

Scheme of Programme : Bachelor of Science with Major in Botany
(Scheme UG A2: (Single Major))

Semester I

Course Code	Course Title	Course ID	L	T	P	L	T	P	Total Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
Core Course(s)														
CC-A1	Plant Diversity and Microbes		3	-	2	3	-	1	4	25	50	5	20	100
CC-A2	Fundamentals of Cell biology		3	-	2	3	-	1	4	25	50	5	20	100
CC-A3	Basic Laboratory Techniques in Plant Biology		3	-	2	3	-	1	4	25	50	5	20	100

Semester 2

Course Code	Course Title	Course ID	L	T	P	L	T	P	Total Credits	MARKS					
			(Hrs)			Credits				TI	TE	PI	PE	Total	
Core Course(s)															
CC-A4	Plant Anatomy		3	-	2	3	-	1	4	25	50	5	20	100	
CC-A5	Plant Resource Utilization		3	-	2	3	-	1	4	25	50	5	20	100	
CC-A6	Plant Molecular Biology		3	-	2	3	-	1	4	25	50	5	20	100	

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CC-A12	Reproductive Biology of Angiosperms		3	-	2	3	-	1	4	25	50	5	20	100
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Semester 5

Course Code	Course Title	Course ID	L	T	P	L	T	P	Total Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
Core Course(s)														
CC-A13	Plant Biotechnology		3	-	2	3	-	1	4	25	50	5	20	100
CC-A14	Plant Physiology		3	-	2	3	-	1	4	25	50	5	20	100
CC-A15	Ecology and phytogeography		3	-	2	3	-	1	4	25	50	5	20	100

Semester 6

Course Code	Course Title	Course ID	L	T	P	L	T	P	Total Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
Core Course(s)														
CC-A16	Plant Biochemistry and metabolism		3	-	2	3	-	1	4	25	50	5	20	100
CC-A17	Plant systematics		3	-	2	3	-	1	4	25	50	5	20	100

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CC-A18	Genomics and Bioinformatics		2	-	2	2	-	1	3	15	35	5	20	75
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Semester 7; 8 (Honours) and Semester 8 (Honours with Research): Detailed Scheme will be prepared in due course of time.

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Multidisciplinary Course from the department for pool of the Courses in the University

(These courses are to be offered to students of different discipline/Subject)Botany

Semester 1

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
MDC-1	Fundamentals of Botany		2	-	2	2	-	1	3	15	35	5	20	75

Semester 2

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
MDC-2	Economic Botany		2	-	2	2	-	1	3	15	35	5	20	75

Semester 3

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
MDC-3	Ornamental Plants		2	-	2	2	-	1	3	15	35	5	20	75

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Minor Course from the department for pool of the Courses in the University

(These courses are offered by each department for students of other departments/same department to gain a broader understanding beyond the major discipline)

Semester 1

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
MIC-1	Plant Diversity		1	-	2	1	-	1	2	5	20	5	20	50

Semester 2

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
MIC-2	Plant for Human Welfare		1	-	2	1	-	1	2	5	20	5	20	50

Semester 3

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
MIC-3	Organic Farming		3	-	2	3	-	1	4	25	50	5	20	100

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Semester 6

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
MIC-6	Floriculture		3	-	2	3	-	1	4	25	50	5	20	100

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Semester 3

Course Code	Course Title	Course ID	L	T	P	L	T	P	Total Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
Core Course(s)														
CC-A7	Diversity of Algae		3	-	2	3	-	1	4	25	50	5	20	100
CC-A8	Diversity of Fungi		3	-	2	3	-	1	4	25	50	5	20	100
CC-A9	Fundamental of Genetics		2	-	2	2	-	1	3	15	35	5	20	75

Semester 4

Course Code	Course Title	Course ID	L	T	P	L	T	P	Total Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
Core Course(s)														
CC-A10	Diversity of Bryophytes and Pteridopytes		3	-	2	3	-	1	4	25	50	5	20	100
CC-A11	Diversity of Gymnosperms and Paleobotany		3	-	2	3	-	1	4	25	50	5	20	100

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Vocation Course from the department for pool of the Courses in the University

(These courses are offered by each department for students of other departments/same department and is focused on practical work, preparing students for a particular skilled profession.

Semester 4

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
VOC-1	Nursery and Gardening		3	-	2	3	-	1	4	25	50	5	20	100

Semester 5

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
VOC-2	Mushroom Cultivation		3	-	2	3	-	1	4	25	50	5	20	100

Semester 6

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
VOC-3	Medicinal Plants of India		3	-	2	3	-	1	4	25	50	5	20	100

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Skill Enhancement Course from the department for pool of the Courses in the University

(These courses are offered by each department for students of other departments/same department and is designed to provide value-based and/or skill-based knowledge and should contain both theory and lab/hands-on/training/field work.)

Semester 1

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
SEC-1	Plant Hybridization		1	-	4	1	-	2	3	5	20	15	35	75

Semester 2

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
SEC-2	Vertical Farming		1	-	4	1	-	2	3	5	20	15	35	75

Semester 6

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
SEC-3	Olericulture		1	-	4	1	-	2	3	5	20	15	35	75

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Ability Enhancement Course from the department for pool of the Courses in the University

(These courses are offered by department of Indian and Foreign Languages for students of other departments/same department and leads to enhancement in the ability of learn
Regional and foreign languages)

Semester 1

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
AEC-1	English Language and Communication: Level-1 OR हिंदीभाषाएव. सम्प्रेषण_1 OR संस्कृतभाषाएव. सम्प्रेषण_1								2					50

Semester 2

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
AEC-2	English								2					50

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Language and Communication: Level-2 OR हिंदीभाषाएव सम्प्रेषण_2 OR संस्कृतभाषाएव. सम्प्रेषण-2													
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Semester 3

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
AEC-3	English Language and Communication:3 OR हिंदीभाषाएव. सम्प्रेषण_3 OR संस्कृतभाषाएव. सम्प्रेषण-3								2					50

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Semester 4

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
AEC-4	English Language and Communication: Level-4 OR हिंदीभाषाएव सम्प्रेषण-4 OR संस्कृतभाषाएव सम्प्रेषण-4								2					50

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Value Added Course from the department for pool of the Courses in the University

(All the departments will offer value added course for semester 3 for the students of same or different departments. In the first year, students will study (i) Human Values and Ethics and (ii) Environmental Studies as value added course)

Semester 1

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
VAC-1	Human Values and Ethics OR Environmental Studies								2					50

Semester 2

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
VAC-2	Human Values and Ethics OR Environmental Studies								2					50

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Semester 3

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
VAC-3									2					50

Nature of Work	Course Credits	Contact hours per week	Contact hours per semester (15 weeks)
Lecture	01	01	15
Tutorial per paper	01	01	15
Practical, Seminar, Internship, field practice/project, or community engagement, etc.	01	02	30

Note: Tutorial batch size (UG programme: 20-25, PG Programme: 12-15)

The distribution of credits among the lectures/tutorial/practicum will be as follows:

Courses	Total Credits	L (Credits)	T (Credits)	P (Credits)	MARKS			
					TI	TE	PI	PE
Only Theory	4	3 (3 hrs)	1	-	30	70	-	-
	3	2 (2 hrs)	1	-	25	50	-	-

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	2	1	1	-	15	35	-	-
Theory and Practicum	4	3 (3 hrs)	-	1 (2 hrs)	25	50	5	20
	4 (Where pract. is dominant)	2 (2 hrs)	-	2 (4 hrs)	15	35	15	35
	3	2 (2 hrs)	-	1 (2 hrs)	15	35	5	20
	2	1	-	1 (2 hrs)	5	20	5	20
When Practicum is separate course	2	-	-	2 (4 hrs)	-	-	15	35
	3	-	-	3 (6 hrs)	-	-	25	50
	4	-	-	4 (8 hrs)	-	-	30	70
AEC/VAC	2	2 (2 hrs)			15	35	-	-
SEC	3	1 (1 hrs)		2 (4 hrs)	5	20	15	35
	2	1		1 (2 hrs)	5	20	5	20
DSEC	4	3 (3 hrs)		1 (2 hrs)	25	50	5	20
Minor/VOC	4	2 (2 hrs)		2 (4 hrs)	15	35	15	35
Internship	4	--	--	4 (8 hrs)			30	70

L= Lecture; T= Tutorial, P= Practicum; Ti= Theory Internal Assessment; TE= Theory End Semester Examination; PI= Practicum Internal; PE= Practicum End Semester examination

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Session 2025-26			
Part A			
Subject	Botany		
Semester	1 st		
Name of the Course	Plant Diversity and Microbes		
Course Code/ID	250/BOT/CC101		
Course Type: (CC/MCC/MDC/CC - M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A1		
Level of the course(As per Annexure-I)			
Pre-requisite for the course(if any)			
Course Learning Outcomes (CLO):	<p>After completing this course, the learner will be able to:</p> <p>Students will understand the fundamental characteristics of Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms.</p> <p>Students will gain knowledge about reproduction and evolutionary trends in Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms.</p> <p>Students will be able to learn general characteristics and mode of the reproduction in Bacteria and Viruses.</p> <p>Students will learn morphology of the Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperm and Angiosperm.</p>		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Theory			
Max. Marks: 75	Time: 2 Hours		
Internal Assessment Marks: 25			
End Term Exam Marks: 50			
Practical			
Max. Marks: 25	Time: 2 Hours		
Internal Assessment Marks: 5			
End Term Exam Marks: 20			
Part B- Contents of the Course			
<p align="center">Instructions for Paper-Setter</p> <p>Nine questions will be set in all. All questions will carry equal marks.</p> <p>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</p>			

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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	<p>Algae: General characteristic features, cell structure, range of thallus, methods of reproduction and evolutionary classification (only upto groups). Brief account of <i>Chlamydomonas</i> and <i>Sargassum</i>.</p> <p>Fungi: General characteristic features, reproduction and broad classification. Myxomycetes and their similarities with fungi, plants and animals. Brief account of <i>Rhizopus</i> and <i>Agaricus</i>. Introduction to lichens.</p>	11
II	<p>Bryophytes: General characteristic features and reproduction, adaptation to land habit, broad classification, evolutionary trends in Bryophytes. Brief account of <i>Marchantia</i> and <i>Funaria</i>.</p> <p>Pteridophytes: General characteristic features and reproduction, broad classification, evolutionary trends in Pteridophytes, affinities with Bryophytes. Brief account of <i>Selaginella</i> and <i>Equisetum</i>.</p>	11
III	<p>Gymnosperms: General characteristic features and reproduction, broad classification, evolutionary trends in Gymnosperm, affinities with Pteridophytes. Brief account of <i>Cycas</i> and <i>Pinus</i>.</p> <p>Angiosperms: General characteristic features and reproduction, Concept of natural, artificial and phylogenetic system of classification. Affinities with Gymnosperms.</p>	12
IV	<p>Bacteria: General characteristic features, cell structure, asexual reproduction and modes of gene transfer (conjugation, transformation and transduction), brief introduction to Archaeobacteria.</p> <p>Viruses: General characteristic features, replication, RNA virus (structure of TMV), DNA virus (structure of T-phage), Lytic and Lysogenic life cycle (Lambda phage).</p>	11
V*	<p>To study structure of TMV and Bacteriophage (electron micrographs/models).</p> <p>To study morphology of <i>Chlamydomonas</i> and <i>Sargassum</i> (Temporary preparation/specimens/slides).</p> <p>To study <i>Rhizopus</i> and <i>Agaricus</i> and <i>Rhizopus</i> (Temporary preparations)</p> <p>To study <i>Marchantia</i> (morphology, WM of rhizoids and scales), <i>Anthoceros</i> (morphology), <i>Funaria</i> (morphology WM of rhizoid and leaf).</p> <p>To study <i>Selaginella</i> (morphology, WM of strobilus and spores), <i>Equisetum</i> (morphology, WM of spores).</p> <p>To study <i>Cycas</i> (morphology, leaf, leaflet anatomy, coralloid root, bulbils, megasporophyll and microsporophyll); <i>Pinus</i> (morphology of dwarf shoot, needle anatomy, male and female cones, WM pollen grains).</p>	

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	To study variation in leaf venations in dicots and monocots (at least two specimens each).	
Recommended Books/e-resources/LMS: Parihar, N.S. (1991). An Introduction to Embryophyta. Vol.II. Pteridophytes. Prayagraj: U.P.: Central Book Depot. Singh,V., Pandey,P.C., Jain,D.K. (2001).A Text Book of Botany. Meerut, UP: Rastogi and Co. Webster, J., Weber, R. (2007). Introduction to Fungi. Cambridge, Cambridge University Press. Campbell, N.A., Reece,J.B. (2008) Biology, 8th edition, Pearson Benjamin Cummings, San Francisco. Evert, R. F., Eichhorn,S.E. (2012).Raven Biology of Plants, 8th edition, New York, NY: W.H.Freeman and Company. Bhatnagar, S.P., Moitra, A. (1996).Gymnosperms. New Delhi, Delhi, New Age International (P) Ltd. Publishers. Kumar, H.D. (1999). Introductory Phycology, 2nd edition .Delhi, Delhi, Affiliated East West. Press Pvt. Ltd. Pelczar, M. J. (2001). Microbiology, 5th edition. NewDelhi, Delhi:TataMcGraw-HillCo. Puri,P. (1985). Bryophytes. New Delhi, Delhi, Atma Ram and Sons. Sethi, I.K. and Walia, S.K. (2018). Textbook of Fungi and Their Allies. (2nd Edition), Medtech Publishers, Delhi. Tortora,G.J., Funke, B.R., Case, C.L. (2007). Microbiology. San Francisco, U.S.A, Pearson Benjamin Cummings. Vashishta, P.C., Sinha, A.K., Kumar, A. (2010). Pteridophyta. New Delhi, Delhi, S.Chand & Co Ltd. Singh, G. (2019) Plant Systematics-An Integrated Approach. 4th edition. CRC Press, Taylor and Francis Group.		

