krebs cycle; electron transport mechanism (chemiosmotic theory); redox-potential; oxidative phosphorylation; pentose phosphate pathway, Lipid metabolism.	11
III	Nitrogen metabolism: Nitrogen fixation and its mechanism, assimilation of ammonia Structure, function and mechanisms of action of phytochromes; stomatal movement; photoperiodism and biological clocks; mechanism of flowering.	11
IV	Biosynthesis, mechanism of action and uses of auxin, gibberellin, cytokinin, abscisic acid, ethylene, Concepts of plant growth; factors affecting germination and dormancy of seeds; physiological and biochemical changes associated with senescence and abscission.	11
V*	<ol style="list-style-type: none"> 1. Demonstration of imbibition by plaster of Paris method. 2. Demonstration of Osmosis by potato Osmo scope method. 3. To study plasmolysis and DE plasmolysis by using Rohee leaf. 4. To separate photosynthetic pigments by thin layer/paper chromatography. 5. Rate of photosynthesis under varying Co₂ concentration. 6. To demonstrate the process of geotropism and phototropism. 7. To study the phenomenon of seed germination (effect of light). 8. To demonstrate ascent of sap through transpiration. 9. Determination of glucose by Benedict's solution and Fehling solution. 10. Determination of protein by Xanthoproteic test and Millon' reagent. 11. Simple test for detection of Fats 12. To demonstrate the process of aerobic respiration 13. To demonstrate the process of anaerobic respiration. 	30

By home...

Shu

	14. To study the action of Ethylene hormone on fruit ripening.	
<p>Recommended Books/e-resources/LMS:</p> <ol style="list-style-type: none"> 1. Pandey, S.N & Sinha BK. 2018. Plant Physiology. Vikas Publishing House Pvt. Ltd. 4th edition 2. Jain, V. K. 2017. Fundamentals of Plant Physiology. S. Chand publishing. 20th edition 3. Gupta, N.K. Bala, MKSM. Gupta, M. 2016. Practical in Plant Physiology and Biochemistry. Scientific Publishers, India 4. Taiz, L., Zeiger, E., Moller, I.M. and Murphy, A. 2015. Plant Physiology and Development. Sinauer Associates Inc. USA. 6th edition. 5. Verma, V. 2015. Plant Physiology 2nd Ed. Athena Academic. 6. James, P.G. 2013. A textbook of Plant Physiology. Hard press Publishing. 7. Ilahi, I. 2009. Plant Physiology. Biochemical Processes in Plants. UGC Press. 8. Hopkins, W.G. and Huner, A. 2008. Introduction to Plant Physiology. John Wiley and Sonchus's. 4th edition. 9. Salisbury, F.B. and Ross, C.W. 2002. Plant Physiology. Wordsworth Publishing Co. Belmont CA. 7th edition. 		

Dr. S. K. Sharma

Dr. S. K. Sharma

Session 2025-26			
Part A			
Subject	Botany		
Semester	4 th		
Name of the Course	Cytology and Genetics		
Course Code/ID	240/BOTL/CC401		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A4		
Level of the course(As per Annexure-I)			
Pre-requisite for the course(if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: 1. Students will understand the fundamental characteristics of cells. 2. Students will acquire comprehensive knowledge about cell division and the central dogma of molecular biology. 3. Students will learn about the principles of inheritance in biology. 4. Students will develop a thorough understanding of mutations, chromosomal aberrations, and the concept of linkage. 5. Students will be able to understand the basic principles of laws of inheritance, stains & staining techniques, cell division processes, chromosome mapping, and chromosomal aberration.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Theory			
Max. Marks: 75 Internal Assessment Marks:25 End Term Exam Marks: 50	Time: 2 Hours		
Practical			
Max. Marks: 25 Internal Assessment Marks:5 End Term Exam Marks: 20	Time: 2 Hours		
Part B- Contents of the Course			
Instructions for Paper-Setter			
Nine questions will be set in all. All questions will carry equal marks. Question No.1 will be short answer type covering the entire syllabus and will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each unit. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.			

