

## Syllabus distribution for Prof. Mahenga Singh , Deptt. Of Botany

Semester: 3<sup>rd</sup> Honours paper CC 5

Unit	Topic
Unit 1: Introduction and scope of Plant Anatomy	Introduction and scope of Plant Anatomy
Unit 2: Structure and Development of Plant Body	Internal organization of plant body: The three tissue systems, types of cells and tissues. Development of plant body: polarity, cytodifferentiation and organogenesis during embryogenic development, Root-stem transition, Nodal anatomy – Basic concept.
Unit 2: Tissues	Classification of tissues; Simple and complex tissues (no phylogeny); cytodifferentiation of tracheary elements and sieve elements; Pits and plasmodesmata; Wall ingrowths and transfer cells, adcrustation and incrustation, Ergastic substances. Hydathodes, cavities, lithocysts and laticifers.
Unit 3: Apical meristems	Evolution of concept of organization of shoot apex (Apical cell theory, Histogen theory, Tunica Corpus theory, continuing meristematic residue, cytohistological zonation); Types of vascular bundles; Structure of dicot and monocot stem. Origin, development, arrangement and diversity in size and shape of leaves; Structure of dicot and monocot leaf, Kranz anatomy. Organization of root apex (Apical cell theory, Histogen theory, Korper-Kappe theory); Quiescent centre; Root cap; Structure of dicot and monocot root; Endodermis, exodermis and origin of lateral root.
Unit 4: Vascular Cambium and Wood	Structure, function and seasonal activity of cambium; Secondary growth in root and stem. Anomalous secondary growth in Bignonia, Boerhaavia, Aristolochia and Dracaena. Axially and radially oriented elements; Types of rays and axial parenchyma; Cyclic aspects and reaction wood; Sapwood and heartwood; Ring and diffuse porous wood; Early and late wood, tyloses; Dendrochronology. Development and composition of periderm, rhytidome and lenticels.
Unit 5: Adaptive and Protective Systems	Epidermal tissue system, cuticle, epicuticular waxes, trichomes(uni-and multicellular, glandular and nonglandular, two examples of each), stomata (classification); Adcrustation and incrustation; Anatomical adaptations of xerophytes and hydrophytes. Mechanical tissue – distribution and significance.
Practical CC5	1. Study of anatomical details through permanent slides/temporary stain mounts/macerations/museum specimens with the help of suitable examples. 2. Apical meristem of root, shoot and vascular cambium. 3. Distribution and types of parenchyma, collenchyma and sclerenchyma. 4. Xylem: Tracheary elements-tracheids, vessel elements; thickenings; perforation plates; xylem fibres. 5. Wood: ring porous; diffuse porous; tyloses; heart- and sapwood. 6. Phloem: Sieve tubes-sieve plates; companion cells; phloem fibres. 7. Epidermal system: cell types, stomata types; trichomes: non-glandular and glandular. 8. Root: monocot, dicot, secondary growth. 9. Stem: monocot, dicot - primary and secondary growth; periderm; lenticels. 10. Leaf: isobilateral, dorsiventral, C4 leaves (Kranz anatomy). 11. Adaptive Anatomy: xerophytes, hydrophytes. 12. Secretory tissues: cavities, lithocysts and laticifers.
C6P: Economic Botany	Practical
	actical 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). 2. Legumes: Soybean, Groundnut, (habit, fruit, seed structure, micro-chemical tests). 3. Sources of sugars and starches: Sugarcane ( habit sketch; cane juice- microchemical tests), Potato (habit sketch, tuber morphology, T.S. tuber to show localization of starch grains, w.m. starch grains, micro-chemical tests). 4. Spices: Black pepper, Fennel and Clove (habit and sections). 5. Beverages: Tea (plant specimen, tea leaves), Coffee (plant specimen, beans). 6. Sources of oils and