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Session 2025-26			
Part A			
Subject	Botany		
Semester	1 st		
Name of the Course	Fundamentals of Cell Biology		
Course Code/ID	250/BOT/CC102		
Course Type: (CC/MCC/MDC/CC - M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A2		
Level of the course(AsperAnnexure-I)			
Pre-requisite for thecourse(if any)			
Course Learning Outcomes (CLO):	<p>After completing this course, the learner will be able to</p> <ol style="list-style-type: none"> 1. Students will understand the fundamental characteristics of cells. 2. Students will acquire comprehensive knowledge about cell wall, cell membrane and cell organelles. 3. Students will understand the fundamental characteristics of cell signaling. 4. Students will acquire comprehensive knowledge about cytodifferentiation and cell death. 5. Students will acquire comprehensive knowledge about structure and characteristics of cancer cells. 		
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:2Hours		
Practical			
Max. Marks: 25 Internal Assessment Marks:5 End Term Exam Marks: 20	Time:2Hours		
Part B- Contents of the Course			
<p align="center">Instructions for Paper-Setter</p> <p>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</p>			

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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	Cell as a unit of structure and function; Characteristics of prokaryotic and eukaryotic cells; Origin of Eukaryotic cell (Endosymbiotic theory). Cell Wall and Plasma membrane. The Nucleus -Nuclear Envelope- structure of nuclear pore complex, nuclear lamina, Transport across Nuclear Envelope, Chromatin: molecular organization, Nucleolus and rRNA Processing. Protein Sorting and Transport, The Endoplasmic reticulum, The Golgi Apparatus, Mechanism of Vesicular Transport, Lysosomes.	12
II	Mitochondria, Chloroplasts and Peroxisomes, Structural organization, Function, Marker enzymes, Mitochondrial biogenesis, Protein import in mitochondria, Semiautonomous nature of mitochondria and chloroplast, chloroplast DNA, Peroxisomes' assembly, Cytoskeleton and Cell Structure, organization of actin filaments, myosin and cell movement, intermediate filaments, microtubules.	11
III	The extracellular matrix and cell matrix interactions; cell-cell interactions. Cell Signalling: Signalling molecules and their receptor, functions of cell surface receptors; Intracellular signal transduction pathway (GPCR). The Cell Cycle: Eukaryotic Cell Cycle, Regulation of Cell cycle progression, Events of Mitotic Phase, Meiosis .	11
IV	Cell Death and Cell Renewal Programmed Cell Death, Stem Cells and Maintenance of adult tissues, Embryonic Stem Cells and Therapeutic cloning. Cancer: Development and Causes of Cancer, Tumor Viruses, Oncogenes, Tumor Suppressor genes, Cancer Treatment- molecular approach.	11
V*	To demonstrate the presence of mitochondria in cheek epithelial cell using vital stain Janus Green B. Study of polyploidy in Onion root tip by colchicine treatment. Preparations of temporary mount of onion flower bud anthers and study the different stages of Meiosis. Study the effect of organic solvent and temperature on membrane permeability. Study of structure of cell organelles through electron micrographs. Preparations of temporary mount of onion flower bud anthers and study the different stages of Meiosis. Study of mitosis and meiosis from permanent slides. Identification and study of cancer cells-	30

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	Slides/Photomicrographs.	
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Recommended Books/e-resources/LMS:

1. Karp, G. (2010). Cell and Molecular Biology: Concepts and Experiments. VI Edition. John Wiley & Sons.Inc.
2. De Robertis, E.D.P. and De Robertis, E.M.F. (2006).Cell and Molecular Biology. VIII Edition. Lippincott Williams and Wilkins, Philadelphia.
3. Cooper, G.M. and Hausman, R.E. (2009). The Cell: A Molecular Approach. V Edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
4. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. (2009). The World of the Cell.VII Edition. Pearson Benjamin Cummings Publishing, San Francisco.

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Session 2025-26			
Part A			
Subject	Botany		
Semester	1 st		
Name of the Course	Basic Laboratory Techniques in Plant Biology		
Course Code/ID	250/BOT/CC103		
Course Type: (CC/MCC/MDC/CC - M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A3		
Level of the course(AsperAnnexure-I)			
Pre-requisite for thecourse(if any)			
Course Learning Outcomes (CLO):	<p>After completing this course, the learner will be able to</p> <p>Students will be able to gain knowledge about Lab safety and good lab practices.</p> <p>Students will be able to understand uses and maintenance of various lab equipment's.</p> <p>Students will be able to learn Microscopy and its types.</p> <p>Students will be develop analytic knowledge about preparation of solutions and buffers used in Lab.</p> <p>Students will be able to learn Basis culturing Lab techniques.</p> <p>Students will be able to practical knowledge on Fundamentals of data collection and data types, basic computer skills of Biology and field skills.</p>		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Theory			
Max. Marks: 75	Time: 2Hours		
Internal Assessment Marks:25			
End Term Exam Marks: 50			
PRACTICAL			
Max. Marks: 25	Time: 2Hours		
Internal Assessment Marks:5			
End Term Exam Marks: 20			
Part B- Contents of the Course			
Instructions for Paper-Setter			
Nine questions will be set in all. All questions will carry equal marks.			

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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	Lab safety and good lab practices – General laboratory safety, good laboratory practices, biosafety measures (first-aid practices to be followed in case of burn, acid spills and injury), safety symbols, lab safety equipments (fire extinguisher, fume hood, safety glasses), classes of laboratory chemicals, maintenance and handling of chemicals (Labels, Quality - LR/ AR/ Molecular biology grade/ HPLC grade/Tissue culture grade; Expiry date; Precautions for use), Disinfectants, Biocontainment, Disposal of hazardous chemicals, radioactive and biological waste, Laboratory waste management.	11
II	Use and maintenance of Laboratory equipment- Weighing balance (Top loading and Analytical), pH meter (calibration and use), magnetic stirrer, pipettes and micropipettes, autoclave, laminar airflow, BOD incubator, incubator shaker, micrometer, haemocytometer, spectrophotometer, Agarose gel electrophoresis unit, centrifuge, distillation unit, conductivity meter, Lux meter. Microscopy, sample and slide preparation -Microscopes (Dissecting, Compound and Electron microscopes), Fixation and Preservation (for light and electron microscopy); staining, mounting; basic introduction to other types of microscopes (Confocal, Fluorescence), Temporary and permanent slides.	11
III	Measurements and calculations -Units of measurements and conversion from one unit to another, measurement of volumes of liquids, Weighing, calculations: scientific notations, powers, logarithm and fractions. Solutions and Buffers- Molarity, Molality, Normality, percent solution, stock solution, standard solution, dilution, dilution series, pH, acids and bases, buffers - phosphate, Tris-acetate, Tris- Cl and Citrate buffer. Basic culturing techniques- Basic culture media (LB, YEB, PDA)- liquid and solid, Culture techniques: plating (streak, spread & pour), replica plating, serial dilution.	11
IV	Data collection, statistical analysis and interpretation Fundamentals of data collection, data types - primary and secondary, methods of data collection, sample, sampling methods - merits and demerits, technical and biological replicates, classification - tabulation and presentation of	12

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	<p>data, Descriptive statistics - Mean, Mode, Median, difference between sample mean and population mean.</p> <p>Basic computer skills for biology MS-Word, PowerPoint, Excel, introduction to biological databases.</p> <p>Field Skills : Identification, collection, cataloguing and preservation of plant specimens, Herbarium and Museum.</p>	
V*	<p>Preparation of solutions- molar, molal, normal, percentage, stock, standard and serial dilution buffers.</p> <p>Determining pH of solutions (pH paper, Universal indicator, pH meter) and preparation of buffers (Phosphate, Tris-Cl buffers)</p> <p>Working of instruments -light microscope, Electrophoresis, autoclave, laminar air flow, spectrophotometer, centrifuge, gel electrophoresis unit (Agarose & Poly acrylamide).</p> <p>Temporary and Permanent slide preparation.</p> <p>Calculate cell size using micrometer.</p> <p>Calculate number of cells (pollen/spores) using haemocytometer.</p> <p>Preparation of LB/PDA/YEB medium, growth and maintenance of cultures (liquid - serial dilution method; and semi-solid cultures - streak, spread and pour plates)</p> <p>Calculation of mean, mode, median.</p> <p>Using software to draw tables, graphs and calculating descriptive statistics (Microsoft Excel)</p> <p>Laboratory safety equipment (Fire extinguisher, Fume hood, safety glasses)</p> <p>Mounting of a properly dried and processed plant specimen with herbarium.</p>	30

Recommended Books/e-resources/LMS:

Evert, R. F., Eichhorn, S. E., Perry, J.B. (2012). Laboratory Topics in Botany. W.H. Freeman and Company.

Mesh, M.S., Kebede-Westhead, E. (2012). Essential Laboratory Skills for Biosciences. John Wiley & Sons, Ltd.

Mu, P., Plummer, D. T. (2001). Introduction to practical biochemistry. Tata McGraw-Hill Education.

Mann, S. P. (2016). Introductory Statistics, 9th edition. Hoboken, NJ, John Wiley and Sons Inc.

Daniel, W.W. (1987). Biostatistics. New York, NY: John Wiley Sons.

Jones, A.M., Reed, R., Weyers, J. (2016). Practical Skills in Biology, 6th Edition, Pearson

Bisen, P.S. (2014). Laboratory Protocols in Applied Life Sciences, 1st edition. CRC Press.

Zar, Z. H. (2010). Biostatistical Analysis, 5th edition, Pearson Prentice Hall, New Jersey, USA.

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Session 2025-26			
Part A			
Subject	Botany		
Semester	2 nd		
Name of the Course	Plant Anatomy		
Course Code/ID	250/BOT/CC201		
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 be able to gain knowledge of various cells and tissues, meristem, epidermal and vascular tissue system in plants. 2. Students will be able to learn various aspects of growth, development of the tissues and differentiation of various plant organs. 3. Students will be able to gain knowledge of basic structure and organization of plant parts in angiosperms. 4. Students will be able to understand the correlation of structure with morphology and functions.		
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.			