B. Home

Davis

Unit	Topic	Contact Hours
I	Cell as a unit of Life; Prokaryotic and eukaryotic cells; Eukaryotic Cell components: Structure and functions of Cell Wall, Plasma Membrane, nucleus, Nuclear Envelope- structure of nuclear pore complex, Golgi Apparatus, Ribosome, Endoplasmic Reticulum, Chloroplast, Mitochondria, Lysosomes, Peroxisomes and Vacuoles.	11
II	Cell Division: Mitosis and Meiosis. Chromosome: structural organization, Centromere and Telomere, lamp brush and polytene chromosomes. DNA: structure, and replication. RNA: structure and types. Genetic code.	10
III	Mendel's laws of Inheritance. Lethal Genes; Codominance, incomplete dominance; Gene interaction (inter- and intra-allelic); Multiple allelism; Pleiotropism. Pedigree Analysis. Cytoplasmic Inheritance.	12
IV	Complete & incomplete linkage, recombination frequency, crossing over. Chromosomal aberrations- deletions, duplications, translocations, inversions; Variations in chromosome number- aneuploidy, polyploidy; sex chromosomes and sex determination. Types of mutations, effects of physical & chemical mutagens.	12
V*	<ol style="list-style-type: none"> 1. To study the structure and functioning of a compound microscope. 2. To study strains and fixatives used in cytogenetics. 3. To study the karyotype using a given metaphase chromosome picture (<i>Allium cepa</i>). 4. To work out the genetics of a cross from the given F₂ harvest. 5. To study different mitotic stages in root tips of <i>Allium cepa</i>. 6. To study Meiosis and mitosis through temporary squash preparation. 7. To demonstrate Mendel's laws through seed ratios. Laboratory exercises in probability and chi-square analysis. 8. Pedigree analysis for dominant and recessive autosomal and sex linked traits. 9. Incomplete dominance and gene interaction through seed ratios (9:7, 9:6:1, 13:3, 15:1, 12:3:1, 9:3:4). 10. Chromosome anomaly : Translocation Ring, Laggards and Inversion Bridge, break etc through slides/photographs. 	30

Bo home

Dev

Recommended Books/e-resources/LMS:

1. Lodish, H., Berk, A., Zipursky, S.L., Mat sudaria, P., Baltimore, D. and Darnell, J. 2021. Molecular Cell Biology, W.H. Freeman and Co., New York., USA. 9th edition.
2. Singh, BD. 2020. Genetics. Kalyani Publishers Delhi.
3. Pierce BA 2020. Genetics: A Conceptual Approach. Palgrave Macmillan U.K. 7th edition.
4. Cummings MR, Klug WS, Spencer, CA, Palladino, MA, Killian D. 2019. Concepts of Genetics, Pearson. 12th edition.
5. Karp, G. Iwasa, J. Marshall W. 2019. Cell and Molecular Biology. Concepts and Experiments. John Wiley and Sons. New York. 9th edition.
6. Gardner EJ, Simmons MJ, Snus tad DP 2012. Principles of Genetics. Wiley India. 8th edition.
7. Griffiths, A.J.F., Wessler, S.R., Carroll, S.B., Doable, J. 2010. Introduction to Genetic Analysis. H. Freeman and Co., U.S.A. 10th edition.
8. Sen, S. Kar, D.K. Johri, B.M. 2005. Cytology and Genetics. Alpha Science International Ltd.
9. Donziger, V. R. 2000. Cytology and Genetics. TATA and McGraw Hill Publication Co. Ltd, New Delhi. 3rd edition.

*PD
Khome*

Dix

Session 2025-26			
Part A			
Subject	Botany		
Semester	5th		
Name of the Course	Economic Botany and Plant Biotechnology		
Course Code/ID	240/BOTL/CC/501		
Course Type: (CC/MCC/MDC/CC - M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A5		
Level of the course (As per Annexure-I)			
Pre-requisite for the course(if any)			
Course Learning Outcomes (CLO):	After completing this course, Students will be able to understand the origin of various crops <ol style="list-style-type: none">1. Students will develop a conceptual understanding of distribution and description of various plants and their economic value.2. Students will gain knowledge on the concepts of plant tissue culture.3. Basic understanding of biotechnological techniques and their applications developed by the students.4. Students will gain the knowledge of practical aspects of various crop plants, various culture processes and genetically modified plants.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Theory			
Max. Marks: 75 Internal Assessment Marks:25 End Term Exam Marks: 50	Time: 2 Hours		
Practical			
Max. Marks: 25 Internal Assessment Marks:5 End Term Exam Marks: 20	Time: 2 Hours		
Part B- Contents of the Course			
Instructions for Paper-Setter			
Nine questions will be set in all. All questions will carry equal marks. Question No.1 will be short answer type covering the entire syllabus and will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each unit. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.			
Unit	Topic		Contact Hours
I			11