	fats: Coconut- T.S. nut, Mustard–plant specimen, seeds; tests for fats in crushed seeds. 7. Essential oil-yielding plants: Habit sketch of Rosa, Vetiveria, Santalum and Eucalyptus (specimens/photographs). 8. Rubber: specimen, photograph/model of tapping, samples of rubber products. 9. Drug-yielding plants: Specimens of Digitalis, Papaver and Cannabis. 10. Tobacco: specimen and products of Tobacco. 11. Woods: Tectona, Pinus: Specimen, Section of young stem. 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 lignin on transverse section of stem and fiber).
	C7T: Genetics Theory
Unit 1: Mendelian genetics and its extension	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, Numericals; Polygenic inheritance.
Unit 2: 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.
Unit 3: Linkage, crossing over and chromosome mapping	Linkage and crossing over-Cytological and molecular basis of crossing over; Recombination frequency, two factor and three factor crosses; Interference and coincidence; Numericals based on gene mapping; Sex Linkage.
Unit 4: Variation in chromosome number and structure	Deletion, Duplication, Inversion, Translocation, Position effect, Euploidy and Aneuploidy
Unit 5: 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. Role of Transposons in mutation.DNA repair mechanisms.
Unit 6: Fine structure of gene	Classical vs molecular concepts of gene; Cis-Trans complementation test for functional allelism; Structure of Phage T4, rII Locus.
Unit 6. Population and Evolutionary Genetics	Allele frequencies, Genotype frequencies, Hardy-Weinberg Law, role of natural selection, mutation, genetic drift. Genetic variation and Speciation.
SEC Theory	
Unit- 1:	: General account about the microbes used as biofertilizer – Rhizobium – isolation, identification, mass multiplication, carrier based inoculants, Actinorrhizal symbiosis.
Unit- 2	: Azospirillum: isolation and mass multiplication – carrier based inoculant, associative effect of different microorganisms.Azotobacter: classification, characteristics – crop response to Azotobacter inoculum, maintenance and mass multiplication.
Unit- 3:	Cyanobacteria (blue green algae), Azolla and Anabaena azollae association, nitrogen fixation, factors affecting growth, blue green algae and Azolla in rice cultivation.
Unit- 4:	Mycorrhizal association, types of mycorrhizal association, taxonomy, occurrence and distribution, phosphorus nutrition, growth and yield – colonization of VAM – isolation and inoculum production of VAM, and its influence on growth and yield of crop plants.
Unit-5:	Organic farming – Green manuring and organic fertilizers, Recycling of biodegradable municipal, agricultural and Industrial wastes – biocompost making methods, types and method of vermicomposting – field Application.

5<sup>th</sup> Sem Honours

Unit	Topic
Unit 1: Plant-water relations	Water Potential and its components, water absorption by roots, aquaporins, pathway of water movement, symplast, apoplast, transmembrane pathways, root pressure, guttation. Ascent of sap – cohesion-tension theory. Transpiration and factors affecting transpiration, antitranspirants, mechanism of stomatal movement.
Unit 2: Mineral nutrition	Unit 2: Mineral nutrition Essential and beneficial elements, macro and micronutrients, methods of study and use of nutrient solutions, criteria for essentiality, mineral deficiency symptoms, roles of essential elements, chelating agents.
Unit 3: Nutrient Uptake	Unit 3: Nutrient Uptake Soil as a nutrient reservoir, transport of ions across cell membrane, passive absorption, electrochemical gradient, facilitated diffusion, active absorption, role of ATP, carrier systems, proton ATPase pump and ion flux, uniport, co-transport, symport, antiport.
Unit 4: Translocation in the phloem	Experimental evidence in support of phloem as the site of sugar translocation. Pressure– Flow Model; Phloem loading and unloading; Source–sink relationship.
Unit 5: Plant growth regulators	Discovery, chemical nature (basic structure), bioassay and physiological roles of Auxin, Gibberellins, Cytokinin, Absciscic acid, Ethylene, Brassinosteroids and Jasmonic acid.
Unit 6: Physiology of flowering	Photoperiodism, flowering stimulus, florigen concept, vernalization, seed dormancy
Unit 7: Phytochrome , cryptochromes and phototropins	Discovery, chemical nature, role in photomorphogenesis, low energy responses (LER) and high irradiance responses (HIR), mode of action.
	Practical
	1. Determination of osmotic potential of plant cell sap by plasmolytic method. 2. Determination of water potential of given tissue (potato tuber) by weight method. 3. Study of the effect of wind velocity and light on the rate of transpiration in excised twig/leaf. 4. Calculation of stomatal index and stomatal frequency from the two surfaces of leaves of a mesophyte and xerophyte. 5. To calculate the area of an open stoma and percentage of leaf area open through stomata in a mesophyte and xerophyte (both surfaces). 6. To study the phenomenon of seed germination (effect of light). 7. To study the effect of different concentrations of IAA on Avena coleoptile elongation (IAA Bioassay). 8. To study the induction of amylase activity in germinating barley grains.
	DSE1 Theory
: Unit- 1: Natural resources	Definition and types.
Unit- 2: Sustainable utilization :	Concept, approaches (economic, ecological and sociocultural).
Unit- 3: Land	Utilization (agricultural, pastoral, horticultural, silvicultural); Soil degradation and management.
Unit- 4: Water	Fresh water (rivers, lakes, groundwater, aquifers, watershed); Marine; Estuarine; Wetlands; Threats and management strategies.