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Unit	Topic	Contact Hours
I	<p>Tissues: Classification of tissues; Simple and complex tissues (no phylogeny); Pits and plasmodesmata; Wall ingrowths and transfer cells; Ergastic substances.</p> <p>Stem and leaf: Organization of shoot apex (Apical cell theory, Histogen theory, Tunica Corpus theory, cyto-histological zonation); Types of vascular bundles; Structure of dicot and monocot stem; Shoot Chimeras; Structure of dicot and monocot leaf, Kranz anatomy; Development of Leaf.</p>	11
II	<p>Root: Organization of root apex (Apical cell theory, Histogen theory, KorperKappe theory); Quiescent centre; Root cap; Structure of dicot and monocot root; Endodermis, exodermis and origin of lateral root.</p>	12
III	<p>Vascular Cambium: Structure (Axially and radially oriented elements); function and seasonal activity of cambium; Secondary growth in root and stem, Anomalies in secondary growth in stem (<i>Dracena</i>, <i>Boerhaavia</i>, <i>Achyranthes</i>).</p> <p>Wood: Types of rays and axial parenchyma; Sapwood and heartwood; Ring and diffuse porous wood; Early and late wood, tyloses; Dendrochronology.</p> <p>Periderm : Development and composition of periderm; rhytidome and lenticels.</p>	11
IV	<p>Adaptive and Protective Systems : Epidermal tissue system; cuticle; epicuticular waxes; trichomes (uni-and multicellular, glandular and non-glandular, two examples of each); stomata (classification); Adcrustation and incrustation; Anatomical adaptations of xerophytes and hydrophytes.</p> <p>Secretory System: Hydathodes, cavities, lithocysts and laticifers.</p> <p>Scope of Plant Anatomy -Applications in systematics, forensics and pharmacognosy</p>	12
V*	<p>Study of anatomical details through permanent slides/temporary stain mounts/ macerations/ museum specimens with the help of suitable examples.</p> <ol style="list-style-type: none"> 1. Apical meristem of root, shoot and vascular cambium. 2. Distribution and types of parenchyma, collenchyma and sclerenchyma. 3. Xylem: Tracheary elements-tracheids, vessel elements; thickenings; perforation plates; xylem fibres. 4. Wood: ring porous; diffuse porous; tyloses; heartwood and sapwood. 5. Phloem: Sieve tubes-sieve plates; companion cells; phloem fibres. 6. Epidermal system: cell types, stomata types; trichomes: non-glandular and glandular. 7. Root: monocot, dicot, secondary growth. 8. Stem: monocot, dicot - primary and secondary growth; phloem wedges in <i>Bignonia</i>, included phloem in <i>Leptadenia</i>/<i>Salvadora</i>; periderm; lenticels. 	30

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	9. Leaf: isobilateral, dorsiventral, C4 leaves (Kranz anatomy). 10. Adaptive Anatomy: xerophytes, hydrophytes. 11. Secretory tissues: cavities, lithocysts and laticifers.	
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Recommended Books/e-resources/LMS:

1. Dickison, W.C. (2000). Integrative Plant Anatomy. Cambridge, U.K.: Harcourt Academic Press.
2. Esau, K. (1977). Anatomy of Seed Plants. New Delhi, Delhi: John Wiley & Sons, Inc.
3. Evert, R.F., Eichhorn, S. E. (2006). Esau's Plant anatomy: Mersitem, Cells, and tissues of the Plant Body: their structure, function and development. New Jersey, U.S.: Wiley- Liss.
4. Mauseth, J.D. (1988). Plant Anatomy. San Francisco, California: The Benjamin Cummings Publisher.
5. Raven, F.H., Evert, R. F., Eichhorn, S.E. (1992). Biology of Plants. New York, NY: W.H. Freeman and Company.

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Session 2025-26			
Part A			
Subject	Botany		
Semester	2 nd		
Name of the Course	Plant Resource Utilization		
Course Code/ID	250/BOT/CC202		
Course Type: (CC/MCC/MDC/CC - M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A5		
Level of the course(AsperAnnexure-I)			
Pre-requisite for thecourse(if any)			
Course Learning Outcomes (CLO):	<p>After completing this course, the learner will be able to</p> <p>After completing this course, the learner will be able to:</p> <p>Students will gain a foundational understanding of the origins of significant cultivated plants.</p> <p>Students will develop a conceptual understanding of important plants that yield vegetables, fiber, and oil.</p> <p>Students will acquire knowledge about the cultivation techniques of essential plants.</p> <p>Students will gain a conceptual understanding of the processing methods applied to economically significant plants.</p> <p>5.Students will be able to gain the knowledge of economic values of cereals, legumes, spices, oil & fibre yielding plants.</p>		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Theory			
Max. Marks: 75	Time: 2Hours		
Internal Assessment Marks:25			
End Term Exam Marks: 50			
Practical			
Max. Marks: 25	Time: 2Hours		
Internal Assessment Marks:5			
End Term Exam Marks: 20			
Part B- Contents of the Course			
<p>Instructions for Paper-Setter</p> <p>Nine questions will be set in all. All questions will carry equal marks.</p> <p>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</p>			

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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	Origin of Cultivated Plants, Concept of centre of origin, their importance with reference to Vavilov's work; examples of major plant introductions; Crop domestication and loss of genetic diversity; evolution of new crops/varieties, importance of germplasm diversity. Fruits- Mango, Citrus and Banana.	11
II	Cereals- Wheat, Rice and maize. Role of dwarf varieties in green revolution; brief account of millets and Pseudocereals. Legumes- Gram, soyabean and pea, their importance to man and cultivation. Sugars and starches- Ratooning and cultivation of sugarcane, products and by products of sugarcane industry. Potato (Tuber anatomy and propagation methods) and comparative account with cassava. Vegetables: brief study of tomato and onion.	12
III	Spices: family and part used with special reference to fennel, saffron, clove, black pepper, turmeric and common adulterants of spices. Beverages: Tea, coffee and cocoa, their processing and some common adulterants. Oils and Fats: General description with details of groundnut, coconut, Brassica species and their use related health implications. Natural Rubber Para Rubber: tapping, extraction and processing and uses of Para Rubber.	11
IV	Drug Yielding Plants- Therapeutic and habit forming drugs: Medicinal properties and uses with special reference to Cinchona, Rauvolfia, Papaver and Cannabis. Masticatories and Fumitories :Tobacco and Bettle leaf - Botany and Health hazards. Fibre yielding plants: Cotton and Jute-cultivation and uses.	11
V*	1. Cereals: Wheat (habit sketch, L.S/T.S. grain, starch grains, micro-chemical tests), Rice (habit sketch, study of paddy and grain, starch grains, micro-chemical tests). Millets and Pseudocereals (specimens / photographs and grains) 2. Legumes: Soybean, Groundnut, (habit, fruit, seed structure, micro-chemical tests). 3. Fruits: Mango (habit sketch, L.S. fruit, micro-chemical tests in ripe fruit); Citrus (habit sketch, T.S. hesperidium, W.M. vesicle, micro-chemical tests including test for vitamin C) 4. Sugars and starches: Sugarcane (habit sketch; cane juice-micro-chemical tests); Potato (habit sketch, tuber morphology, T.S. tuber to show localization of starch grains, W.M. starch grains, micro-chemical tests). 5. Spices: Black pepper, Fennel and Clove (habit and sections	30

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	<p>L.S./T.S.).</p> <p>6. Beverages: Tea (plant specimen, tea leaves), Coffee (plant specimen, beans).</p> <p>7. Oils and fats: Coconut- T.S. nut, Mustard-plant specimen, seeds</p> <p>8. Essential oil-yielding plants: Habit sketch of Rosa, Vetiveria, Santalum and Eucalyptus (specimens/photographs).</p> <p>9. Rubber: specimen, photograph/model of tapping, samples of rubber products.</p> <p>10. Drug-yielding plants: Specimens of Cinchona, Digitalis, Papaver and Cannabis (male & female plant).</p> <p>11. Tobacco: specimen and products of Tobacco.</p> <p>12. Fiber-yielding plants: Cotton (specimen, whole mount of seed to show lint and fuzz; whole mount of fiber and test for cellulose), Jute (specimen, transverse section of stem, test for cellulose and lignin on transverse section of stem and fiber). Collection and preparation of reports on various crops and economically important plants being cultivated/wildly available in your area.</p>	
<p>Recommended Books/e-resources/LMS:</p> <p>Kochhar, S.L. (2012). Economic Botany in Tropics. New Delhi, India: MacMillan & Co. 2.</p> <p>Wickens, G.E. (2001). Economic Botany: Principles & Practices. The Netherlands: Kluwer Academic Publishers.</p> <p>Chrispeels, M.J. and Sadava, D.E. (1994) Plants, Genes and Agriculture. Jones & Bartlett - Publishers.</p> <p>Singh, V., Pande, P.C., Jain, D.K. 2018. Economic Botany, Rastogi Publications.</p> <p>Daubenmire, R.F. Plants & Environment (2nd Edn.) John Wiley & Sons., New York 22</p> <p>S. Sundar Rajan-2007. College Botany Vol V, Part 1: Taxonomy and Economic Botany Himalaya Publishing House.</p> <p>Susil Kumar Mukharjee-2004. College Botany Vol-III. New Central Book Agency, London.</p>		

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Session 2025-26			
Part A			
Subject	Botany		
Semester	2 nd		
Name of the Course	Plant Molecular Biology		
Course Code/ID	250/BOT/CC203		
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, the learner will be able to- Students will be able to gain understanding of nucleic acid, organization of DNA in prokaryotes and Eukaryotes, DNA replication mechanism, genetic code and transcription process. Students will be able to understand processing and modification of RNA and translation process, function and regulation of expression.		
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

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I	<p>Nucleic acids as carriers of genetic information -Historical perspective; Experiments that established nucleic acids (DNA & RNA) as the carrier of genetic information: Griffith's, Hershey & Chase, Avery, McLeod & McCarty and Fraenkel-Conrat's experiment.</p> <p>Structure and organisation of the genetic material - DNA Structure: Miescher to Watson and Crick- a historic perspective, DNA structure, salient features of double helix; Types of DNA: A, B & Z conformations.</p> <p>Genome complexity: Concept of C-value paradox, denaturation and renaturation, Cot curves; Organization of DNA- in Prokaryotes, Viruses & Eukaryotes.</p> <p>Organelle DNA - mitochondria and chloroplast DNA; Chromatin structure- Nucleosome, Euchromatin, Heterochromatin- Constitutive and Facultative heterochromatin, RNA : types of RNA molecules, structure and function of mRNA, tRNA and rRNA.</p>	11
II	<p>Central Dogma, Genetic code (salient features) Replication of DNA -Mechanism - initiation, elongation and termination, Kornberg's discovery; Enzymes and other proteins involved in DNA replication; General principles – bidirectional, semiconservative and semi discontinuous replication (Replisome), RNA priming (primase & Primosome); Various modes of DNA replication, including rolling circle, θ (theta) mode of replication, replication of linear ds-DNA. Replication of the 5' end of linear chromosome (end replication problem & Telomerase).</p>	11
III	<p>Transcription - Transcription in prokaryotes and eukaryotes ; Understanding the steps in process of transcription: Initiation, Elongation and Termination. Enzymes and factors involved in transcription.</p> <p>Processing and modification of RNA -Split genes-concept of introns and exons, Splicing pathways, group I & group II intron splicing, Spliceosome and assembly of the spliceosome machinery , Alternative splicing, Eukaryotic mRNA processing (5' cap, 3' poly A tail) ; Ribozymes, RNA Editing</p>	11
IV	<p>Translation – Translation in prokaryotes and eukaryotes; process of translation - Initiation, Elongation and Termination. Enzymes and factors involved in translation.</p> <p>Ribosome structure and assembly (in prokaryotes and eukaryotes); charging of tRNA, aminoacyl tRNA synthetases; Fidelity of translation; Inhibitors of protein synthesis; Post-translational modifications of proteins.</p> <p>Gene Regulation in prokaryotes and eukaryotes- Basic principles of transcriptional regulation: Positive & negative; Inducible & Repressible; Activators and Repressors; Prokaryotes: Operon concept & regulation of lactose metabolism (positive and Negative) and tryptophan synthesis (Repression- Derepression and Attenuation) in E.coli; Eukaryotes: Gene silencing: Methylation, RNAi, Imprinting.</p>	12

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V*	<ol style="list-style-type: none"> 1. Preparation of LB medium and raising E. coli 2. DNA isolation from cauliflower heads 3. Quantification of unknown DNA by diphenylamine reagent. 4. Study of experiments establishing nucleic acid as genetic material (Avery et al, Griffith's, Hershey & Chase's and Fraenkel & Conrat's experiments) through photographs 5. Numericals based on DNA re-association kinetics (melting profiles and Cot curves) 6. Study of DNA replication through photographs: Modes of replication - Rolling circle, Theta and semi-discontinuous ; Semiconservative model of replication (Messelson and Stahl's experiment); Telomerase assisted end-replication of linear DNA 7. Study of structures of : tRNA (2D and 3D); prokaryotic RNA polymerase and eukaryotic RNA polymerase II through photographs 8. Understanding the regulation of lactose (lac) operon (positive & negative regulation) and tryptophan (trp) operon (Repression and De-repression & Attenuation) through photographs. 	30
<p>Recommended Books/e-resources/LMS:</p> <ol style="list-style-type: none"> 1. Watson J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M., Losick, R. (2007). Molecular Biology of the Gene, Pearson Benjamin Cummings, CSHL Press, New York, U.S.A. 6th edition. 2. Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics. John Wiley and Sons Inc., U.S.A. 5th edition. 3. Klug, W.S., Cummings, M.R., Spencer, C.A. (2009). Concepts of Genetics. Benjamin Cummings. U.S.A. 9th edition. 4. Russell, P. J. (2010). iGenetics- A Molecular Approach. Benjamin Cummings, U.S.A. 3 rd edition. 5. Griffiths, A.J.F., Wessler, S.R., Carroll, S.B., Doebley, J. (2010). Introduction to Genetic Analysis. W. H. Freeman and Co., U.S.A. 10th edition. 6. Micklos D A., Freyer G.A. (2003) DNA Science: A First Course (2nd Edition), Cold Spring Harbor Laboratory; Greg A., CSHL Press, USA 		

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Session 2025-26			
Part A			
Subject	Botany		
Semester	3 rd		
Name of the Course	Diversity of Algae		
Course Code/ID	250/BOT/CC301		
Course Type: (CC/MCC/MDC/CC - M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A7		
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- Students will be able to understand diversity of algae and classification. Students will be able to explore algal groups and recognise the contribution of Phycologists. Students will be able to understand the role and economic importance of Algae. Students will be able to examine the vegetative and reproductive structure		
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		

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questions selecting one question from each unit.

