



**DEPARTMENT OF PLANT SCIENCE
MJP ROHILKHAND UNIVERSITY, BAREILLY**

The Registrar,

As per recommendations of the B.O.S. find herewith modified syllabus of M. Sc. Plant Science which is to be effective from session 2019-2020 Semester I and onwards.

You are requested to do the needful to change accordingly in :-Computer sectionø for result declaration and paper setting in confidential section.

Thanks

Prof. Sanjay Kumar Garg
Convenor B.O.S.



DEPARTMENT OF PLANT SCIENCE

Modified Syllabus Effective from session 2019-2020 & Onwards (2019)

SEMESTER-I

(Two Mid term)

I.	Genetics	MM = 70	+ 30	= 100
II.	Elementary Biochemistry	MM = 70	+ 30	= 100
III.	Plant Diversity I- Algae & Bryophytes	MM = 70	+ 30	= 100
IV.	Mycology	MM = 70	+ 30	= 100
V.	Cell Biology	MM = 70	+ 30	= 100
VI.	Plant Diversity-II (Pteridophytes)	MM = 70	+ 30	= 100

SEMESTER-II

VII.	Cytogenetics	MM = 70	+ 30	= 100
VIII.	Molecular Techniques and Markers	MM = 70	+ 30	= 100
IX.	Plant Diversity-III: Gymnosperms	MM = 70	+ 30	= 100
X.	Plant Pathology	MM = 70	+ 30	= 100
XI.	Biochemistry	MM = 70	+ 30	= 100
XII.	Molecular Biology	MM = 70	+ 30	= 100

SEMESTER-III

XIII.	Plant Ecology	MM = 70	+ 30	= 100
XIV.	Plant Transgenics	MM = 70	+ 30	= 100
XV.	Plant Breeding and Biostatistics	MM = 70	+ 30	= 100
XVI.	Plant Physiology	MM = 70	+ 30	= 100
XVII.	Microbiology	MM = 70	+ 30	= 100
XVIII.	Micropropagation	MM = 70	+ 30	= 100

SEMESTER-IV

XIX.	Advanced Plant Breeding	MM = 70	+ 30	= 100
XX.	Plant Metabolism	MM = 70	+ 30	= 100
XXI.	Environmental Biology	MM = 70	+ 30	= 100
XXII.	Analytical Techniques	MM = 70	+ 30	= 100
XXIII.	Immunology	MM = 70	+ 30	= 100
XXIV.	Plant Diversity-IV: Angiosperms	MM = 70	+ 30	= 100



DEPARTMENT OF PLANT SCIENCE

Modified Syllabus Effective from session 2019-2020 & Onwards (2019) **PRACTICALS (From Session 2019-2020)**

SEMESTER I

Lab Course I

MM= 150

- Paper I Genetics
Paper II Elementary Biochemistry
Paper III Plant Diversity I- Algae & Bryophytes

Lab Course II

MM=150

- Paper IV Mycology
Paper V Cell Biology
Paper VI Plant Diversity-II (Pteridophytes)

SEMESTER II

Lab Course III

MM= 150

- Paper VII Cytogenetics
Paper VIII Molecular Techniques and Markers
Paper IX Plant Diversity-III: (Gymnosperms)

Lab Course IV

MM=150

- Paper X Plant Pathology
Paper XI Biochemistry
Paper XII Molecular Biology

SEMESTER III

Lab Course V

MM= 150

- Paper XIII Plant Ecology
Paper XIV Plant Transgenics
Paper XV Plant Breeding and Biostatistics

Lab Course VI

MM=150

- Paper XVI Plant Physiology
Paper XVII Microbiology
Paper XVIII Micropropagation

SEMESTER IV

Lab Course VII

MM= 150

- Paper XIX Advanced Plant Breeding
Paper XX Plant Metabolism
Paper XXI Environmental Biology

Lab Course VIII

MM=150

- Paper XXII Analytical Techniques
Paper XXIII Immunology
Paper XXIV Plant Diversity- IV (Angiosperms)



DEPARTMENT OF PLANT SCIENCE

Modified Syllabus Effective from session 2019-2020 & Onwards (2019)

SEMESTER – I

PAPER I: GENETICS

UNIT- I

Mendel's Law of inheritance and deviations i.e. incomplete dominance, Interaction of factors, multiple allelism, pleiotropism, quantitative inheritance.