Unit- 5: Biological Resources	Biodiversity-definition and types; Significance; Threats; Management strategies; Bioprospecting; IPR; CBD; National Biodiversity Action Plan).
Unit - 6: Forests	Definition, Cover and its significance (with special reference to India); Major and minor Forest products; Depletion; Management.
Unit- 7: Energy	: Renewable and non-renewable sources of energy
Unit- 8: Contemporary practices in resource management	EIA, GIS, Participatory Resource Appraisal, Ecological Footprint with emphasis on carbon footprint, Resource Accounting; Waste management.
	Unit- 9: National and international efforts in resource management and conservation
	DSE2 Theory
Unit -1: Plant Breeding	Introduction and objectives. Breeding systems: modes of reproduction in crop plants. Important achievements and undesirable consequences of plant breeding.
Unit -2: Methods of Crop improvement	Introduction: Centres of origin and domestication of crop plants, plant genetic resources; Acclimatization; Selection methods: For self pollinated, cross pollinated and vegetatively propagated plants; Hybridization: For self, cross and vegetatively propagated plants – Procedure, advantages and limitations.
Unit -3: Quantitative inheritance	Concept, mechanism, examples of inheritance of Kernel colour in wheat, Skin colour in human beings. Monogenic vs polygenic Inheritance.
Unit - 4: Inbreeding depression and heterosis	History, genetic basis of inbreeding depression and heterosis : Applications.
Unit - 5: Crop improvement and breeding	Role of mutations; Polyploidy; Distant hybridization and role of biotechnology in crop improvement.
	DSE2P: Plant Breeding (Practical)
	Practical 1. Identification of offspring's having parental genotypes and recombinant genotypes, based on combination of morphological attributes in a dihybrid cross. 2. Processes of emasculation – a) By applying higher temperature, b) By amputating anthers. 3. Determination of genetic inheritance of characters in monohybrid and dihybrid crosses by Chi-square test (including Mendelian ratios and the ratios of gene interactions e.g. Dominant Epistasis, Supplementary gene action, Polymeric Gene action, Complementary Gene action, Inhibitory Gene action and Duplicating Gene action. 4. Identification of fertile and sterile pollens with carmine stain and TTC test.

Syllabus distribution for Prof. Mahenga Singh , Deptt. Of Botany

SEM 1 Botany Major

Unit	Topic
1	Introduction to microbial diversity; Whittaker's five-kingdom system and Carl Richard Woese's three-domain system