Unit	Topics	Contact Hours
I	General characteristics- Ecology and distribution; range of thallus organization; Cell structure and components; cell wall, pigment system, reserve food (of only groups represented in the syllabus), flagella; and methods of reproduction, classification; criteria, system of Fritsch, and evolutionary classification of Lee (only upto groups); significant contributions of important phycologists (F.E. Fritsch, G.M. Smith, R.N. Singh, T.V. Desikachary, H.D. Kumar, M.O.P. Iyengar).	11
II	Cyanophyta - Ecology and occurrence, range of thallus organization, cell structure, heterocyst, reproduction, economic importance; role in biotechnology. Morphology and life-cycle of <i>Nostoc</i> . Chlorophyta -General characteristics, occurrence, range of thallus organization, cell structure and reproduction. Morphology and life-cycles of <i>Chlamydomonas</i> , <i>Volvox</i> , <i>Oedogonium</i> . Evolutionary significance of <i>Prochloron</i> .	12
III	Charophyta - General characteristics; occurrence, morphology, cell structure and life-cycle of <i>Chara</i> ; evolutionary significance. Xanthophyta -General characteristics; range of thallus organization; Occurrence, morphology and life-cycle of <i>Vaucheria</i> . Phaeophyta - Characteristics, occurrence, range of thallus organization, cell structure and reproduction. Morphology and life-cycles of <i>Ectocarpus</i> , <i>Sargassum</i> and <i>Fucus</i> .	12
IV	Rhodophyta -General characteristics, occurrence, range of thallus organization, cell structure and reproduction. Morphology and life-cycle of <i>Polysiphonia</i> . Applied Phycology - Role of algae in the environment, agriculture, biotechnology and industry.	11
V*	Study of vegetative and reproductive structures of <i>Nostoc</i> , <i>Chlamydomonas</i> (electron micrographs), <i>Volvox</i> , <i>Oedogonium</i> , <i>Chara</i> , <i>Vaucheria</i> , <i>Ectocarpus</i> , <i>Sargassum</i> , <i>Fucus</i> and <i>Polysiphonia</i> , <i>Prochloron</i> through electron micrographs, temporary preparations and permanent slides	30

Recommended Books/e-resources/LMS:

1. Lee, R.E. (2008). Phycology, Cambridge University Press, Cambridge. 4th edition.
2. Prescott, L.M., Harley J.P., Klein D. A. (2005). Microbiology, McGraw Hill, India. 6th edition.
3. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West Press, Delhi.
4. Sahoo, D. (2000). Farming the ocean: seaweeds cultivation and utilization. Aravali International, New Delhi.
5. Campbell, N.A., Reece J.B., Urry L.A., Cain M.L., Wasserman S.A. Minorsky P.V., Jackson R.B. (2008). Biology, Pearson Benjamin Cummings, USA. 8th edition.
6. Pelczar, M.J. (2001) Microbiology, 5th edition, Tata McGraw-Hill Co, New Delhi.

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Session 2025-26			
Part A			
Subject	Botany		
Semester	3 rd		
Name of the Course	Diversity Of Fungi and Phytopathology		
Course Code/ID	250/BOT/CC302		
Course Type: (CC/MCC/MDC/CC - M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A8		
Level of the course(AsperAnnexure-I)			
Pre-requisite for thecourse(if any)			
Course Learning Outcomes (CLO):	<p>After completing this course, the learner will be able to</p> <p>Understand some of the selected Fungi. Students will be able to understand diversity of Fungi and classification. Students will be able to explore Fungal groups and recognise the contribution of Mycologists. Students will be able to understand the role and economic importance of Fungi. Students will be able to examine the vegetative and reproductive structure of different Fungi and Diseases cause by Microbes and Fungi.</p>		
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: 2Hours		
Practical			
Max. Marks: 25 Internal Assessment Marks:5 End Term Exam Marks: 20	Time: 2Hours		
Part B- Contents of the Course			
<p>Instructions for Paper-Setter</p> <p>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.</p>			

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Unit	Topic	Contact Hours
I	<p>Introduction to true fungi -Definition, General characteristics; Thallus organization; Cell wall composition; Nutrition; Classification.</p> <p>Chytridiomycetes -General account</p> <p>Oomycota -General characteristic; Ecology; Life cycle and classification with reference to <i>Phytophthora Albugo</i>.</p> <p>Zygomycota - General characteristics; Ecology; Thallus organisation; Life cycle with reference to <i>Rhizopus</i>.</p>	10
II	<p>Ascomycota - General characteristics (asexual and sexual fruiting bodies); Ecology; Life cycle, Heterokaryosis and parasexuality; life cycle and classification with reference to <i>Saccharomyces, Aspergillus, Penicillium, Alternaria and Neurospora, Peziza</i>.</p> <p>Basidiomycota -General characteristics; Ecology; Life cycle and Classification with reference to black stem rust on wheat <i>Puccinia</i> (Physiological Specialization), loose and covered smut (symptoms only), <i>Agaricus</i>; Bioluminescence, Fairy Rings and Mushroom Cultivation.</p>	12
III	<p>Allied Fungi - General characterises; Status of Slime molds, Classification; Occurrence; Types of plasmodia; Types of fruiting bodies.</p> <p>Deuteromycota -General characteristic; Ecology; Life cycle and classification with reference to <i>Colletotricum</i></p> <p>Symbiotic associations -Lichen – Occurrence; General characteristics; Growth forms and range of thallus organization; Nature of associations of algal and fungal partners; Reproduction.</p> <p>Mycorrhiza-Ectomycorrhiza, Endomycorrhiza and their significance.</p>	12
IV	<p>Applied Mycology -Role of fungi in biotechnology, Application of fungi in food industry (Flavour & texture, Fermentation, Baking, Organic acids, Enzymes, Mycoproteins); Secondary metabolites (Pharmaceutical preparations); Agriculture (Biofertilizers); Mycotoxins; Biological control (Mycofungicides, Mycoherbicides, Mycoinsecticides, Myconematicides); Medical mycology.</p> <p>Phytopathology -Terms and concepts; General symptoms; Geographical distribution of diseases; etiology; symptomology; Host- Pathogen relationships; disease cycle and environmental relation; prevention and control of plant diseases, and role of quarantine.</p> <p>Bacterial diseases – Citrus canker and angular leaf spot disease of Cotton.</p> <p>Viral diseases – Tobacco Mosaic viruses, vein clearing.</p>	12

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	Fungal diseases – Early blight of potato, Black stem rust of wheat, white rust of crucifers.	
V*	<p>1. Introduction to the world of fungi (Unicellular, coenocytic/septate mycelium, asocarps & basidiocarps).</p> <p>2. <i>Rhizopus</i>: study of asexual stage from temporary mounts and sexual structures through permanent slides.</p> <p>3. <i>Aspergillus</i> and <i>Penicillium</i>: study of asexual stage from temporary mounts. Study of Sexual stage from permanent slides/photographs.</p> <p>4. <i>Peziza</i>: sectioning through ascocarp.</p> <p>5. <i>Alternaria</i>: Specimens/photographs and temporary mounts.</p> <p>6. <i>Puccinia</i>: Herbarium specimens of Black Stem Rust of Wheat and infected Barberry leaves; sections/ mounts of spores on wheat and permanent slides of both the hosts.</p> <p>7. <i>Agaricus</i>: Specimens of button stage and full grown mushroom; sectioning of gills of <i>Agaricus</i>, fairy rings and bioluminescent mushrooms to be shown.</p> <p>8. Study of phaneroplasmodium from actual specimens and /or photograph. Study of Stemmonitis sporangia.</p> <p>9. <i>Albugo</i>: Study of symptoms of plants infected with <i>Albugo</i>; asexual phase study through section/ temporary mounts and sexual structures through permanent slides.</p> <p>10. Lichens: Study of growth forms of lichens (crustose, foliose and fruticose) on different substrates. Study of thallus and reproductive structures (soredia and apothecium) through permanent slides. Mycorrhizae: ectomycorrhiza and endomycorrhiza (Photographs)</p> <p>11. Phytopathology: Herbarium specimens of bacterial diseases; Citrus Canker; Angular leaf spot of cotton, Viral diseases: TMV, Vein clearing, Fungal diseases: Early blight of potato, Black stem rust of wheat and White rust of crucifers.</p>	30
Recommended Books/e-resources/LMS: <ol style="list-style-type: none"> 1. Agrios, G.N. 1997 Plant Pathology, 4th edition, Academic Press, U.K. 2. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley & Sons (Asia) Singapore. 4th edition. 3. Webster, J. and Weber, R. (2007). Introduction to Fungi, Cambridge University Press, Cambridge. 3rd edition. 4. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi and Their Allies, Macmillan Publishers India Ltd. 5. Sharma, P.D. (2011). Plant Pathology, Rastogi Publication, Meerut, India. 		

S. B. Sharma

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Session 2025-26			
Part A			
Subject	Botany		
Name of the Course	Fundamentals of Genetics		
Semester	3 rd		
Course Code/ID	250/BOT/CC303		
Course Type: (CC/MCC/MDC/CC - M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A9		
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		
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: 2Hours		
PRACTICAL			
Max. Marks: 25 Internal Assessment Marks:5 End Term Exam Marks: 20	Time: 2Hours		
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	Mendelism: History; Principles of inheritance; Chromosome theory of inheritance; Autosomes and sex chromosomes; Probability and pedigree analysis; Incomplete dominance and codominance; Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, Recessive and Dominant traits, Penetrance and Expressivity, Polygenic inheritance.	11	
II	Extrachromosomal Inheritance - Chloroplast mutation: Variegation in Four o'clock plant; Mitochondrial mutations in yeast; Maternal effects-shell coiling in snail; Infective heredity-	12	

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	<p>Kappa particles in Paramecium.</p> <p>Linkage, crossing over and chromosome mapping- Linkage and crossing over-Cytological basis of crossing over; Recombination frequency, two factor and three factor crosses; Interference and coincidence; Numericals based on gene mapping; Sex Linkage.</p>	
III	<p>Chromosomal Mutations: Deletion, Duplication, Inversion, Translocation, Aneuploidy and Polyploidy;</p> <p>Gene mutations- Types of mutations; Molecular basis of Mutations; Mutagens – physical and chemical (Base analogs, deaminating, alkylating and intercalating agents); Detection of mutations: ClB method, Attached X method. Role of Transposons in mutation.</p> <p>DNA repair mechanisms, Sex Determination, Environmental factors determining sex determination, Barr bodies, Dosage compensation.</p>	12
IV	<p>Extrachromosomal Inheritance -Chloroplast mutation: Variegation in Four o'clock plant; Mitochondrial mutations in yeast; Maternal effects-shell coiling in snail; Infective heredity-Kappa particles in Paramecium</p> <p>Population and Evolutionary Genetics- Allele frequencies, Genotype frequencies, Hardy-Weinberg Law, role of natural selection mutation, genetic drift. Genetic variation and Speciation.</p>	11
V*	<p>Mendel's laws through seed ratios. Laboratory exercises in probability and chi-square analysis.</p> <p>Chromosome mapping using test cross data.</p> <p>Pedigree analysis for dominant and recessive autosomal and sex linked traits.</p> <p>Incomplete dominance and gene interaction through seed ratios (9:7, 9:6:1, 13:3, 15:1, 12:3:1, 9:3:4)</p> <p>Blood Typing: ABO groups & Rh factor.</p> <p>Study of aneuploidy: Down's, Klinefelter's and Turner's syndromes.</p> <p>Photographs/Permanent Slides showing Translocation Ring, Laggards and Inversion Bridge.</p> <p>Study of Human and Phlox/ Allium Karyotype (normal and abnormal).</p>	30

Recommended Books/e-resources/LMS:

1. Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008). VIII ed. Principles of Genetics. Wiley India.
2. Snustad, D.P., Simmons, M.J. (2009). Principles of Genetics.V Edition. John Wiley and Sons Inc.
3. Klug, W.S., Cummings, M.R., Spencer, C.A. (2009). Concepts of Genetics.XI Edition. Benjamin Cummings.
4. Russell, P. J. (2009). iGenetics- A Molecular Approach. III Edition. Benjamin Cummings.
5. Glick, B.R., Pasternak, J.J. (2003). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington.

