BOTANY SYLLABUS CBCS

V SEMESTER

PAPER-V: TAXONOMY AND ECONOMIC BOTANY

39hrs

UNIT: I **CLASICAL TAXONOMY** 13 hrs

Aim and Scope of taxonomy, Brief History, Broad outline of classification proposed by Bentham & Hooker, Engler & Prantl and their relative merits and demerits. Species concept: Taxonomic hierarchy, species, genus and family.

Biosystematics: Plant nomenclature, Binomial system, ICBN- rules for nomenclature. Taxonomic Tools, Herbarium and its techniques, Floras and their importance, Botanical gardens and their importance (one state level, one national level & one international level). (Examples: State: Lalbagh, National: Indian Botanical garden Sibpur, Calcutta, International: Royal Botanical garden, Kew, England). Chemotaxonomy, Cytotaxonomy, Numerical taxonomy & application of computer.

UNIT: II **TAXONOMY – I** 13hrs

Taxonomic studies of following families, according to Engler & Prantl system of classification and their economic importance

Monocotyledoneae Families: Poaceae, Arecaceae Musaceae, and rchidaceae

Dicotyledoneae Families:
Archichlamydeae- Magnoliaceae, Annonaceae, Brassicaceae, Rutaceae, Leguminosae (Subfamilies: Papilionatae, Caesalpinioideae and Mimosoideae) Rosaceae & Euphorbiaceae.

UNIT: III **TAXONOMY – II AND ECONOMIC BOTANY** 13hrs

Metachlamydeae - Cucurbitaceae, Apiaceae Rubiaceae, Asteraceae, Asclepiadaceae, Acanthaceae & Lamiaceae.

Ethnobotany: A general account.

ECONOMIC BOTANY: Study of the following plants with Botanical names, Family, part used, and economic uses.

Edible oils:	Groundnut, Coconut & Sesamum
Sugar and Starch:	Sugarcane, Beetroot, Potato & Tapioca
Fibers:	Cotton, Jute & Coir
Paper & Pulp:	Bamboo & Eucalyptus
Beverages:	Coffee, Tea &Cocoa

Spices:	Ginger, Cardamom, Clove, Cinnamon, Asafoetida, Turmeric Saffron & Nutmeg
Timber:	Teak & Rose wood
Medicinal & Aromatic:	Ashwagandha, Aloe *vera,* Indian Pennywort, Holy Basil, Amla, Periwinkle, Margosa tree, *Patchouli*, Mint, & Lavender

PRACTICAL PAPER – V

TAXONOMY AND ECONOMIC BOTANY

Total Units: 13

1. Morphology of Angiosperms – Vegetative Structure and modifications of root, & leaf. — **1 Unit**
2. Morphology of Angiosperms – Inflorescence and flower — **1 Unit**
3. Morphology of Angiosperms– Fruits (Simple, aggregate & multiple) — **1 Unit**
4. Methods of identification of plants with Technical terms. — **1 Unit**
5. Study of taxonomic characters of families included in theory (Minimum one genus from each family) — **6 Units**
6. Study of economically important plants covered in theory to identify with Botanical names, families, parts used and Economic uses. — **2Units**
7. Herbarium techniques. — **1 Unit**
8. Study of local flora by arranging local collection trips.
9. Record & Submission of 6 Herbaria with field notes of plants included in theory.

V SEMESTER

PAPER VI: MOLECULAR BIOLOGY, GENETIC ENGINEERING, BIOTECHNOLOGY AND PLANT PHYSIOLOGY

39 hrs

UNIT I MOLECULAR BIOLOGY — 13 hrs

Introduction, Discovery, Chemical nature& replication of genetic material, genetic code, non genetic RNA, Biosynthesis of proteins, Regulation of gene action in prokaryotes (Lac operon concept only).

GENETIC ENGINEERING & BIOTECHNOLOGY: Steps in Recombinant DNA technology, Genomic libraries, application of genetic engineering technology in agriculture.A brief account on hazards & safe guards of genetic engineering technology with special reference to Bt Cotton. A brief account of Bioinformatics and its uses.