2	Virus: General characteristics; classification (Baltimore), idea about viroids and prions; detailed structure T4-phage and SARS-COV2, lytic and lysogenic cycle; Economic importance of viruses.
3	Bacteria: General characteristics; Types-archaeobacteria, eubacteria, wall-less forms (mycoplasma and spheroplasts); Bergey's classification, Cell structure; Nutritional types; vegetative and Reproductive structure - asexual and recombination (conjugation, transformation and transduction). Economic importance of bacteria.
5	Fungi: General characteristics; Affinities with plants and animals; Thallus organization; Heterothallism and parasexuality. Classification Ainsworth (up to Order). Life cycles of Synchitrium, Saccharomyces, Ascobolus, Agaricus. Symbiotic associations: Lichen and Mycorrhiza. Economic importance.
	Practical
	1. Electron micrographs/Models of viruses – T-Phage and Sars-CoV2, 2. Sketches of Lytic and Lysogenic Cycle. 3. Study of curd organisms curd through Gram staining. 4. Endospore staining. 5. Study of vegetative and reproductive structures of Nostoc, Oedogonium and Polysiphonia. 6. Study of reproductive structures of Ascobolus, and Agaricus. 7. Study of reproductive structure of Saccharomyces and Penicillium.
	SEC SEC 1: Biofertilizers
1	General account about the microbes used as biofertilizer – Rhizobium – isolation, identification, mass multiplication, carrier based inoculants, Actinorrhizal symbiosis.
2	Azospirillum: isolation and mass multiplication – carrier based inoculant, associative effect of different microorganisms. Azotobacter: classification, characteristics – crop response to Azotobacter inoculum, maintenance and mass multiplication.
3	Cyanobacteria (blue green algae), Azolla and Anabaena azollae association, nitrogen fixation, factors affecting growth, blue green algae and Azolla in rice cultivation.
4	Mycorrhizal association, types of mycorrhizal association, taxonomy, occurrence and distribution, phosphorus nutrition, growth and yield – colonization of VAM – isolation and inoculum production of VAM, and its influence on growth and yield of crop plants.
5	Organic farming – Green manuring and organic fertilizers, Recycling of biodegradable municipal, agricultural and Industrial wastes – biocompost making methods, types and method of vermicomposting – field Application.

**TEACHING PLAN OF ODD SEMESTER (1ST, 3RD & 5TH)**

**SESSION -2023-2024**

**DEPARTMENT OF BOTANY**

**NAME OF THE TEACHER- MR. HAPPY DAS**

SEMESTER –I		
SYLLABUS ALLOTTED – MJ-1T & MJ-1P PLANTS AND MICROBIAL DIVERSITY AND ITS EVOLUTION	MJ-1P (TOTAL LECTURE-15)	MJ-1T (TOTAL LECTURE-30)
	<p>5. Study of vegetative and reproductive structures of Nostoc, Oedogonium and Polysiphonia.</p> <p>9. Marchantia- Morphology of thallus, whole mount of rhizoids &amp; 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).</p> <p>10. Anthoceros- Morphology of thallus, dissection of sporophyte (to show spores, pseudoelaters, columella) (temporary slide), vertical section of thallus (permanent slide).</p> <p>11. Pogonatum- Morphology, whole mount of leaf, rhizoids, operculum, peristome, annulus, spores (temporary slides); Permanent slides showing antheridial and archegonial heads, longitudinal section of capsule and protonema.</p> <p>12. Selaginella- 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).</p> <p>13. Equisetum- Morphology, transverse section of internode, longitudinal section of strobilus,</p>	<p>4 Algae: General characteristics; Ecology and distribution; range of thallus organization; Classification (Van Den Hoek, 1995), reproduction and life cycles of Nostoc, Oedogonium, Chara, and Polysiphonia.</p> <p>6 Archegoniate: Unifying features of archegoniates, Bryophytes: General characteristics; Adaptations to land habit; Range of thallus organization. Idea about different orders. Outline classification (Mishler), Morphology, anatomy and reproduction of Marchantia, Porella, Anthoceros, Notothylas and Funaria; Economic importance with special reference to Sphagnum.</p> <p>7 Pteridophytes: General characteristics; Idea about different orders. Classification (Sporne, 1975), Early land plants (Rhynia and Asteroxylon) Morphology, anatomy and reproduction of Lycopodium, Selaginella, Equisetum and Pteris. Economic importance.</p> <p>8 Gymnosperms: General characteristics, idea about different orders, Classification (Sporne, 1965), morphology, anatomy and reproduction of Cycas, Pinus and Gnetum; Economic importance.</p>