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6. Pevsner, J. (2009). Bioinformatics and Functional Genomics. II Edition. John Wiley & Sons.

7. Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C. and Carroll, S.B. IX Edition. Introduction to Genetic Analysis.

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Session 2025-26			
Part A			
Subject	Botany		
Semester	4 th		
Name of the Course	Diversity of Bryophytes and Pteridophytes		
Course Code/ID	250/BOT/CC401		
Course Type: (CC/MCC/MDC/CC - M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A10		
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 Students will be able to learn classification , Habit, Habitat, lifecycle of Bryophytes and Pteridophytes. Students will be able to learn about the ecological and economic importance of Bryophytes and Pteridophytes. Morphology and reproductive structure of some of the selected bryophytes and pteridophytes will be studied by the students.		
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.			

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Unit	Topic	Contact Hours
I	Characteristic features and life cycle patterns of Bryophytes. Classification; Habit and Habitat; Adaptations to land habit. Evolution of sporophyte. Ecological and Economic importance of Bryophytes.	11
II	Comparative account of Morphology and Anatomy of <i>Riccia</i> , <i>Marchantia</i> , <i>Pellia</i> , <i>Porella</i> , <i>Anthoceros</i> , <i>Sphagnum</i> and <i>Funaria</i> ; Reproduction and evolutionary trends in <i>Riccia</i> , <i>Marchantia</i> , <i>Anthoceros</i> and <i>Funaria</i> (developmental stages not included).	12
III	Characteristic features and life cycle patterns of Pteridophytes. Evolutionary concepts in Pteridophytes: Telome theory; Stelar evolution; Heterospory and seed habit Apogamy and Apospory. Ecological and Economic importance of Pteridophytes.	10
IV	Comparative account of Morphology and Anatomy of <i>Rhynia</i> , <i>Psilotum</i> , <i>Selaginella</i> , <i>Equisetum</i> , <i>Pteris</i> , <i>Marsilea</i> ; Reproduction and evolutionary trends in <i>Selaginella</i> , <i>Equisetum</i> ; and <i>Pteris</i> (developmental details not included).	12
V*	1. <i>Riccia</i> – Morphology of thallus (permanent slide). 2. <i>Marchantia</i> - Morphology of thallus, whole mount of rhizoids & Scales, vertical section of thallus through Gemma cup, whole mount of Gemmae (all temporary slides), vertical section of Antheridiophore, Archegoniophore, longitudinal section of Sporophyte (all permanent slides). 3. <i>Anthoceros</i> - Morphology of thallus, dissection of sporophyte (temporary slide), vertical section of thallus (permanent slide). 4. <i>Pellia</i> , <i>Porella</i> - Permanent slides. 5. <i>Sphagnum</i> - Morphology of plant, whole mount of leaf (permanent slide only). 6. <i>Funaria</i> - Morphology, whole mount of leaf, rhizoids, operculum, peristome, annulus, spores (temporary slides); permanent slides showing capsule section. 7. <i>Psilotum</i> - Study of specimen, transverse section of synangium (permanent slide). 8. <i>Selaginella</i> - Morphology, whole mount of leaf with ligule, transverse section of stem, whole mount of strobilus, whole mount of microsporophyll and megasporophyll (temporary slides), longitudinal section of strobilus (permanent slide). 9. <i>Equisetum</i> - Morphology, transverse section of internode, longitudinal section of strobilus, transverse section of strobilus, whole mount of sporangiophore, whole mount of spores (temporary slide), transverse section of rhizome (permanent slide). 10. <i>Pteris</i> - Morphology, transverse section of rachis, vertical section of sporophyll, wholemount of sporangium, whole mount of spores (temporary slides), transverse section of rhizome, whole mount of prothallus with sex organs and young sporophyte (permanent slide).	30

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	Botanical excursion	
<p>Recommended Books/e-resources/LMS:</p> <ol style="list-style-type: none"> 1. Buchanan, B., Gruissem, W. and Jones, R. (2000) Biochemistry and Molecular Biology of Plants. American Society of Plant Biologists. 2. Raven, P.H., Johnson, G.B., Losos, J.B. and Singer, S.R. (2005) Biology. Tata MC Graw Hill. 3. Richardson, D.H.S. (1981) The Biology of Mosses. John Wiley and Sons, New York. 4. Sambamurty (2008) A Textbook of Bryophytes, Pteridophytes, Gymnosperms and Paleobotany. IK International Publishers. 5. Shaw, A.J. and Goffinet, B. (2000) Bryophyte Biology. Cambridge University Press. 6. Vander-Poorteri (2009) Introduction to Bryophytes. COP. 7. Parihar, N.S. 1991. Bryophytes. Central Book Depot, Allahabad. 8. Parihar, N.S. 1996. The Biology and Morphology of Pteridophytes. Central Book Depot, Allahabad 		

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Session 2025-26			
Part A			
Subject	Botany		
Semester	4 th		
Name of the Course	Diversity of Gymnosperm and Paleobotany		
Course Code/ID	250/BOT/CC402		
Course Type: (CC/MCC/MDC/CC - M/DSEC/VOC/DSE/PC/AEC/VAC)	CC-A11		
Level of the course(AsperAnnexure-I)			
Pre-requisite for thecourse(if any)			
Course Learning Outcomes (CLO):	After completing this course, the learner will be able to- Students will be able about the evolution of Gymnosperms. Students will gain knowledge about the classification, distribution of the Gymnosperm. Students gain insights on Fossils and their techniques to study them. Students will learn the economic importance of the Gymnosperms.		
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:2Hours		
Practical			
Max. Marks: 25 Internal Assessment Marks:5 End Term Exam Marks: 20	Time:2Hours		
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			

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questions selecting one question from each unit.

Unit	Topic	Contact Hours
I	General account of fossils, techniques used to study fossil. Evolution of gymnosperms. Classification and distribution of Gymnosperms in India. Contribution of Prof. Birbal Sahni.	10
II	Characteristic features and life cycle patterns of Gymnosperms. Patterns of variation in morphology of gymnosperms. Ecological and Economic importance of Gymnosperms.	11
III	<i>Cycas</i> - Morphology and anatomy of coralloid roots, bulbil, leaf, root, rachis, leaflet, stem, microsporophyll and megasporophyll, reproductive structures (male and female cone), ovule and Seed. <i>Pinus</i> - Morphology and anatomy of long and dwarf shoots, root, needle, stem, microsporophyll, megasporophyll male and female cones, Microspores, Megaspore, Ovule and seed. (developmental stages and EM studies not included).	13
IV	<i>Ephedra</i> - Morphology, and anatomy of root, stem and leaf. Reproductive structure of male and female strobilus, ovule and seed. Morphology and anatomy of <i>Gnetum</i> . (developmental stages and EM studies not included). Modern methods of propagation of gymnosperms: somatic embryogenesis, haploids and protoplast culture.	11
V*	Study of habit, structure and reproductive structures of <i>Cycas</i> , <i>Pinus</i> , <i>Ephedra</i> , <i>Gnetum</i> * temporary mounts and permanent slides (Fresh material whichever available). *Only through permanent slides <i>Cycas</i> - Morphology (coralloid roots, bulbil, leaf), whole mount of microsporophyll, transverse section of coralloid root, transverse section of rachis, vertical section of leaflet, vertical section of microsporophyll, whole mount of spores (temporary slides), longitudinal section of ovule, transverse section of root (permanent slide). <i>Pinus</i> - Morphology (long and dwarf shoots, whole mount of dwarf shoot, male and female cones, transverse section of Needle, transverse section of stem, longitudinal/ transverse section of male cone, whole mount of microsporophyll whole mount of Microspores (temporary slides), longitudinal section of female cone, tangential longitudinal section and radial longitudinal sections stem (permanent slide) <i>Ephedra</i> - Morphology, transverse section stem, Vertical section leaf. Male and Female cone. <i>Gnetum</i> - Morphology (stem, male & female cones), transverse section of stem, vertical section of ovule (permanent slide), Study of fossils through Photographs/Specimens/Herbarium Botanical excursion	30

Recommended Books/e-resources/LMS:

1. Bhatnager, S.P. and Moitra, A. (1996) Gymnosperms. New Age International (P) Ltd.

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Publishers, New Delhi.

2. Buchanan, B., Gruissem, W. and Jones, R. (2000) Biochemistry and Molecular Biology of Plants. American Society of Plant Biologists.

3. Raven, P.H., Johnson, G.B., Losos, J.B. and Singer, S.R. (2005) Biology. Tata MC Graw Hill.

4. Richardson, D.H.S. (1981) The Biology of Mosses. John Wiley and Sons, New York.

5. Sambamurty (2008) A Textbook of Bryophytes, Pteridophytes, Gymnosperms and Paleobotany. IK International Publishers. 6. Bhatnagar SP and Mohitra A 1996 Gymnosperms. New Age Publishers, New Delhi.

S. B. Sharma

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Session 2025-26	
Part A	
Subject	Botany
Semester	4 th
Name of the Course	Reproductive Biology of Angiosperm
Course Code/ID	250/BOT/CC403
Course Type:	CC-A12

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(CC/MCC/MDC/CC

- M/DSEC/VOC/DSE/PC/AEC/VAC)			
Level of the course(AsperAnnexure-I)			
Pre-requisite for thecourse(if any)			
Course Learning Outcomes (CLO):		After completing this course, the learner will be able to- Student would have an understanding of - Induction of flowering and molecular and genetic aspects of flower development. Students will gain knowledge on Pollen development, dispersal and pollination. Students will be able to understand Ovule development, fertilization, Endosperm development and its importance Students will be able to learn pathways of reproduction. Student would be able to apply this knowledge for conservation of pollinators and fruit development	
Credits	Theory	Practica l	Total
	3	1	4
Contact Hours	3	2	5
THEORY			
Max. Marks: 75 Internal Assessment Marks:25 End Term Exam Marks: 50		Time: 2Hours	
PRACTICAL			
Max. Marks: 25 Internal Assessment Marks:5 End Term Exam Marks: 20		Time: 2Hours	
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	Introduction: History and scope, Anther: Structure, ontogeny; tapetum; structure and functions; micro-sporogenesis; callose deposition and its significance, Microgametogenesis, pollen wall development, MGU (male germ unit) structure, NPC system, pollen wall proteins; pollen viability, storage and germination;		11