UNIT – II

Crossing over & Chiasma formation: Theories of crossing over at chromosomal & molecular level i.e. Classical & Chiasmata theory, Precocity, Belling's, Whitehouse and Holiday model, Sobel's and Meselson and Radding's models of genetic recombination, cytological evidence of crossing over.

UNIT- III

Linkage: Concept of linkage and factors affecting the strength of linkage, Measurement of linkage from F₂ and back cross data, Genetic map of chromosomes, double crossing over, interference and coincidence.

UNIT – IV

Mutation: Type of mutation, Mutation rate, Base substitution (transition and transversion), Frame shift Mutation, Mechanism of gene, Detection of mutation in *Drosophila* and plants.

UNIT- V

Induction of Mutation: UV rays and thymine dimer formation, Target theory, Peroxide formation, Tautomerization of Nitrogen Bases and incorporation of Base analogue and chemical alteration in nucleic acids, Chemical vs Physical mutagens.



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SEMESTER – I PAPER II: ELEMENTARY BIOCHEMISTRY

UNIT – I

Molecular Properties: Formulation and biological significance of hydrogen bonds, Vander wall forces and hydrophobic interaction.

Acidity, Basicity, pH, Buffers, Buffering action of Blood, pH of the buffer solutions, Isomeric and optical activity in biological molecules.

UNIT – II

Bioenergetics: Law of thermodynamics, Concept of enthalpy and entropy and their significance in biological systems, high energy molecules causes energy richness of ATP and Redox Potential.

UNIT – III

Nucleic acid: Structure and conformation of Nucleic acids.

Amino acids: Structure and physiochemical nature of amino acids.

UNIT – IV

Carbohydrates: Structure and physiochemical properties of carbohydrates, its biological significance and importance, Glycoproteins.

UNIT –V

Lipids: Classification, Structure and properties of important lipids, Biological significance, Glycolipids, Fatty acid biosynthesis and storage lipids and their catabolism.



DEPARTMENT OF PLANT SCIENCE

Modified Syllabus Effective from session 2019-2020 & Onwards (2019)

SEMESTER – I

PAPER III: PLANT DIVERSITY- I

(Algae and Bryophytes)

UNIT – I

Distinguishing Characters of Different classes of Algae: A general knowledge of algal pigments, food reserves, specific cell organelles, algal blooms, algal biofertilizers, Economic Importance: algal foods, feed and uses in industry.

UNIT – II

Range of vegetative structure and reproduction of Cyanophyceae, Chlorophyceae, Xanthophyceae and Bacillariophyceae.

UNIT – III

Range of vegetative structure and reproduction of Phaeophyceae and Rhodophyceae.

UNIT – IV

Important characters of bryophytes, outline of classification and evolutionary tendencies with respect to gametophyte and sporophyte.

UNIT – V

Comparative study of different groups- Hepaticopsida, Anthocerotopsida and Bryopsida.



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SEMESTER – I

PAPER IV: MYCOLOGY

UNIT – I

Classification of fungi: Criteria for classification, salient features of different classes and comparative study of different system of classification.

UNIT – II

Nutrition of fungi, Heterothallism, Dikaryotization, Parasexuality and Physiological specialization.

UNIT – III

Range and comparative account of vegetative and reproductive structure with evolutionary significance in Myxomycotina, Mastigomycotina, Amastigomycotina and hormones in sexuality.

