

**B.Sc. BOTANY
FIRST SEMESTER**

Paper I – Viruses, Bacteria, Cyanobacteria, Algae, Fungi and Lichens

Theory

Total theory marks -50

I A marks for theory – 10hr

Total number of teaching hours / sem – 60hr

Total number of teaching hours / week – 04hr

Duration of theory exam -03hr

Practical

Based on theory paperI

Max. marks -40

Total number practical / week -01

Duration -03hr

Duration of practicaexam -03hr

Viruses ; Ultrastructure of TMV and Bacteriophage, Multiplication of Viruses, Common viral diseases of plants – Tobacco mosaic diseases. Bean mosaic disease and Leaf curl of Tomato.

Mycoplasma ; General concept

Bacteria; Introduction, Morphological types, flagellation, ultra structure, nutrition, reproduction – cell division, conjugation, transduction and transformation, Economic importance and diseases – Citrus canker, Late blight of paddy, Red stripe of sugarcane and Angular leaf spot of Cotton.

Cyanobacteria; Occurrence, Structure, reproduction and economic importance (Biofertilizer, food, and indicator of eutrophication) of cyanobacteria and algal blooms. Type study – Nostoc and Spirulina **-16hr**

Algae – General characters, Classification based on Fritch system and economic importance.

Occurrence, structure of thallus, Reproduction and life cycle of the following.

Chlorophyceae- Volvox, Spirogyra, Oedogonium, Vaucheria, Chara

Phaeophyceae – Sargassum

Rhodophyceae – Batrachospermum

- 22hr

Fungi - General characters, Classification based on major classes based on Alexopoulos system and economic importance of fungi.

Structure, nutrition, reproduction, lifecycle, disease symptoms and controlling methods of the following.

Oomycetes - Phytophthora, Albugo.

Zygomycetes – Rhizopus

Ascomycetes- Penicillium, Xylaria

Basidiomycetes – Puccinia graminis tritici

Deuteromycetes – Cercospora

Lichens – Occurrence, and classification [Crustose, foliose, and fruticose] Structure [external and internal], reproduction and economic importance of Lichens as spice, medicine, cosmetics and as pollution indicator.

- 22hr

B.Sc BOTANY
SECOND SEMESTER
Paper II
Bryophyta, Pteridophyta, Palaeobotany and Gymnosperms

| | |
|--|---------------|
| Theory | |
| Total theory marks | -50 |
| I A marks for theory | - 10hr |
| Total number of teaching hours / sem | - 60hr |
| Total number of teaching hours / week | - 04hr |
| Duration of theory exam | -03hr |
| Practical | |
| Based on theory paper II | |
| Max. marks | -40 |
| Total number practical / week | -01 |
| Duration | -03hr |
| Duration of practical exam | -03hr |

Bryophyta – Introduction, Alternation of generation, classification, structure [external and internal] and reproduction of the following examples.

Hepaticopsida – Riccia

Anthocerotopsida – Anthoceros

Bryopsida – Polytrichum

Brief account of evolution of sporophytes - 15hr

Pteridophyta – Introduction, classification, occurrence, morphology, anatomy, reproduction and life cycle of the following examples.

Psilopsida – Psilotum

Lycopsidea – *Lycopodium cernuum* , Selaginella.

Sphenopsida – Equisetum

Pteropsida – Marselia

Brief account on stellar evolution, Heterospory and seed habit - 25hr

Palaeobotany – Introduction, process of fossilization, types of fossils, geological time scale, a brief account of **Rhynia and Lepidodendron** stem. - 05hr

Gymnosperms- General characters, classification, morphology, anatomy of root, stem and leaf. Reproduction and life cycle of

Cycadopsida -Cycas,

Coniferopsida -Pinus

Gnetopsida - Gnetum . - 15hr

[Developmental aspects need not to be studied]

B.Sc BOTANY
THIRDD SEMESTER
Paper III
Histology, Anatomy, Embryology and Palynology

| | |
|--|---------------|
| Theory | |
| Total theory marks | -50 |
| I A marks for theory | - 10hr |
| Total number of teaching hours / sem | - 60hr |
| Total number of teaching hours / week | - 04hr |
| Duration of theory exam | -03hr |
| Practical | |
| Based on theory paper III | |
| Max. marks | -40 |
| Total number practical / week | -01 |
| Duration | -03hr |
| Duration of practical exam | -03hr |

Histology: Meristems – Structure and function, Classification based on Origin, function and position. Histogen and Tunica corpus theory. Structure and function of parenchyma, Collenchyma, Sclerenchyma, Xylem and Phloem. **07hr**

Tissue system:

Dermal–Structure and function of epidermis, Stomata, hairs and glandular hairs **02hr**

Ground tissuesystem -Structure and function of Cortex, Endodermis, Pericycle and Pith. **03hr**

Vascular tissue system – Types of vascular bundles- Radial, Conjoint, Collateral, Bicollateral and Concentric. **02hr**

Anatomy: - Internal structure of

dicot - Tridax and Cucurbita stem, Cicer root and Tridax leaf.