*Bo
herme*

Devi

	<p>Vavilov's centres of origin of crop plants, Origin, distribution, botanical description, brief idea of cultivation and economic uses of the following:</p> <p>Food plants- cereals (rice, wheat and maize), pulses (gram and pea), vegetables (potato and tomato).</p> <p>Origin, distribution, botanical description, brief idea of cultivation and economic uses of the following: Fibers- cotton and jute</p> <p>Oils- groundnut and mustard.</p>	
II	<p>Morphological description, brief idea of cultivation and economic uses of the following: Spices- coriander, turmeric, cloves.</p> <p>Medicinal plants- Cinchona, Rauwolfia, , Opium, Cannabis.</p> <p>Botanical description, processing and uses of: Beverages- tea and coffee; Rubber- Hevea; Sugar- sugarcane energy plantations and bio-fuels</p>	11
III	<p>Plant Tissue Culture : nutrient and hormone requirement; totipotency; Organization; physic-chemical conditions for propagation of plant cells and tissues; somatic embryogenesis; protoplast isolation culture and fusion; cybrids, micropropagation; androgenesis. Tissue Culture Applications, Restriction Endonucleases , PCR; construction of genomic library and cDNA library; DNA Fingerprinting (RAPD, RFLP);</p>	11
IV	<p>Gene transfer– prokaryotic and eukaryotic vectors; Agrobacterium-mediated transformation; Direct gene transfer methods– Electroporation, Microinjection, Gene-gun;. Pest resistant plants (BT-cotton); herbicide resistance; transgenic crops with improved quality traits (Flav saver tomatoes, Golden rice); Application of plant biotechnology for production of quality oil, industrial enzymes, edible vaccines and plantibodies.</p>	12
V*	<ol style="list-style-type: none"> 1. Economic importance of: Cereals: Wheat, Rice, Maize, pulses (gram and pea), vegetables (potato, tomato and onion). 2. Fibers- cotton, jute and flax. 3. Oils- groundnut, mustard, sunflower and coconut. 4. Spices- coriander, ferule, ginger, turmeric, cloves 5. Medicinal plants- Cinchona, Rauwolfia, Atropa, Opium, Cannabis, Azadirachta, With Ania. 6. Tea and coffee; Rubber- Hevea, Sugarcane 7. methods of in vitro sterilization 8. Preparation of media MS (1962) 9. To study demonstration of culturing and subculturing in plant tissue culture. 	30

By home

Dev

	10. To study demonstration of anther culture. 11. To study demonstration of protoplast isolation and culture. 12. Study of genetically modified plants from photographs (Bt cotton, Golden rice, Flavr savr tomatoes)	
--	---	--

Recommended Books/e-resources/LMS:

1. Kocchar, S.L. 1998: Economic Botany in Tropics, 2nd edition, MacMillan India Ltd., New Delhi.
2. Sama Ramamurthy, A.V.S.S. And Subramanyam, N.S. 1989: A Textbook of Economic Botany, Wiley Eastern Ltd., New Delhi.
3. Sharma, O.P. 1996: Hills Economic Botany (Late Dr. A.F. Hill adapted by O.P. Sharma), Tata McGraw Hill Co. Ltd., New Delhi.
4. Simpson, B.B. and Conner-Ogorzaly, M. 1986: Economic Botany- Plants in Our World, McGraw Hill, New York
5. Slater, A., Scott, N.W. & Fowler, M.R. (2008) Plant Biotechnology: The Genetic Manipulation of Plants, Oxford University Press.
6. Bhojwani, S.S. and Razdan (2004) Plant Tissue Culture and Practice.
7. Chrisp eel, M.J. and Sadava, D.E. (1994) Plants, Genes and Agriculture. Jones and Barlett Publishers.
8. Reinert, J. and Bajaj, Y.P.S. (1997) Applied and Fundamental Aspects of Plant Cell, Tissue and Organ Culture. Narosa Publishing House.
9. Smith, R. (2000) Plant Tissue Culture: Techniques and Experiments, 2nd Edition, Academic
10. Gardner, E.J. Simmons, M.J. Snus tad, D.P. (2008) VIIIed. Principles of Genetics.

S. B. Sharma

Devi

Session 2025-26			
Part A			
Subject	Botany		
Semester	6 th		
Name of the Course	Plant anatomy and Embryology		
Course Code/ID	240/BOTL/CC601		
Course Type: (CC/MCC/MDC/CC - M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A6		
Level of the course (As per Annexure-I)			
Pre-requisite for the course(if any)			
Course Learning Outcomes (CLO):	After completing this course 1. Students will have a basic knowledge of various type of plant tissues, shoot and root apex, secondary growth. 2. Students will develop a conceptual understanding of anatomy of root stem and leaves. 3. Students will gain knowledge of floral parts, gametes, and pollination 4. Basic understanding of the gametophytes, endosperm and embryogenesis developed by the students. 5. Students will gain the knowledge of practical aspects of plant tissues, secondary growth, stomata types, types of embryo, leaf, root and stem.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Theory			
Max. Marks: 75 Internal Assessment Marks:25 End Term Exam Marks: 50	Time: 2 Hours		
Practical			
Max. Marks: 25 Internal Assessment Marks:5 End Term Exam Marks: 20	Time: 2 Hours		
Part B- Contents of the Course			
Instructions for Paper-Setter			
Nine questions will be set in all. All questions will carry equal marks. Question No.1 will be short answer type covering the entire syllabus and will be compulsory. The remaining eight questions will be set unit wise selecting two questions from each unit. The candidate will be required to attempt question No. 1 and four more questions selecting one question from each unit.			