UNIT – IV

Range and comparative account of vegetative and reproductive structure with evolutionary significance in Ascomycotina and sexuality in Ascomycotina.

UNIT – V

Basidiomycotina, important characters of different groups and salient features of Deuteromycotina.



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SEMESTER I

PAPER V: CELL BIOLOGY

Unit I

Cell: Type- Eukaryote, Prokaryote & Mesokaryote.

Cell Wall: Structure, Biogenesis and Functions.

Plasma membrane: Structural models ó (Davson & Danielli, Unit membrane & Fluid Mosaic Model), Regulation of Membrane Fluidity, Biogenesis and turnover of membrane, ion carriers, channel protein and ATPases (Pump).

Unit II

Chloroplast: Structure & Function in brief, Genome, Biogenesis, Origin & Evolution.

Mitochondrion: Structure & Function in brief, Genome, Biogenesis, Origin & Evolution.

Unit III

Endoplasmic reticulum: Structure and function.

Golgi complex: Structure and function.

Peroxisome: Structure and function.

Plant vacuole: Structure and function.

Lysosome: Structure and function.

Unit IV

Nucleus: Structure, Nuclear pore complex and Nucleolus.

Cytoskeleton: *Microtubule*- Structure and role in chromosome movement; *Microfilament*-structure and role in brief; *Intermediate filament*- structure and role in brief.

Motor molecules: Kinesin & Dynein and role in flagella movement.

Unit V

Chromosome: Structure- Centromere, Secondary constriction, Satellite body, Telomere and significance of telomere organization.

Types of Chromosomes: Sex B, Polytene Chromosome, Lampbrush Chromosome and Isochromosome.



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Modified Syllabus Effective from session 2019-2020 & Onwards (2019)

SEMESTER-I

PAPER VI: PLANT DIVERSITY II - (Pteridophytes)

UNIT – I

Types of rocks and fossils, conditions for fossilization and methods of their study.

UNIT – II

Classification and characteristics features of Pteridophytes, Heterospory and origin of seed habit.

UNIT – III

Apogamy, Apospory and evolution of stellar system in Pteridophytes.

UNIT – IV

Comparative study of structure of gametophyte, sporophyte and embryo in relation to Psilopsida and Lycopsida.

UNIT – V

Comparative study of structure of gametophyte, sporophyte and embryo in relation to Sphenopsida & Pteropsida.



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Modified Syllabus Effective from session 2019-2020 & Onwards (2019)

SEMESTER – II

PAPER VII: CYTOGENETICS

UNIT – I

Polyploidy: Classification cytological and genetical method of identification of auto-polyploids and allopolyploids.

Relationship between Auto, Allo, Segmental Allo and Auto ó allopolyploids.

UNIT – II

Aneuploids: Classification method of production identification and meiotic behaviour of aneuploids (Monosomics, Nullisomics and trisomics).

Haploidy & Monoploidy: Origin, morphology and cytological behaviour haploids.

UNIT – III

Sex determination: Theories of sex determination in *Drosophila*, plant & man single gene, hormonal control of sex, sex reversal and gynandromorph.

Human genetic disorders: Sex linked inheritance, (Colour blindness, Haemophilia, Hypertichosis etc.).

Physiological disorders: Phenylketoneurea, Alkaptonurea, Albinism, sickle cell anemia and **Syndromes:** Down, Klinfelter and Turner.

UNIT – IV

Structural alteration in chromosome: Deletion, Duplication, Inversion & Translocation etc.

Extrachromosomal Inheritance: Cytoplasmic inheritance in *Mirabilis*, Maize and Paramecium. Delayed inheritance and Dauer modification.

UNIT – V

Concept of Gene, Genetic load & Genetic counselling.

Nuclear DNA content, C- Value Paradox, Cot value and its significance in *situ* hybridization ó concept & techniques flow cytometry in karyo type analysis.