	<p>transverse section of strobilus, whole mount of sporangiophore, whole mount of spores, transverse section of rhizome (all permanent slide).</p> <p>14. Pteris- 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).</p> <p>15. Cycas- Morphology (leaf), vertical section of leaflet, vertical section of microsporophyll, whole mount of spores (temporary slides), longitudinal section of ovule, transverse section of root (permanent slide).</p> <p>16. Pinus- Morphology (long and dwarf shoots, whole mount of dwarf shoot, male and female cones), transverse section of Needle (temporary slide), transverse section of stem, longitudinal section of / transverse section of male cone, whole mount of microsporophyll, whole mount of Microspores (temporary slides), longitudinal section of female cone, tangential longitudinal section &amp; radial longitudinal sections stem (permanent slide).</p>	
SYLLABUS ALLOTTED – MI-1T & MI-1P PLANT SCIENCE I	MI-1P(TOTAL LECTURE-15)	MI-1T (TOTAL LECTURE-15)
	<p>1. Study of leaf types (Simple and Compounds).</p> <p>2. Study of inflorescence types(recemose and cymose)</p> <p>3. Study of floral diversity with special reference to adhesion and cohesion.</p> <p>4. Study of fruit types: Berry: Cucumis sativus, Capsicum annum, Solanum melongena Drupe: Mangifera indica, Borasus flaballifer Hesperidium: Citrus Nut: Arachis hypogea</p>	<p>1. Algae: General characteristics; habitat, classification (Van Den Hoek, 1995), lifecycle patterns of Volvox and Batrachospermum, Economic importance.</p> <p>2. Bryophytes: General characteristics, classification (Proskauer, 1957), morphology, anatomy and reproduction of Riccia, Anthoceros and Funaria, economic importance of bryophytes.</p> <p>Pteridophytes: General characteristics, Classification (Sporne,</p>

	5. Study of vegetative and floral characters of the following families Malvaceae – Sida sp. / Abutilon sp. Acanthaceae – Ruellia sp./Barleria sp. Papilionaceae – Tephrosia sp./Crotalaria sp. Verbenaceae – Lantana sp./Duranta sp	1975), morphology, anatomy and reproduction of Lycopodium, Adiantum and Marsilea. Economic importance 3. Gymnosperms: General characteristics, Classification (Sporne, 1965), morphology, anatomy and reproduction of Cycas and Pinus. Economic importance.
SEMESTER –III		
SYLLABUS ALLOTTED – CC 6 T & CC 7 P ECONOMIC BOTANY & GENETICS	CC 7 P (TOTAL LECTURE-15)	CC 6 T (TOTAL LECTURE-15)
	<p>1. Demonstration on pretreatment, fixation, staining and squash and smear preparation.</p> <p>2. Study of Mitosis from Onion / Garlic / Lentil root.</p> <p>3. Study of Meiosis with pollen mother cell (PMC) of Onion / Solanum / Datura by smear preparation.</p> <p>4. Mendel's laws through seed ratios. Laboratory exercises in probability and chisquare.</p> <p>5. Chromosome mapping using point test cross data.</p> <p>6. Pedigree analysis for dominant and recessive autosomal and sex linked traits.</p> <p>7. 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>8. Blood Typing: groups &amp; Rh factor.</p> <p>9. Study of aneuploidy: Down's, Klinefelter's and Turner's syndromes.</p> <p>10. Photographs/Permanent Slides showing Translocation Ring, Laggards and Inversion Bridge.</p> <p>11. Study of human genetic traits: Sick cell anemia, Xeroderma Pigmentosum, Albinism, red-green Colour blindness, Widow's peak, Rolling of tongue, Hitchhiker's thumb and Attached ear lobe.</p>	<p>Unit 1: Origin of Cultivated Plants Concept of Centres 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.</p> <p>Unit 2: Cereals Wheat and Rice (origin, morphology, cultivation, management processing &amp; uses); Brief account of millets.</p> <p>Unit 3: Legumes Origin, morphology cultivation, management and uses of Chick pea, Pigeon pea and fodder legumes. Importance to man and ecosystem.</p> <p>Unit 4: Sources of sugars and starches Morphology cultivation, management and processing of sugarcane, products and byproducts of sugarcane industry. Potato – morphology, propagation &amp; uses.</p> <p>Unit 5: Spices Listing of important spices, their family and part used. Economic importance with special reference to fennel, saffron, clove and black pepper</p> <p>Unit 6: Beverages Tea, Coffee (morphology, processing &amp; uses)</p> <p>Unit 7: Sources of oils and fats General description, classification,</p>