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	pollen tube structure.	
II	Ovule: Structure, ontogeny, types; special structures – endothelium, operculum, obturator, aril, arillode, caruncle, hypostase, epistase: female gametophyte – megasporogenesis and megagametogenesis: organization and ultra structure of mature embryo sac.	11
III	Pollination and Fertilization: Pollination types and significance; adaptations; pollination biology; pollen-pistil Interaction; structure of stigma and style; double fertilization. Self Incompatibility: Basic concepts; methods to overcome self incompatibility	11
IV	Endosperm: Types, development and functions; endosperm haustoria. Embryogenesis: Classification, development, organization and differentiation of crucifer and Najas embryo; embryo– endosperm relationship; physiological and genetical control. Polyembryony and Apomixes: Introduction; classification; causes and applications. Development of seed, modes of seed dispersal.	12
V*	1. Photographs of eminent embryologists. 2. Anther: wall and its ontogeny; tapetum; microsporogenesis, stages (slides and fresh material). 3. Pollen grains: fresh and acetolysed, ornamentation and aperture; pollen viability: tetrazolium test. 4. Pollen germination: in different media; calculation of percentage germination; male germ unit (MGU): through photographs. 5. Ovule: types; unitegmic, bitegmic; tenuinucellate and crassinucellate (permanent slides/ specimens/photographs). 6. Female gametophyte through permanent slides/ photographs: types and ultrastructure of mature embryo sac. 7. Style and stigma through suitable preparations: unpollinated and pollinated stigma and style; wet and dry stigma; hollow and solid styles; tracing and path of pollen tube. 8. Intra-ovarian pollination; test tube pollination/ fertilization: through photographs. 9. Endosperm: dissections of developing seeds for free-nuclear endosperm with haustoria; types (permanent slides). 10. Embryogenesis: study of development of dicot embryo through permanent slides; dissection of developing seeds for embryos at various developmental stages; study of suspensor through electron micrographs.	30

Recommended Books/e-resources/LMS:

1. Raghavan, V. (2000) Developmental Biology of Flowering plants, Springer, Netherlands.
2. Raghavan, V. (1997) Molecular embryology of flowering plants. Cambridge, University Press.
3. Shivanna, K.R. (2003) Pollen Biology and Biotechnology, Science Publishers.
4. Bhojwani, S.S. and Bhatnagar SP (2004) The Embryology of Angiosperms, Vikas

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5. Johri, B.M. (1984), Embryology of Angiosperms, Springer-Verlag, Netherlands.

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Session 2025-26			
Part A			
Subject	Botany		
Semester	1 st		
Name of the Course	Plant Hybridization		
Course Code/ID			
Course Type: (CC/MCC/MDC/CC - M/DSEC/VOC/DSE/PC/AEC/VAC)	SEC-1		
Level of the course (As per Annexure-I)			
Pre-requisite for the course(if any)			
Course Learning Outcomes (CLO):	<p>After completing this course, the learner will be able to-</p> <ol style="list-style-type: none"> 1. Gain knowledge of plant reproductive structures and processes, including flower anatomy, pollination mechanisms, and fertilization 2. Comprehend the basic principles and concepts of plant hybridization 3. Learn practical skills in plant hybridization techniques 4. Foundational understanding of plant breeding principles 5. Gain knowledge about the floral structures and underlying plant breeding techniques 		
Credits	Theory	Practical	Total
	1	2	3
Contact Hours	1	4	5
Theory			
Max. Marks: 25 Internal Assessment Marks: 5 End Term Exam Marks: 20	Time: 2 Hours		
Practical			
Max. Marks: 50 Internal Assessment Marks: 15 End Term Exam Marks: 35	Time: 2 Hours		
Part B- Contents of the Course			
<p style="text-align: center;">Instructions for Paper-Setter</p> <p>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.</p>			

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Unit	Topic	Contact Hours
I	General objectives of plant breeding Major achievements, Future Prospects. Self-incompatibility- Definition, classification, heteromorphic SI, homomorphic SI i.e. gametophytic SI and sporophytic SI, utilization of self-incompatibility in plant breeding	3
II	Definition and concept of population genetics, random mating population, gene and genotypic frequency Hardy-Weinberg law- Law, its validity, factors affecting gene frequency Heterosis- Definition, heterosis and hybrid vigour, effects and estimation of heterosis, genetic basis/theories of heterosis Inbreeding depression Definition, effects of inbreeding.	4
III	Hybridization techniques- Definition, aim and objectives, types of hybridization, steps and procedure of hybridization programme choice of parents, evaluation of parents, emasculation – different methods, bagging, tagging, pollination, harvesting and storing of the F1 seeds and selfing, consequences of hybridization Wide hybridization- Definition, types, main features, interspecific and intergeneric hybridization, its examples, incompatibility barriers for wide hybridization, techniques for overcoming incompatibility barriers, achievements	4
IV	Methods of breeding in self-pollinated crops- Pure line selection, mass selection, pedigree method, bulk method. Methods of breeding in cross pollinated crops- list of plant breeding methods for cross pollinated crops Modes of selection- Recurrent selection, its types and its procedure	4
V	1. Study of floral structure of self- pollinated crops. 2. Study of floral structure of cross pollinated crops. 3. Emasculation methods: hand, hot water, cold water, alcohol, suction, chemical emasculation 4. Designs used in plant breeding experiment 5. Study of male sterility system 6. To test pollen viability/incompatibility 7. Field equipment's used in plant breeding. 8. incompatibility studies in horticultural crops. 9. Determination of mode of reproduction in crop plants, handling of breeding material ,segregating generations(pedigree ,bulk and back cross methods). 10. Field visit / Educational excursion and report.	60

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<p>Recommended Books/e-resources/LMS:</p> <ol style="list-style-type: none"> 1. Plant Breeding Principles and Methods by B.D. Singh, Kalyani publication, New Delhi 2. Essentials of Plant Breeding by Phun dan Singh, Kalyani Publication New Delhi 2. Principles and Practices Plant Breeding by J. R. Sharma, McGraw Hill Publishing company Limited, New Delhi. 3. Plant Breeding Theory and Practices by V.L. Chopra, Oxford and IBH. Publishing Company, New Delhi. 4. Introduction to Plant Breeding by R.C. Choudhary, Oxford and IBH. Publishing Company, New Delhi. 1. 6. Elementary Principles of Plant Breeding by R.C. Choudhary, Oxford and IBH. Publishing Company, New Delhi. 		

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Session 2025-26			
Part A			
Subject	Botany		
Semester	2 nd		
Name of the Course	Vertical Farming		
Course Code/ID			
Course Type: (CC/MCC/MDC/CC - M/DSEC/VOC/DSE/PC/AEC/VAC)	SEC-2		
Level of the course (As per Annexure-I)			
Pre-requisite for the course(if any)			
Course Learning Outcomes (CLO):	<p>After completing this course, the learner will be able to-</p> <ol style="list-style-type: none"> 1. Understand the principles and concepts of vertical farming systems such as such as hydroponics, aeroponics, and aquaponics 2. Learn how to select suitable crops for vertical farming and understand best practices for their cultivation 3. Understand the principles of designing and planning a vertical farm 4. Explore the economic aspects of vertical farming, including business models, market trends, and the financial viability of vertical farming 5. Gain knowledge and hand on experience in growing plants under various conditions and systems of vertical farming 		
Credits	Theory	Practical	Total
	1	2	3
Contact Hours	1	4	5
Theory			
Max. Marks: 25 Internal Assessment Marks: 5 End Term Exam Marks: 20	Time:2 Hours		
Practical			
Max. Marks: 50 Internal Assessment Marks:15 End Term Exam Marks: 35	Time: 2 Hours		
Part B- Contents of the Course			
<p>Instructions for Paper-Setter</p> <p>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</p>			

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questions selecting one question from each unit.

Unit	Topic	Contact Hours
I	Vertical farming: concept, application and future prospects, vertical farms in India and world Media used in vertical farming, design and working of vertical farms Types of vertical farms: abandoned buildings, shipping container, underground	4
II	Methods of vertical farming, selection of appropriate plants for vertical farming Introduction to Hydroponics and its types, Management of variables, disinfection of system, pest management. Aeroponics and Aquaponics	3
III	Propagation of crops: sexual and asexual propagation, its advantages and disadvantages; different methods of asexual propagation: cutting, layering, budding, grafting; factors influencing successful grafting/budding union, selection of buds; propagation of plants using specialized parts.	4
IV	Rooftop farming/greenhouses: strategies/technological solutions for management of climate, lightning, carbon dioxide enrichment and other parameters Opportunities & amp; advantages of vertical farming- Environmental and economic benefits. Challenges for sustainability of vertical farming.	4
V*	<ol style="list-style-type: none"> 1. To grow plants under hydroponics and aeroponics. 2. Compare the rate of growth and Vigor of hydroponically/aeroponically grown plants (under nutrient-rich and nutrient-deficient water conditions. 3. To study the aquaponics system in reference to simultaneously grown plants and fish in the same system. 4. To study the wind-powered vertical farming tower. 5. To study sustainable farming techniques for urban areas. 6. To study the wing-powered vertical tower. 7. Preparation and composition of medium used in different Hydroponic crops with basic knowledge of macro and micronutrients. 8. To study the structure of greenhouse for controlled environmental conditions. 9. A short term project : <ol style="list-style-type: none"> a. Vertical farming for green leafy vegetables. b. Vertical farming for flowering plants. c. Vertical farming for tomato, cucumber. d. Cost calculation for output. 	60

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<p>Recommended Books/e-resources/LMS:</p> <ol style="list-style-type: none"> 1. Plant Breeding Principles and Methods by B.D. Singh, Kalyani publication, New Delhi 2. Essentials of Plant Breeding by Phundan Singh, Kalyani Publication New Delhi 3. Principles and Practices Plant Breeding by J. R. Sharma, McGraw Hill Publishing company Limited, New Delhi. 4. Plant Breeding Theory and Practices by V.L. Chopra, Oxford and IBH. Publishing Company, New Delhi. 5. Introduction to Plant Breeding by R.C. Choudhary, Oxford and IBH. Publishing Company, New Delhi. 6. Elementary Principles of Plant Breeding by R.C. Choudhary, Oxford and IBH. Publishing Company, New Delhi. 		

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Session 2025-26			
Part A			
Subject	Botany		
Semester	6 th		
Name of the Course	Olericulture		
Course Code/ID			
Course Type: (CC/MCC/MDC/CC - M/DSEC/VOC/DSE/PC/AEC/VAC)	SEC-3		
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. Distinguish the growing of vegetables according to season and climate 2. Understand and explain the special intercultural operations done in vegetable crops 3. Study of morphology and taxonomy of different vegetable crops 4. Identify the diseases and pests of vegetable crops and their management 5. Grow and produce various types of vegetables and understanding of package and practices of vegetable crops.		
Credits	Theory	Practical	Total
	1	2	3
Contact Hours	1	4	5
Theory			
Max. Marks: 25 Internal Assessment Marks: 5 End Term Exam Marks: 20	Time: 2 Hours		
Practical			
Max. Marks: 50 Internal Assessment Marks: 15 End Term Exam Marks: 35	Time: 2 Hours		
Part B- Contents of the Course			
<p style="text-align: center;">Instructions for Paper-Setter</p> <p>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</p>			

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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	Importance of vegetable cultivation in India and Haryana. Export and import potential of vegetables in India. Constraints in vegetable production and remedies to overcome them.	3
II	Importance, morphology and taxonomy, varieties, climate and soil, seeds and sowing, manuring, irrigation, intercultural operations, diseases and their control, harvesting and yield of following crops: Cultivation of (a) Brinjal (b) Tomato (c) coriander (d) Spinach.	4
III	Importance, morphology and taxonomy, varieties, climate and soil, seeds and sowing, manuring, irrigation, intercultural operations, diseases and their control, harvesting and yield of following crops: Cultivation of (a) Carrot (b) Beet root.	4
IV	Importance, morphology and taxonomy, varieties, climate and soil, seeds and sowing, manuring, irrigation, intercultural operations, diseases and their control, harvesting and yield of following crops: Cultivation of (a) mung bean and (b) chick pea	3
V*	1. Demonstration of seed germination test for a vegetable seed. 2. Demonstration of seed viability test. 3. Identification of vegetable seeds and vegetable crops at different growth stages. 4. Preparing vegetable nursery beds. 5. Raising vegetable seedlings in nursery bed and portrays. 6. Identification of major diseases and insect pests of vegetables. 7. Land preparation for sowing/ transplanting of vegetable crops. 8. Sowing/ transplanting of vegetables in main field. 9. Fertilizer application for vegetable growing. 10. Irrigation practices in a vegetable crop field. 11. A report on vegetable crops in a locality. Collection and preparation of herbarium of vegetable crops in their locality	30

Recommended Books/e-resources/LMS:

1. Bose T K et al. (2003) Vegetable crops, Naya Udhog Publishers, Kolkata.
2. Singh D K (2007) Modern vegetable varieties and production, IBN Publisher Technologies, International Book Distributing Co, Lucknow.
3. Premnath, Sundari Velayudhan and D P Sing (1987) Vegetables for the tropical region, ICAR, New Delhi.
4. Chauhan Shohaib Sheikh Ayub (2021) A textbook of Olericulture. New Visual

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Session 2025-26			
Part A			
Subject	Botany		
Semester	1 st		
Name of the Course	Plant Diversity		
Course Code/ID			
Course Type: (CC/MCC/MDC/CC - M/DSEC/VOC/DSE/PC/AEC/VAC)	MIC-1		
Level of the course(As per Annexure-I)			
Pre-requisite for the course(if any)			
Course Learning Outcomes (CLO):	<p>After completing this course, the learner will be able to</p> <ol style="list-style-type: none"> 1. The general characteristics of microorganisms, algae, fungi, and lichens will be understandable to students. 2. Students will acquire a conceptual grasp of bryophytes and 3. pteridophytes. 4. Students will acquire knowledge about the fundamental features of gymnosperms. 5. Students will acquire a foundational understanding of angiosperm morphology. 6. Student will gain the knowledge about the practical aspects related to identification, structure, economic values of microorganisms, algae, fungi, bryophytes, pteridophytes gymnosperms, and angiosperms. 		
Credits	Theory	Practical	Total
	1	1	2
Contact Hours	1	2	3
THEORY			
Max. Marks: 25 Internal Assessment Marks: 5 End Term Exam Marks: 20	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			
<p align="center">Instructions for Paper-Setter</p> <p>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.</p>			

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Unit	Topic	Contact Hours
I	General characteristics, morphology and economic importance of viruses, bacteria, algae, fungi and lichens.	4
II	General characteristics, morphology and economic importance of Bryophytes and Pteridophytes.	4
III	General characteristics, morphology and economic importance of Gymnosperms.	4
IV	General characteristics, morphology and economic importance of Angiosperms.	3
V*	1. Identification of some common algae and fungi. 2. Morphological study of some common Bryophytes. 3. Morphological study of some common Pteridophytes. 4. Morphological study of some common Gymnosperms. 5. Morphological study of some common Angiosperms.	30

Recommended Books/e-resources/LMS:

1. Wiley, J.M., Sherwood, L.M. and Woolverton, C.J.(2019) Prescott's Microbiology. 11th Edition. McGraw Hill International.
2. Lee, R.E.(2018) Phycology. 5th Edition. Cambridge University Press.
3. Ahluwalia, A.S.(2020). Phycology: Principles, Processes and Applications. Daya Publishing House, New Delhi.
4. Dube, H.C. (2012). An Introduction to Fungi, Vikas Publishing House Pvt. Ltd., Delhi. 4th edition.
5. Mehrotra, R.S. and Aggarwal, Ashok (2013) Fundamentals of Plant Pathology, Tata McGraw-Hill Publishing company Ltd, New Delhi
6. Pelczar, M.J. (2001) Microbiology, 5th edition, Tata McGraw-Hill Co, New Delhi.
7. Sethi, I.K. and Walia, S.K.(2011). Textbook of Fungi & Their Allies, MacMillan Publishers Pvt. Ltd., Delhi.
8. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R. (2005). Biology. Tata McGraw Hill, Delhi, India.
9. Sharma, O.P.(2017). Text Book of Pteridophyta, McMillan India Ltd.
10. Thakur, A.K. and Bassi, S.K. (2008). Diversity of Microbes and Cryptogams. S. Chand & Co., Delhi.
11. Vanderpoorten, A. & Goffinet, B.(2009) Introduction to Bryophytes. Cambridge University Press.
12. Vashishta, P.C., Sinha, A.K., Kumar, A.,(2010). Pteridophyta, S.Chand. Delhi, India
13. Vashishta, P.C., Sinha, A.K., Kumar, A.,(2010). Gymnosperms, S.Chand. Delhi, India
14. Pandey, B.P.(2001). A Textbook of Botany-Angiosperms, S.Chand. Delhi, India

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Session 2025-26			
Part A			
Subject	Botany		
Semester	2 nd		
Name of the Course	Plant for Human Welfare		
Course Code/ID			
Course Type: (CC/MCC/MDC/CC - M/DSEC/VOC/DSE/PC/AEC/VAC)	MIC-2		
Level of the course(As per Annexure-I)			
Pre-requisite for the course(if any)			
Course Learning Outcomes (CLO):	<p>After completing this course, the learner will be able to</p> <ol style="list-style-type: none"> 1. Students will acquire a foundational understanding of plant diversity. 2. Students will develop a conceptual grasp of plants utilized for human welfare. 3. Students will gain knowledge about the origins of certain cultivated plants. 4. Students will acquire a conceptual understanding of the utilization of fruits, nuts, and other plant components for human welfare. 5. Students will acquire the knowledge about the economic valuable plants and their products. 		
Credits	Theory	Practical	Total
	1	1	2
Contact Hours	1	2	3
Theory			
Max. Marks: 20 Internal Assessment Marks: 5 End Term Exam Marks: 25	Time: 2 Hours		
Practical			
Max. Marks: 20 Internal Assessment Marks: 5 End Term Exam Marks: 20	Time: 2 Hours		
Part B- Contents of the Course			
Instructions for Paper-Setter			
<p>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.</p>			

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Unit	Topic	Contact Hours
I	Biodiversity: levels of Biodiversity (Genetic, species and ecosystem), Types, Biodiversity Loss, Agrobiodiversity, Factors affecting biodiversity over exploitation, habitat loss and degradation, invasive species, natural calamities	3
II	Role of plants in relation to Human Welfare; Importance of Forestry, their utilization and commercial aspects. Purpose and benefits of avenue trees and ornamental plants Economic and ecological Importance of agro forestry and social forestry. Ornamental plants and avenue of India. Soil erosion and conservation methods.	4
III	Origin of Cultivated Plants (Vavilov theory) Morphology and economic importance of: Food plants-Cereals (Rice, Wheat and Maize). Pulses - Gram, Arhar and Pea. Processing and uses of rubber and sugarcane	4
IV	Fruits and nuts: Important fruit crops (Mango, Apple Citrus, Almonds and cashewnut) and their commercial importance. Spices and condiments (clove, Black pepper, turmeric, ginger and coriander). Wood (heart wood, sap wood, porous wood, non porous wood, sheesham, teak, deodar) and its uses.	4
V*	1. Identification and study of some important medicinal plants. 2. Identification and study of some common ornamental plants. 3. Identification and study of some important cereals. 4. Identification and study of some important pulses. 5. Identification and study of some important spice yielding plants. 6. Study of different types of woods. 7. Study of different fruit types.	30

Recommended Books/e-resources/LMS:

1. Singh, V., Pande, P.C., Jain, D.K. 2018. Economic Botany, Rastogi Publications.
2. Kocchar, S.L. 2016. Economic Botany: A Comprehensive Study, 5Ed, Cambridge India.
3. Wickens, G.E. 2001. Economic Botany: Principles and Practices, Springer.
4. Singh, V., Pande, P.C., Jain, D.K. 2018. Economic Botany, Rastogi Publications.
5. Daubenmire, R.F. Plants & Environment (2nd Edn.) John Wiley & Sons., New York 22
6. Odum E.P. 2005. Fundamentals of Ecology (5th Edn.) Saunders & Co., Philadelphia
7. S. SundarRajan-2007. College Botany Vol-V, Part I: Taxonomy and Economic Botany Himalaya Publishing House.
8. SusilKumar Mukharjee-2004. College Botany Vol-III. New Central Book agency, London

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Session 2025-26			
Part A			
Subject	Botany		
Semester	3 rd		
Name of the Course	Organic Farming		
Course Code/ID			
Course Type: (CC/MCC/MDC/CC - M/DSEC/VOC/DSE/PC/AEC/VAC)	MIC-3		
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 be able to understand the need and concept of organic and integrated farming system.2. Students will develop a conceptual understanding of plant nutrients, utilization of biofertilizers.3. Students will gain knowledge about the disease and pest management4. Students will learn about the use of plant products in organic farming, quality control and certification procedures of organic products.5. Students will gain the knowledge of practical aspects of organic and integrated farming system, role of nutrient in plant growth, utilization of plant and animal waste in organic farming, and also learn about the standardization procedures		
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: 2Hours		

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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	Basics of organic farming – Concept and components of organic farming, aims and objectives; Need of organic farming; Historical development of organic farming in India; Status of organic farming in India; Advantages and disadvantages of organic farming. Organic farming process- Concept of farming system, Developing organic farms, Important steps & methods; Pure organic farming and integrated farming system (combination of organic and inorganic).	11
II	Plant nutrients: Essential plant nutrients, their role in plant growth and development, Nutrient uptake and utilization by plant. Nutrient management in organic farming: Balanced nutrients supply for organic farming system using nutrients from organic sources. Preparation, nutrient content and methods of use of following- FYM/Rural compost, mulching, city compost, oil cakes, animal wastes, vermicomposts, vermiwash, jeevamrit, beejamrit, green manures, biofertilizers	11
III	Bio fertilizers and their method of use – Nitrogenous, Phosphatic, Potassic, availability of nutrients from above sources. Recycling of organic matter in organic agriculture-Transformation of organic substances in soil. Disease and pest management in organic farming-Integrated pest & disease managements; Organic pesticides, bio-pesticides; Inorganic pesticides, disadvantages of their use; Seed, seedling and soil treatment measures; Feasibility of complete dependence on organic sources. Weed management in organic farming	12
IV	Use of Neem and other plant products in organic farming; Organic agrihorticulture in urban & semi urban areas. Certification, Standardization, Marketing - Quality control and certification procedures of organic products. Organic standards In India. Govt. schemes related to organic farming in India. Potential demand and Marketing of organic products. Organic farming and food security in India.	11

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V*	<ol style="list-style-type: none"> 1. Preparation of compost by open air composting. 2. Preparation of vermicompost. 3. Comparative analysis of plants grown in compost prepared in 1 and 2. • Determining the effectiveness of neem extract in pest control. 4. Comparative analysis of plants grown in the presence of organic and inorganic fertilizers. 5. Comparative analysis of nitrogen content in organic and inorganic fertilizers. 6. Comparative analysis of phosphorous content in organic and inorganic fertilizers. 	30
Recommended Books/e-resources/LMS: <ol style="list-style-type: none"> 1. Chandran, S., Unni M.R., Thomas, S. Meena, D.K. 2023. Organic Farming: Global Perspectives and Methods. Elsevier. 2. Somasundaram, E. Udhaya Nandhini, D., Meyyappan, M. 2021. Principles of Organic Farming. CRC Press. 3. Chandran, S., Thomas, S., Unni M.R. 2019. Organic Farming: New Advances Towards Sustainable Agricultural Systems. Springer. 4. Giri b, Prasad, R. Qiang-Sheng, W. & Varma A. 2019. Biofertilizers for sustainable agriculture and environment (Soil Biology Book 55). Springer. 5. Chandran, S., Unni M.R., Thomas, S. 2018. Organic Farming: Global Perspectives and Methods. Elsevier. 6. Subbarao, N.S. 2017. Bio-fertilizers in Agriculture and Forestry. MedTech Publishers. 4th edition. 7. Hermary, H. 2007. Working with nature. Gaia College Inc. 		