DEPARTMENT OF PLANT SCIENCE

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SEMESTER II

PAPER VIII: MOLECULAR TECHNIQUES AND MARKERS

UNIT - I

Denaturation, Renaturation and hybridization of DNA.
Restriction endonucleases and Restriction map.
Gene Probes, labels, labeling and detection methods in brief.

UNIT - II

Recombinant DNA Production (overview).
cDNA synthesis and Artificial gene synthesis.
Gene sequencing: Chemical and Sanger Methods.
DNA Microarray.

UNIT - III

Cloining, Golden Gate Cloining; DNA Library.
Southern, Northern and Western blot.
Colony Hybridization and Colony Lift-hybridization, Dot & Slot blot Hybridization.
Isolation of a Gene.

UNIT- IV

PCR: Basic mechanism and application. Variation of basic PCR; Multiplex PCR, Nested PCR, Assembly PCR, Asymmetric PCR, Touch ó down PCR, HOT-start PCR, qPCR, Cold PCR, Anchored ó PCR, Linker ó PCR, Methylation specific PCR, DOP - PCR, Site Directed Mutagenesis PCR, OE ó PCR, Inverse ó PCR and TAIL- PCR.

UNIT - V

DNA Profiling and Application:

- Restriction fragment length polymorphism (RFLP) typing,
- Amplified fragment length polymorphism (AmpFLP),
- Random Amplified Polymorphic DNA (RAPD),
- Short tandem repeat (STR) typing,
- Single nucleotide polymorphism (SNP) typing,
- Mitochondrial DNA (mtDNA) analysis,
- Y-chromosome typing,



DEPARTMENT OF PLANT SCIENCE

Modified Syllabus Effective from session 2019-2020 & Onwards (2019)

SEMESTER – II

PAPER IX: PLANT DIVERSITY-III: GYMNOSPERMS

Unit I

Comparative morphology and reproductive organs in Pteridospermales.
Origin and Evolution of Pteridospermales: Stem, Male reproductive organs-
synangium and female reproductive organs - Ovule/seeds.

Unit II

Comparative morphology and reproductive organs in Cycadeoidales.
Comparative morphology and reproductive organs in Cycadales.
Origin, evolution & diversification of Cycads.
Comparative morphology and reproductive organs in Pentoxylales.

Unit III

Comparative morphology and reproductive organs in Ginkgoales.
Comparative morphology and reproductive organs in Cordaitales.
Comparative morphology and reproductive organs in Taxales.
Systematic position of Taxales.

Unit IV

Comparative morphology and reproductive organs in extinct Coniferales.
Fossil Coniferales- Lebachiaceae and Voltziaceae.
Origin, evolution and diversification of Conifers.
Gymnosperm wood: Types and characteristics.

Unit V

Comparative morphology and reproductive organs in Gnetales.
Comparative morphology and reproductive organs in Ephedrales.
Comparative morphology and reproductive organs in Welwitschiales.
Morphology of Ovule envelopes, Origin and affinity Gnetophytes.



DEPARTMENT OF PLANT SCIENCE

Modified Syllabus Effective from session 2019-2020 & Onwards (2019)

SEMESTER – II

PAPER X: PLANT PATHOLOGY

UNIT – I

Nature and classification of plant diseases their symptoms.

UNIT – II

Host-parasite relationship: General concept, biochemical host - parasite relation, disease resistance in plants: Physical, chemical and cytological.

UNIT – III

Control of plant diseases, quarantine, certification and notification.

UNIT – IV

Fungicides, Phytoalexins, Antibiosis, Antagonism, Chemotherapy, Hypersensitivity, Toxins and Toxoids.

UNIT – V

Phycomycetes: Black wart of potato, club root disease of cabbage and late blight of potato.

Ascomycotina: Peach leaf curl, stem gall of Coriander, powdery mildew of wheat and Ergot of rye.