S. B. Sharma

D. S. Datta

Unit	Topic	Contact Hours
I	<p>Tissues- meristematic and permanent (simple, complex and secretory) Tissue systems (Epidermal, ground and vascular)</p> <p>The Shoot system- shoot apical meristem and its histological organizations.</p> <p>Cambium- structure and functions. Secondary growth in dicot stem; characteristics of growth rings; sap wood and heart wood, periderm; Anomalous secondary growth (<i>Dracaena</i> and <i>Boerhaave</i>)</p>	11
II	<p>Leaf: Types of leaves (simple and compound); phyllotaxy. Epidermis uniseriate and multiseriate, epidermal appendages and their morphological types.</p> <p>Anatomy of typical Monocot and Dicot leaf and cell inclusions in leaves, leaf abscission, Stomatal apparatus and their morphological types.</p> <p>Root system: Root apical meristem; histological organization Secondary growth in dicot root. Structural modifications in roots: Storage (Beta), Respiratory (Rhizophora), Epiphytic (Vanda).</p>	12
III	<p>Flower-a modified shoot, Microsporangium, its wall and dehiscence mechanism. Microsporogenesis, pollen grains and its structure (pollen wall). Pollen germination (micro gametogenesis), Male gametophyte, Pollen-pistil interaction; self-incompatibility, Pollination: types and agencies</p>	11
IV	<p>Structure of Megasporangium (ovule), its curvatures; Megasporeogenesis and Mega gametogenesis, Female gametophyte (mono, bi and tetra spores), Double fertilization, Endosperm types and its biological importance.</p> <p>Embryogenesis in Dicot and Monocot; Polyembryony, Structure of Dicot and Monocot seed, Dispersal mechanisms in fruits and seeds.</p>	11
V*	<ol style="list-style-type: none"> 1. Familiarization with techniques: double staining, maceration, peel mount, clearing. 2. Apical meristem of root and shoot, vascular cambium and intercalary meristem. 3. Distribution and types of parenchyma, collenchyma and sclerenchyma. 4. Xylem: Tracheary elements-tracheid's, vessel elements; thickenings; perforation plates; xylem fibres; xylem parenchyma.; tyloses; heart-and sapwood. 5. Phloem: Sieve tubes-sieve plates; companion cells; phloem fibres. 	30

Supreme

Sum

	<ol style="list-style-type: none"> 6. stomata types; trichomes: non-glandular and glandular. 7. Root: monocot, dicot. 8. Stem: monocot, dicot- primary and secondary growth; periderm; lenticel; abnormal secondary growth in dicots and monocots. 9. Leaf: isobilateral, dorsiventral,); venation patterns. Adaptive Anatomy: xerophytes, hydrophytes. 10. Anther, Pollen grains. 11. Ovule and its types 12. Female gametophyte through permanent slides/ photographs: types and ultrastructure of mature embryo sac. 13. Endosperm and its type(permanent slides) 14. Embryogenesis: study of development of dicot embryo through permanent slides; 	
--	---	--

Recommended Books/e-resources/LMS:

1. Bhatnagar, S. and Moitra, A. 1996. Gymnosperms. New Age International Limited, New Delhi.
2. Davis, P.H. and Heywood, V.H. 1963. Principles of Angiosperms Taxonomy, Oliver and Boyd. London.
3. Gifford, E.M. and Foster, A.S. 1988. Morphology and Evolution of Vascular Plants, W.H. Freeman & Company, New York.
4. Heywood, V.H. and Moore, D.M. (eds) 1984. Current concepts in Plant Taxonomy. Academic Press, London.
5. Jeffrey, C. 1982. An introduction to Plant Taxonomy. Cambridge University Press, Cambridge, London.
6. Maheshwari, J.K. 1963. Flora of Delhi, CSIR, New Delhi
7. Bhojwani, S.S. and Bhatnagar, S.P. 2000. The Embryology of Angiosperms. 4th revised and enlarge edition. Vikas Publishing House, Delhi.
8. Cutter, E.G. 1969. Plant Anatomy Part-I, Cells and Tissues, Edward Arnold, London.
9. Esau, K. 1977. Anatomy of Seed Plants, 2nd edition. John Wiley & Sons, New York
10. Proctor, M and Yeo, P. 1973. The Pollination of Flowers. William Collins Sons, London

S. B. Moitra

Davis