UNIT II MICROBIAL BIOTECHNOLOGY — 13 hr

Uses of microbes in industry and agriculture fermentation – production of ethanol, production of antibioties – Penicillin.

PLANT PHYSIOLOGY- I – Water Relations: Importance of water, Diffusion, Osmosis, water potential, Osmotic Potential, Membrane and their Permeability.Absorption Of Water- Mechanisms of water absorptions, factors affecting rate of waterabsorption.

Stress Physiology: Water stress, heat stress, salt stress and mechanisms of Plant response to water and related stress.

UNIT III PLANT PHYSIOLOGY – II — 13

Mechanism of ascent of Sap – Vital and physical force theories.

Transpiration – Loss of water, Types, Mechanisms, Stomatal Dynamics. Stomatal mechanism, Significance, Factors affecting transpiration, anti - transpirants, Guttation.

Mineral Nutrition In Plants - Major& Minor elements, their deficiency symptoms in plants.

Phloem Transport- Transport of organic solutes.Path of transport, vein loading and unloading.Transcellular or streaming hypothesis, contractive protein hypothesis, mass flow hypothesis,Source – Sink concept.

PRACTICAL PAPER–VI

MOLECULAR BIOLOGY, GENETIC ENGINEERING, BIOTECHNOLOGY AND PLANT PHYSIOLOGY

Total Units – 13

1. Qualitative Test for Starch, Protein, Reducing Sugars and Lipids.	2 Units
2. Determination of Osmotic potential of the cell sap by Plasmolytic method.	1 Unit
3. Determination of Stomatal Index.	1 Unit
4. Structures of Stomata in Hydrophytes, Mesophytes and Xerophytes.	2 Units
5. Streaming of Protoplasm to show Cyclosis.	1 Unit
6. Determination of pH of Plant Samples by using Indicators.	1 Unit
7. Study of Osmosis & Transpiration Experiments.	3 Units
8. Study of Phloem Transport by Ringing Experiment.	2 Units

VI SEMESTER

PAPER–VII: CYTOLOGY, GENETICS, EVOLUTION AND PLANT BREEDING

NIT I **CELL & CHROMOSOME BIOLOGY** **39 hrs**

13 hrs

Cell as a fundamental unit of life and organism. Structure of eukaryotic chromosome;centromere,kinetochore and telomere. Nucleosome and its importance in the organisation of eukaryotic chromosome. Types of Chromosomes; biarmed and holocentrictypes.

Cell Division - Phases, mitotic apparatus, cytokinesis, mitotic inhibitors, significance of mitosis; Meiosis- phases of meiotic cycle cytological proof of crossing over, synaptonemal complex. Brief study on Apoptosis (PCD).

NIT II **MENDELIAN GENETICS** **13 hrs**

Biography of Mendel in brief: Mendel's experiments:Monohybrid cross – law of dominance, law of segregation, purity of gametes .Homozygous, heterozygous, phenotype, genotype, monohybrid test cross, Dihybridcross-law of independent assortment, dihybrid test cross, incomplete dominance(*Mirabilis jalapa*, Snapdragon).

Modification of Mendelian ratios:(With reference to plant examples). Interaction of genes epistasis (dominant & recessive); supplementary factors, complementary factors: Polygenic inheritance in Maize (Self Sterility in*Nicotiana*), Linkage & Crossing over (in Maize).

SEX DETERMINATION: Chromosomal mechanism of sex determination methods. XX –XY, ZZ – ZW & XX – XO (Sex determination in *Melandrium*) and genetic problems related to topics.

NIT III **EVOLUTION** **13 hrs**

Origin of life, theories of evolution, modern concepts of evolution, role of mutations in evolution, Gene duplication (2R hypothesis), Big Bang theory.Numerical changes in chromosome number, polypioidy and aneuploidy - trisomics and monosomics and Chromosomal aberrations.