Basidiomycotina: Loose smut of Wheat, covered smut of Wheat, smut of Bajra, rust disease of Wheat, rust of gram and rust of linseed.

Deuteromycotina: Early blight of Potato, Wilts disease of Arhar, Tikka disease of Groundnut and Red rot of Sugarcane.



DEPARTMENT OF PLANT SCIENCE

Modified Syllabus Effective from session 2019-2020 & Onwards (2019)

SEMESTER – II

PAPER XI: BIOCHEMISTRY

UNIT – I

Proteins: Peptide bond and polypeptides secondary tertiary and quaternary structure of proteins, conformation of Proteins, determination of amino acid sequence of proteins, physical and chemical properties of proteins and biological significance of proteins.

UNIT – II

Signal Transduction I: Overview of receptors, G-proteins phospholipids, signaling role of cyclic nucleotides, Calcium-Calmodulin cascade and phosphatase specific signaling mechanism.

UNIT – III

Signal Transduction II: Diversity in protein kinase and phosphatase, two component sensor regulator system bacteria and plants and sucrose- mechanism.

UNIT – IV

Enzyme I: Nomenclature, physico-chemical nature, elementary idea of enzyme kinetics, mechanism of action and regulation.

Vitamins & Coenzymes: Structure and general biochemistry.

UNIT – V

Enzyme II: Isolation, purification and assay of enzyme immobilization, Ribozymes, Zymogens and Isozyme.



DEPARTMENT OF PLANT SCIENCE

Modified Syllabus Effective from session 2019-2020 & Onwards (2019)

SEMESTER – II

PAPER XII: MOLECULAR BIOLOGY

UNIT – I

Control of cell Cycle: Role of Cyclin and Cyclin Dependent kinases (CDKs), Retinoblastoma and E2F Protein.

Cytokinesis and cell plate formation in plants.

Cancer and Oncogenes, Mechanism of cancer induction and Programmed cell death.

UNIT – II

Nucleotides: Structure and Polymerizations.

DNA: Structure and Properties; A, B and Z DNA, Quadruplex DNA & branched DNA
Coding and Non-coding sequences, Repetition and Satellite DNA.

UNIT – III

Replication and Transcription of DNA.

DNA damage and repair.

RNA: Structure of mRNA, tRNA and rRNA.

Replication of RNA.

Splicing and Molecular editor.

UNIT – IV

Ribosome: Structure and Biogenesis.

Protein Synthesis (Translation): Initiation, Elongation and Termination of Polypeptide.

Post-translational modification in protein.

Protein targeting to cell organelles.

UNIT – V

Transcription and regulation of protein synthesis in prokaryotes and eukaryotes.

Translational regulation of protein synthesis in prokaryotes and eukaryotes.

Chromatin: Nucleosome organization and packaging of DNA into chromosome.

MicroRNA and siRNA in protein synthesis Regulation.



DEPARTMENT OF PLANT SCIENCE

Modified Syllabus Effective from session 2019-2020 & Onwards (2019)

SEMESTER – III

PAPER XIII: PLANT ECOLOGY

UNIT – I

Population characteristics, population growth forms, density dependent & density independent controls.

UNIT – II

Population structure (Distribution, Aggregation, Isolation and Territoriality), energy partitioning, r - & k-selection and concept of carrying capacity.

UNIT – III

Concepts of community & continuum, analysis of communities (analytical & synthetic characters), community coefficients, competition and ecological niche.

UNIT – IV

Mechanism of ecological succession (relay floristic & initial floristic composition facilitation tolerance & inhibition models) and concept of climax.

UNIT – V

Ecosystem: Structure, Primary production (methods of measurement controlling factors), energy dynamics (Trophic organization, Energy flow pathways, Energy quality, ecological efficiencies), cybernetic nature of ecosystem & Gaia hypothesis.