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Session 2025-26			
Part A			
Subject	Botany		
Semester	6 th		
Name of the Course	Floriculture		
Course Code/ID			
Course Type: (CC/MCC/MDC/CC - M/DSEC/VOC/DSE/PC/AEC/VAC)	MIC-6		
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 be able to understand the importance and scope of floriculture, management of nursery and gardens, methods of plant propagation. 2. Students will develop a conceptual understanding of different types of ornamental plants. 3. Students will gain knowledge about the various types of gardens and importance of landscaping. 4. Students will learn about commercial floriculture and cultivation of important cut flowers. 5. Students will gain the knowledge of practical aspects of floriculture, management of nursery, maintenance of gardens, vase life of cut flowers, various methods used for the propagation of ornamental plants, hydroponics, and disease management.		
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		

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Part B- Contents of the Course		
Instructions for Paper-Setter		
<p>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.</p>		
Unit	Topic	Contact Hours
I	Introduction:History, importance andscope of floriculture and landscape gardening. Nursery management and routine garden operations: Sexual and vegetative methods of propagation; Soil sterilization; Seed sowing; Pricking; Planting and transplanting; Shading; Stopping or pinching; Defoliation; Wintering; Mulching; Topiary; Role of plant growth regulators	11
II	Ornamental Plants: Flowering annuals; Herbaceous perennials; Divine vines; Shade and ornamental trees; Ornamental bulbous and foliage plants; Cacti and succulents; Palms and Cycads; Ferns and Selaginellas; Cultivation of plants in pots; Indoor gardening; Bonsai.	11
III	Principles of Garden Designs: English, Italian, French, Persian, Mughal and Japanese gardens; Features of a garden (garden wall, fencing, steps, hedge, edging, lawn, flower beds, shrubbery, borders, water garden. Some famous gardens of India. Landscaping of places of public importance: Landscaping highways and educational institutions	12
IV	Commercial floriculture: Factors affecting flower production; Production and packaging of cut flowers; Flower arrangements; Methods to prolong vase life. Cultivation of Important cut flowers- Carnation, Aster, Chrysanthemum, Dahlia, Gerbera, Gladiolous, Marigold, Rose, Lilium). Diseases and Pests of Ornamental Plants.	11
V	<ol style="list-style-type: none"> 1. Plant propagation by cutting. 2. Plant propagation by grafting. 3. Plant propagation by air-layering. 4. Investigating the effect of different flower preservatives on the vase life of common ornamental flowers. 5. Setting up a laboratory scale hydroponics setup. 6. Preparation of different types of floral arrangements. 7. Morpho-anatomical study of different types of flowers. 8. Study of different diseases in ornamental plants. 	30

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Recommended Books/e-resources/LMS:

1. Singh, A.K. & Kumar A. 2023. Plant Propagation and Nursery management. S.K. Kataria and sons.
2. Arora, J.S. 2016. Introductory Ornamental Horticulture. Kalyani Publishers. 8th edition.
3. Jain, S.M. & Ochatt, S.J. 2009. Protocols for in vitro propagation of ornamental plants: 598 (Methods in Molecular Biology). Humana Press.
4. Prasad S & Kumar U. 2003. Commercial Floriculture. Agrobios
5. Lauria A & Victor HR. 2001. Floriculture – Fundamentals and Practices Agrobios.

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Session 2025-26			
Part A			
Subject	Botany		
Semester	1 st		
Name of the Course	Fundamentals Of Botany		
Course Code/ID			
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/VAC)	MDC-1		
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 gain a foundational understanding of the biology of microorganisms, algae, fungi and lichens. 2. Students will develop a conceptual understanding of bryophytes and pteridophytes. 3. Students will acquire knowledge about the fundamental characteristics of gymnosperms and the challenges related to their propagation. 4. Students will acquire a basic understanding of angiosperm morphology. 5. Students will be able to learn the practical aspects of microorganisms, algae, fungi and students will be able to identify the major groups of plants and compare the characteristics of higher plants (angiosperms and gymnosperms) and lower plants (bryophytes and pteridophytes).		
Credits	Theory	Practical	Total
	2	1	3
Contact Hours	2	2	4
Theory			
Max. Marks: 50 Internal Assessment Marks: 15 End Term Exam Marks: 35	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			

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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	General characteristics, morphology and economic importance of viruses, bacteria algae, fungi and lichens.	7
II	General characteristics, morphology and economic importance of Bryophytes and Pteridophytes. Similarities, differences with algae and gymnosperm	7
III	Fossils (living fossil, pseudo fossils, process and importance of fossils), Gymnosperms (<i>Cycas</i> , <i>Pinus</i>), general characters, xerophytic characters, well labelled diagrams of male and female cone of <i>Cycas</i> and <i>Pinus</i> . Similarities, differences with pteridophytes and angiosperms	8
IV	General characteristics, morphology and economic importance of Angiosperms (Monocot and Dicot). Well labelled diagram of a typical flower. Difference between Dicots and monocots.	8
V*	<p>Cyanobacteria & Algae: Study of slides of <i>Nostoc</i> and <i>Volvox</i> through permanent slides.</p> <p><i>Agaricus</i>: Specimens of button stage and full grown mushroom.</p> <p><i>Marchantia</i> & <i>Funaria</i>-morphology of thallus through permanent slides.</p> <p><i>Selaginella</i> & <i>Equisetum</i>- morphology specimen study.</p> <p><i>Cycas</i> & <i>Pinus</i>-morphology specimen study.</p> <p>Study of vegetative and floral characters of the one or two members of some important families (Malvaceae, Solanaceae, Poaceae)</p> <p>Excursion Report: Report on excursion tours with photographs, collection, preservation and preparation of herbarium sheets and specimens related to Archegoniates and Angiosperms.</p> <p>Mounting of a collected, properly dried and pressed specimen of minimum 20 wild plants with herbarium label.</p>	30

Recommended Books/e-resources/LMS:

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1. Wiley, J.M., Sherwood, L.M. and Woolverton, C.J. (2019) Prescott's Microbiology. 11th Edition. McGraw Hill International.
2. Lee, R.E.(2018) Phycology. 5th Edition. Cambridge University Press.
3. Ahluwalia, A.S.(2020). Phycology: Principles, Processes and Applications. Daya Publishing House, New Delhi.
4. Dube, H.C. (2012). An Introduction to Fungi, Vikas Publishing House Pvt. Ltd., Delhi. 4th edition.
5. Mehrotra, R.S. and Aggarwal, Ashok (2013) Fundamentals of Plant Pathology, Tata McGraw-Hill Publishing company Ltd, New Delhi
6. Pelczar, M.J. (2001) Microbiology, 5th edition, Tata McGraw-Hill Co, New Delhi.
7. Sethi, I.K. and Walia, S.K. (2011). Textbook of Fungi & Their Allies, Mac Millan Publishers Pvt. Ltd., Delhi
8. Sharma, O.P. (2017). Text Book of Pteridophyta, McMillan India Ltd.
9. Vashishta, P.C., Sinha, A.K., Kumar, A., (2010). Pteridophyta, S.Chand. Delhi, India
10. Vashishta, P.C., Sinha, A.K., Kumar, A., (2010). Gymnosperms, S.Chand. Delhi, India
11. Pandey, B.P. (2001). A Textbook of Botany-Angiosperms, S.Chand. Delhi, India

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Subject	Botany		
Semester	2 nd		
Name of the Course	Economic Botany		
Course Code/ID			
Course Type: (CC/MCC/MDC/CC - M/DSEC/VOC/DSE/PC/AEC/VAC)	MDC-2		
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 gain a foundational understanding of the origins of significant cultivated plants. 2. Students will develop a conceptual understanding of important plants that yield vegetables, fiber, and oil. 3. Students will acquire knowledge about the cultivation techniques of essential plants. 4. Students will gain a conceptual understanding of the processing methods applied to economically significant plants. 5. Students will be able to gain the knowledge of economic values of cereals, legumes, spices, oil & fibre yielding plants.		
Credits	Theory	Practical	Total
	2	1	3
Contact Hours	2	2	4
Theory			
Max. Marks: 50 Internal Assessment Marks:15 End Term Exam Marks: 35	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

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I	Morphology and economic importance of: Food plants-Cereals (Rice, Wheat and Maize). Pulses - Gram, Arhar and Pea.	7
II	Morphology and economic importance of: Vegetables: Potato, Tomato and Onion. Fibers: Cotton, and jute Oils: Mustard and Coconut.	7
III	Morphology and economic importance of the following: Spices: Black pepper, Coriander, Ginger, Cloves and Turmeric. Medicinal Plants: <i>Cinchona</i> , <i>Atropa</i> , <i>Opium</i> , <i>Cannabis</i> , <i>Azadirachta</i> .	8
IV	Botanical description and processing of: Beverages: Tea and Coffee. Wood: Sheesham, teek, deodar and its uses. Processing and uses of rubber and sugarcane.	8
V*	1. Study of economically important plants: Wheat, Rice, Maize, Gram, Pea, Arhar, Black pepper, Ginger, Clove, Tea, Coffee, Cotton, Coconut, Mustard. 2. Collection and preparation of reports on various crops and economically important plants being cultivated/wildly available in your area.	30
<p>Recommended Books/e-resources/LMS:</p> <ol style="list-style-type: none"> 1. Singh, V., Pande, P.C., Jain, D.K. 2018. Economic Botany, Rastogi Publications. 2. Kocchar, S.L. 2016. Economic Botany: A Comprehensive Study, 5 Ed, Cambridge India. 3. Wickens, G.E. 2001. Economic Botany: Principles and Practices, Springer. 4. Singh, V., Pande, P.C., Jain, D.K. 2018. Economic Botany, Rastogi Publications. 5. Daubenmire, R.F. Plants & Environment (2nd Edn.,) John Wiley & Sons., New York 22 6. S. Sundar Rajan-2007. College Botany Vol-V, Part 1: Taxonomy and Economic Botany Himalaya Publishing House. 7. Susil Kumar Mukharjee-2004. College Botany Vol-III. New Central Book agency, London 		

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Part A			
Subject	Botany		
Semester	3 rd		
Name of the Course	Ornamental Plants		
Course Code/ID			
Course Type: (CC/MCC/MDC/CC - M/DSEC/VOC/DSE/PC/AEC/VAC)	MDC-3		
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- After completing this course, the learner will be able to: <ol style="list-style-type: none">1. Students will acquire an understanding of the history of gardens in India and other countries.2. Students will develop comprehensive knowledge about different groups of plants used as ornamentals.3. Students will learn about flower and seed production.4. Students will gain a deep understanding of vegetative propagation methods for ornamental plants.5. Students will be able to learn various types of gardens & their significance, management, and methods of propagation of valuable plants.		
Credits	Theory	Practical	Total
	2	1	3
Contact Hours	2	2	4
Theory			
Max. Marks: 50 Internal Assessment Marks:15 End Term Exam Marks: 35	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 *Devi*

Unit	Topic	Contact Hours
I	History of gardens in India; terrace gardening; popular gardens of India; Types of gardens: Formal and Informal gardens; Styles of gardens: Mughal gardens, Persian gardens, Italian gardens, French gardens, English gardens, Japanese gardens.	7
II	Significance of Shrubs, trees, palms, ferns, cycads, cacti and succulents, climbers, creepers, indoor plants, water plants, bonsai plants as ornamentals.	7
III	Flower and seed production; protected cultivation of ornamentals; present position and scope of floriculture in India.	8
IV	Vegetative propagation-principles and practices of clone selection; techniques of cutting, budding, grafting and layering; propagation by specialized stems and roots.	8
V*	<ol style="list-style-type: none"> 1. Preparation of nursery beds – flat, raised and sunken beds • Identification and description of various plants grown in ornamental gardens. 2. Tools, implements and containers used in ornamental gardening. 3. Planning, designing and establishment of garden features viz. lawn, hedge and edge, rockery etc. 4. To study propagation by separation and division technique. • Preparation of land for lawn and planting. 5. To study propagation by cuttings, layering, grafting and budding 6. Flower arrangement practices. 7. Preparation of bouquets, garland. 	30

Recommended Books/e-resources/LMS:

1. Singh, A.K. & Kumar A. 2023. Plant Propagation and Nursery management.
2. S.K. Kataria and sons. Arora, J.S. 2016. Introductory Ornamental Horticulture. Kalyani Publishers. 8th edition.
3. Sachdeva, P. & Tongbram, V. 2014. A Naturalist's guide to the trees & Shrubs of India. Prakash Books.
4. Jain, S.M. & Ochatt, S.J. 2009. Protocols for in vitro propagation of ornamental plants: 598 (Methods in Molecular Biology). Humana Press.
5. Sabina, GT and Peter KV. 2008. Ornamental Plants for Gardens. New India Publ. Agency. Reddy S, Janakiram B, Balaji T, Kulkarni S & Misra RL. 2007. Hightech Floriculture. Indian Society of Ornamental Horticulture, New Delhi.
6. Bhattacharjee SK. 2006. Advances in Ornamental Horticulture. Vols. I-VI. Pointer Publ. Krishnamurthy, K.V. 2004. An Advanced Text Book of Biodiversity - Principles and Practices. Oxford and IBH Publications Co. Pvt. Ltd. New Delhi
7. Prasad S & Kumar U. 2003. Commercial Floriculture. Agrobios
8. Lauria A & Victor HR. 2001. Floriculture – Fundamentals and Practices Agrobios.

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Home*

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