PLANT BREEDING

Historical account and objectives of plant breeding.Vegetative propagation methods (underground plant parts and isolated plant parts - cutting, grafting, layering, gootee, clones) Hybridization (intergeneric and interspecific), maintenance of germplasm, pollen banks, quarantine methods.

PRACTICAL PAPER – VII

CYTOLOGY, GENETICS, EVOLUTION AND PLANT BREEDING

Total Units - 13

1. Preparation of cytological stains - Aceto carmine &Aceto orcein.	1 Unit
2. Mitosis from *Allium* root tips—Aceto orcein.	3Units
3. Meiosis from *Allium* flower buds- Aceto carmine.	3Units
4. Karyotype and Idiogram : Camera Lucida drawing.	1 Unit
5. Permanent slides of Mitosis.	1Unit
6. Permanent slides of Meiosis.	1 Unit
7. Emasculation and bagging of the flower buds of available species.	1 Unit
8. Genetic problems.	2Units
9. Record and Submission- 6 Slides (3 Mitosis and 3 Meiosis.)	

VI SEMESTER

PAPER –VIII: PLANT PHYSIOLOGY – III

NIT I **ENZYMES** 39 hrs

Nomenclature, classification, chemical composition, prosthetic groups coenzymes, cofactors , vitamins properties of enzymes , mechanism of enzymes action, enzyme kinetics, factors affecting enzyme activity, Inhibition of enzyme action (Competitive, Non Competitive, feedback), Allosteric enzyme. 13 hrs

Nitrogen Metabolism:

Sources of nitrogen, Nitrogen fixation, *nif* genes in relation to symbiotic fixation in *Rhizobim*. Synthesis of amino acids and Nitrogen cycle.

NITII **BIOENERGETICS**

Photosynthesis – Introduction, ultra structure of the chloroplast, photosynthetic apparatus, principle of light absorption, Emerson's enhancement effect, photosystems I & II, Light reaction – Hill reaction, photophosphorylation (cyclic, non-cyclic), carbon reactions (Calvin Cycle, C_4 – Pathway, CAM), Factors affecting the process. 13hrs

Photorespiration – Organelles involved, mechanisms and significance.

Respiration- Introduction, mechanism of aerobic respiration – glycolysis,TCA cycle, ETS and oxidative phosphorylation, mechanism of anaerobic respiration(alcoholic fermentation and lactic acid fermentation), Respiratory Quotient and its significance, factors affecting respiration.

IT III **PLANT GROWTH AND GROWTH REGULATORS** 13hrs

Definitions of growth, Kinetics, Factors affecting growth, Phytohormones, Metabolism, Physiological effects, mode of action of auxins, gibberellins, cytokinins, ethylene and ABA. Applications of these hormones in agriculture and horticulture.

Plant movements – A brief account on the classification and types of movements.

Photobiology – A brief account of dormancy, Photoperiodism, phytochrome and its role, Florigen concept, Vernalization,

Defence mechanisms – A brief account of Secondary metabolites (Phenolics, Flavonoids and alkaloids) and their role in plant defence.

PRACTICAL PAPER – VIII
PLANT PHYSIOLOGY – III

Total Units : 13

1. Separation of Photosynthetic pigments by paper chromatography and measurement of Rf Values. — 1 unit
2. Determination of rate of photosynthesis at different wavelengths of light. — 1 unit
3. Determination of rate of photosynthesis at different concentrations of CO_2 — 1 unit
4. Estimation of Ascorbic acid content in a plant sample. — 1 unit
5. Determination of RQ of carbohydrates, fats and proteins. — 1 unit
6. Study of geotropism, phototropism and hydrotropism. — 2 unit
7. Evolution of O_2 during photosynthesis. — 1 unit
8. Evolution of CO_2 during respiration. — 1 unit
9. Kuhne's fermentation vessel. — 1 unit
10. Moll's half leaf Experiment. — 1 unit
11. Evolution of heat during respiration — 1 unit
12. Determination of the rate of growth using Arc Auxanometer — 1 unit
13. An industrial visit to study the manufacture of alcohol / antibiotics / enzymes. Bioinformatics/ Molecular biological lab.