DEPARTMENT OF PLANT SCIENCE

Modified Syllabus Effective from session 2019-2020 & Onwards (2019)

SEMESTER-III

PAPER XIV: PLANT TRANSGENICS

Unit I

Transgenesis- Basic steps.

Vector: Plasmid, Cosmids, Bacteriophages, Plant and Animal Viruses.

Artificial Chromosome: BAC, PAC, YAC, HAC, Plant Artificial Chromosome.

Unit II

Biological Method of gene transfer: Ti-plasmid vector and *Agrobacterium tumefaciens* mediated gene transfer; Plant Viruses.

Direct Methods of gene Transfer: Chemical- liposome, Calcium phosphate, PEG, Non-Chemical- Electroporation, Sonoporation, Optical, Physical- Microinjection, Gun Particle Method and Microprojectile Bombardment.

Marker genes and measurement of transgene expression.

Unit III

Transformation of Chloroplasts and significance.

Insect Resistance Transgenesis: Bt-toxin gene Transgenesis, Protease inhibitor transgenesis.

Herbicide Resistance Transgenesis: Modification of Target Metabolites, Degradation of the herbicide and Herbicide resistance through gene amplification.

Unit IV

Virus resistance transgenesis.

Antisense RNA expression.

Heat-shock gene transgenesis and Stress resistance transgenesis.

Unit V

Production of marker free transgenic plants.

Molecular farming, GMOs vs LMOs.

Religious, legal & ethical, and social concerns of transgenic plants.



DEPARTMENT OF PLANT SCIENCE

Modified Syllabus Effective from session 2019-2020 & Onwards (2019)

SEMESTER – III

PAPER XV: PLANT BREEDING AND BIOSTATISTICS

UNIT – I

Source of variability and its genetic basis, heritability and genetic advances.

UNIT – II

Varietal release and maintenance procedure: Improved seeds production, practice naming multiplication and release of new variety and seed testing.

Hybrid seed production and its application.

UNIT – III

Intellectual Property Rights (IPR): Patents, Copy rights & Trademarks.

UNIT – IV

Estimation of Mean, Median & Mode.

Coefficient of Variation.

Test of significance X^2 test and t- test.

UNIT – V

ANOVA (Analysis of Variance).

Correlation and simple regression.



DEPARTMENT OF PLANT SCIENCE

Modified Syllabus Effective from session 2019-2020 & Onwards (2019)

SEMESTER-III

PAPER XVI – PLANT PHYSIOLOGY

UNIT – I

Translocation of water and solutes: Plant water relations, mechanism of water transport through xylem, root & microbe interactions in facilitating, nutrient uptake, comparison of xylem and phloem transport, phloem loading and unloading.

UNIT – II

Sensory photobiology: Phytochromes and cryptochromes and their photochemical and biochemical properties photo-physiology of light induced responses. Cellular localization, molecular mechanism of action of photo & morphogenic receptors, signaling and gene expression.

UNIT – III

Plant growth substance I: Chemical structure, physiological effects and mechanism of action of Auxin, Gibberellins and Cytokinins.

UNIT – IV

Plant growth substance II: Growth regulatory nature of Ethylene, Abscissic acid, Polyamines, Jasmonic acid, Salicylic acid, Brassinosteroides and Systemines.

UNIT – V

Growth and developmental aspects:

Measurement of vegetative growth, Factors affecting vegetative growth, Dormancy, Breaking of dormancy, Vernalization, Physiology and biochemistry of leaf, Abscission and senescence.



DEPARTMENT OF PLANT SCIENCE

Modified Syllabus Effective from session 2019-2020 & Onwards (2019)

SEMESTER – III

PAPER – XVII: MICROBIOLOGY

UNIT – I

Types of Microbes: A-cellular, Prokaryotic and Eukaryotic, their detail characters, Identification of Microbes, Media, Pure Culture, Aseptic techniques.

UNIT – II

Growth: Growth factors and nutrients, Population growth curve, counting methods, total cell count, viable cell count, Biomass determination and Biological assay.