		<p>extraction, their uses and health implications groundnut, coconut, linseed, soybean, mustard and coconut (Botanical name, family &amp; uses). Essential Oils: General account, extraction methods, comparison with fatty oils &amp; their uses.</p> <p>Unit 8: Natural Rubber Para-rubber: tapping, processing and uses.</p> <p>Unit 9: Drug-yielding plants Therapeutic and habit-forming drugs with special reference to Cinchona, Digitalis, Papaver and Cannabis; Tobacco (Morphology, processing, uses and health hazards).</p> <p>Unit 10: Timber plants General account with special reference to teak and pine.</p> <p>Unit 11: Fibers Classification based on the origin of fibers; Cotton, Coir and Jute (morphology, extraction and uses)</p>
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SEMESTER –V		
SYLLABUS ALLOTTED – CC 11 T & CC 11 P REPRODUCTIVE BIOLOGY OF ANGIOSPERMS	CC 11 P (TOTAL LECTURE-15)	CC 11 T (TOTAL LECTURE-15)
	<p>1. Anther: Wall and its ontogeny; Tapetum (amoeboid and glandular); MMC, spore tetrads, uninucleate, bicelled and dehiscent anther stages through slides/micrographs, male germ unit (MGU) through photographs and schematic representation.</p> <p>2. Pollen grains: Fresh and acetolyzed showing ornamentation and aperture, pseudomonads, polyads, pollinia</p>	<p>Unit 1: Introduction History (contributions of G.B. Amici, W. Hofmeister, E. Strasburger, S.G. Nawaschin, P. Maheshwari, B.M. Johri, W.A. Jensen, J. Heslop-Harrison) and scope.</p> <p>Unit 2: Reproductive development Induction of flowering; flower as a modified determinate shoot. Flower development: genetic and molecular aspects.</p> <p>Unit 3: Anther and pollen biology</p>

	<p>(slides/photographs,fresh material), ultrastructure of pollen wall(micrograph); Pollen viability: Tetrazolium test.germination: Calculation of percentage germination in different media using hanging drop method.</p> <p>3. Ovule: Types-anatropous, orthotropous, amphitropous/campylotropous, circinotropous, unitegmic, bitegmic; Tenuinucellate and crassinucellate; Special structures: Endothelium, obturator, hypostase, caruncle and aril (permanent slides/specimens/photographs).</p> <p>4. Female gametophyte through permanent slides/ photographs: Types, ultrastructure of mature egg apparatus.</p> <p>5. Intra-ovarian pollination; Test tube pollination through photographs.</p> <p>6. Endosperm: Dissections of developing seeds for endosperm with free-nuclear haustoria.</p> <p>7. 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.</p>	<p>Anther wall: Structure and functions, microsporogenesis, callose deposition and its significance. Microgametogenesis; Pollen wall structure, MGU (Male Germ Unit) structure, NPC system; Palynology and scope (a brief account); Pollen wall proteins; Pollen viability, storage and germination; Abnormal features: Pseudomonads, polyads, massulae, pollinia.</p> <p>Unit 4: Ovule Structure; Types; Special structures–endothelium, obturator, aril, caruncle and hypostase; Female Gametophyte – megasporogenesis (monosporic, bisporic and tetrasporic) and megagametogenesis (details of Polygonum type); Organization and ultrastructure of mature embryo sac.</p> <p>Unit 5: Pollination and fertilization Pollination types and significance; adaptations; structure of stigma and style; path of pollen tube in pistil; double fertilization.</p> <p>Unit 6: Self incompatibility Basic concepts (interspecific, intraspecific, homomorphic, heteromorphic, GSI and SSI); Methods to overcome self-incompatibility: mixed pollination, bud pollination, stub pollination; Intra-ovarian and in vitro pollination; Modification of stigma surface, parasexual hybridization; Cybrids, in vitro fertilization.</p> <p>Unit 7: Embryo, Endosperm and Seed Structure and types; General pattern of development of dicot and monocot embryo and endosperm; Suspensor: structure and functions; Embryo-endosperm relationship; Nutrition of embryo; Unusual features; Embryo development in Paeonia. Seed structure, importance and dispersal</p>
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		<p>mechanisms</p> <p>Unit 8: Polyembryony and apomixis</p> <p>Introduction; Classification; Causes and applications</p>
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