UNIT – III

Food Microbiology: Microbes as food: Single cell Protein, Food spillage, Food poisoning, Food infection, Preservation of food.

UNIT – IV

Agriculture & Aquatic Microbiology: Biodegradable materials and their degradation like; cellulose, hemicelluloses lignocelluloses; Non biodegradable herbicides and pesticides.

UNIT – V

Industrial Microbiology: Fermentation, Microbial enzymes in industry, water contaminants, Water purification, Sewage disposal and waste water treatment, Protoplast fusion (Parasexual hybridization).



DEPARTMENT OF PLANT SCIENCE

Modified Syllabus Effective from session 2019-2020 & Onwards (2019)

SEMESTER – III

PAPER XVIII: MICROPROPAGATION

UNIT – I

Plant cell and Tissue culture: General introduction, History, Scope, Concept of cellular differentiation, Totipotency.

UNIT – II

Organogenesis and adventitious embryogenesis: Fundamental aspects of Morphogenesis, Somatic embryogenesis and Androgenesis, Mechanism, Techniques and Utility.

UNIT – III

Somatic Hybridization: Protoplast isolation, Fusion and culture, Hybrid selection and regeneration, Possibilities, Achievements and limitations of protoplast research.

UNIT – IV

Applications of tissue culture: Clonal propagation, Artificial seed, Production of hybrids and somaclones, Production of secondary metabolites/ natural products.

UNIT – V

Cryopreservation and Germplasm storage.



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SEMESTER – IV

PAPER XIX: ADVANCED PLANT BREEDING

UNIT – I

Breeding for specific character: Adoptive breeding and quality breeding.

Protection breeding: Sources of disease, genetics of disease and methods of producing disease and pest resistance.

UNIT – II

Mutation breeding: Direct and indirect uses, Achievements and prospects.

Selection value of mutants and controversy over its application.

Role of Auto & Allo polyploidy in plant breeding.

UNIT – III

Male sterility and its types, their mechanism, genetic maintenance and application.

Incompatibility and its types, their mechanism and application.

UNIT – IV

Heterosis and inbreeding selection, its genetic basis and uses in crop improvement programmes.

Genome analysis.

UNIT – V

Monosomics and its application in Plant Breeding.

Haploidy and its role in Plant Breeding.



DEPARTMENT OF PLANT SCIENCE

Modified Syllabus Effective from session 2019-2020 & Onwards (2019)

SEMESTER – IV

PAPER XX – PLANT METABOLISM

UNIT – I

Nitrogen fixation and Metabolism: Biological nitrogen fixation, nodule formation and non factors, mechanism of nitrogen uptake and reduction, ammonium assimilation, foliar nitrogen nutrition, interaction of nitrogen assimilation with carbon metabolism.

UNIT – II

Stress Physiology: Plant responses to biotic and abiotic stress, Physiological and metabolic responses of plants to high CO₂, HR and SAR, Water deficit and drought resistance, salinity stress, metal toxicity, freezing and heat stress and oxidative stress.

UNIT – III

Photochemistry and photosynthesis: Photosynthetic apparatus, photoreceptor, light reaction of photosynthesis, photo oxidation of water, mechanism of electron and proton transport, carbon assimilation, calvin cycle, photorespiration and its significance, C₄ cycle and CAM pathway.

UNIT – IV

Respiration: Glycolysis, TCA cycle, Electron transport and ATP synthesis, Pentose phosphate pathway, glyoxylate cycle and cyanide resistant respiration.

UNIT – V

Seed and flowering: Metabolic changes during seed germination, factors affecting seed germination, biochemistry of flowering, initiation and development of flowering and induction of flowering.



DEPARTMENT OF PLANT SCIENCE

Modified Syllabus Effective from session 2019-2020 & Onwards (2019)

SEMESTER – IV

PAPER XXI: ENVIRONMENTAL BIOLOGY

UNIT – I

Kinds, sources & effects of pollution, Heavy metals (As, Pb, Cd, Hg) pollution.

UNIT – II

Green House Gases (CO₂, CH₄, N₂O, CFCs), green house effect and global warming, ozone layer and ozone hole, acid rain, environmental impact assessment.

UNIT – III

Concept and levels of Biodiversity, Natural selection, Speciation, Coevolution.

UNIT – IV

Threatened and Endangered plant species, Concept of resistance and resilience role of diversity in ecosystem stability.

UNIT – V

General account of remote sensing and its application and sustainable development.



DEPARTMENT OF PLANT SCIENCE

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SEMESTER – IV

PAPER XXII: ANALYTICAL TECHNIQUES

UNIT – I

Principles and Biological application of:

Simple Spectroscopy.

Mass Spectroscopy.

NMR and ESR Spectroscopy.

Atomic Absorption Spectroscopy.

UNIT – II

Principles, Working and Application of the following instruments / Techniques:

Autoradiography.

Polarimeter.

Electron microscopes (TEM, SEM).

X- ray crystallography.

UNIT – III

Chromatography: Paper, Thin layer, Ion exchange, Gas, High performance liquid, Molecular sieve filtration and affinity chromatography.

UNIT - IV

Centrifugation: Theory and application, ultracentrifugation.

UNIT – V

Electrophoresis: Free boundary and zonal electrophoresis, Paper and gel electrophoresis, two dimension electrophoresis, Immunoelectrophoresis, Isoelectrofocussing, Disc electrophoresis.



DEPARTMENT OF PLANT SCIENCE

Modified Syllabus Effective from session 2019-2020 & Onwards (2019)

SEMESTER – IV

PAPER XXIII: IMMUNOLOGY

UNIT – I

Introduction of immune system, specific and Non- Specific defence, Blood groups, Type of leukocytes, Phagocytes, Inflammation, Interferon, Antigens, Molecular basics of antigen recognition.

UNIT – II

Lymphoid organs, T-Lymphocytes, B-Lymphocytes, Histocompatibility, MHC Human leukocytes antigen (HLA) system, Molecular structure of HLA class I and Class II protein.

UNIT – III

Immunoglobulin and their properties, Diversity and Specificity of Antibody.

UNIT – IV

Hybridoma ó Monoclonal antibody and its applications, Antigen antibody interactions: Agglutination, Precipitation, Complement ó fixation, Opsonization, Neutralization.

UNIT – V

Hypersensitivity: Immunodeficiency and Autoimmunity, Anaphylaxis, Cytotoxicity, Immune-complex disorders, Delayed cell mediated hypersensitivity, Cancer and Immunology.



DEPARTMENT OF PLANT SCIENCE

Modified Syllabus Effective from session 2019-2020 & Onwards (2019)

SEMESTER – IV

PAPER XXIV: PLANT DIVERSITY-IV: ANGIOSPERMS

UNIT – I

Plant Nomenclature- ICBN.

Plant Taxonomy with particular reference Anatomy, Embryology, Palynology & Cytogenetics Chemotaxonomy.

Molecular Taxonomy, Numerical taxonomy.

UNIT – II

Microsporangium, Microsporogenesis and Development of male gametophyte .

Megasporangium (Types and development).

Megasporogenesis and Female gametophyte (Structure and Types).

Placentation.

UNIT – III

Fertilization: Types and Development.

Endosperms: Types and Development.

Embryo: Types and Development.

Apomixis, Parthenocarpy, Polyembryony.

UNIT – IV

Morphological nature of carpel.

Stamen morphology and evolutionary trends.

Inferior Ovary: Concept and Evolution.

UNIT – V

Root- Shoot Transition Zone and Nodal anatomy.

Meristem: Types, root and shoot tip organization.

Origin and Evolution of Angiosperms.