Monocot –Grass stem, Canna root and Grass leaf.

Normal secondary growth- in Tridax stem. Formation of cambial ring, Storied and non-storied cambium, activity of cambium, secondary xylem, phloem, vascular rays, sap wood, heart wood, growth rings, tylosis and periderm . **10hr**

Secondary growth in typical dicot root – Cicer.

Anamolous secondary growth in Boerhavia and Dracena stem. **06hr**

Embryology: Historical account, contribution of Maheshwari and BGL Swamy **02hr**

Microsporogenesis – Development of Anther, male gametophyte and Pollen embryosac. **03hr**

Megasporogenesis – Types of ovules, differentiation of archesporial initial, formation of megaspore, types of tetrads, types of embryosac [Monosporic, Bisporic and Tetrasporic]. Development of monosporic embryosac [Polygonum type only]. Double fertilization, Triple fusion and its significance. **06hr**

Endosperm: Types Cellular, Helobial and free nuclear . Detailed study of cellular type of endosperm, endosperm haustorium and vermiform appendage. **04hr**

Embryo: Types – Dicot and Monocot, development of dicot embryo Crucifer type. Suspensor haustorium [definitionwith example]. **02hr**

Apomixis - a brief account **02hr**

Polyembryony – Types, causes, induction of poly embryony, significance **02hr**

Palynology – Definition pollen morphology –Pollen structure, size and shape of pollen grains [spherical, sub-porate,prolate and perprolate], Wall layers and their morphology [exine, sexine, ecto and endoexine, Nexine- I,II,and III], Pollen kit, Number, position and character of aperture and Exine sculpture **06hr**

Pollination : Types – Self and cross pollination, types of cross pollination, piston and lever mechanism, Contrivances of cross pollination . **03hr**

Syllabus for Paper- IV
PLANT ECOLOGY AND ENVIRONMENTAL BIOLOGY
FOURTH SEMESTER(D-792)

Total No. of Teaching hours: 60
Total No. of Teaching hours per week: 04
Duration of Practical's: 03 Hrs/ Practical
Total theory Marks: 50
I.A Marks for theory: 10
Total Practical Marks: 40

Theory:

- 1. Ecology:** Definition and Scope, Factors affecting plant growth and their distribution, Climatic factors (light, temperature, rainfall, wind & atmospheric humidity), Edaphic factors (Soil formation, profile, soil air & soil biota) & Biotic factors. Response of Plants to stress conditions- Hydrophytes, Mesophytes, Xerophytes, Epiphytes, Halophytes, Psamophytes and Parasites **15hrs**
 - 2. Ecosystem:** Biosphere, concept and structure of ecosystem. Types of ecosystem (pond, forest and grassland), Ecological pyramids, Ecological niche, Food chain, Food web, Ecotone, Trophic level, Energy flow, Law of thermodynamics and Biogeochemical cycles (Nitrogen, Hydrologic, Carbon, Sulphur and Phosphorous cycles) **14hrs**
 - 3. Ecological Successions:** Process of plant succession, hydrosere and xerosere, concept of climax vegetation **02 hrs**
 - 4. Community Ecology:** Methods of studying natural vegetation Qualitative and Quantitative techniques (Quadrates, Bisects and Transects) **02hrs**
- Environmental Biology**
- 5. Natural Resources:** Introduction, renewable and non-renewable resources, a study on fuel and soil resources, general account on NTFPs **05hrs**
 - 6. Environmental Pollution:** Source of air, water, land and noise pollution, Causes & effects of air, water, land and noise pollution (Global warming, Acid rain, Smog & fog, Eutrophication, Ozone depletion, Green house effect, Acidification, Solid wastes, Nuclear hazards) and Control/management of pollution (Importance of Public awareness) **06hrs**
 - 7. Forestry:** Deforestations, Reforestations, Afforestations and Social forestry, importance of forestry **02hrs**
 - 8. Conservation Ecology:** Soil erosions and its types, control of soil erosions, conservation and management of soil erosions. Wet lands, Sacred Grooves, National parks, Wildlife Sanctuaries and Biosphere reserves **08hrs**
 - 9. Phytogeography:** Phytogeographical regions of India, Types of forest in India and Karnataka, Biodiversity Hot spots, Concept of endemism. **04hrs**

B.Sc., Botany

FIFTH SEMESTER

Paper- V: Morphology, Taxonomy, Economic Botany and Ethno botany

Theory - 45 hr

Maximum marks - 50

IA Marks - 10

No. of teaching hours per week -03 hours

Duration of examination -03 hours.

MORPHOLOGY: Vegetative Morphology

Root: General introduction including classification. Modification for storage (fusiform, conical, napiform and fasciculate), support (epiphytic and aerial) and respiration (respiratory/pneumatophores) floating and sucking (haustoria).

Stem: General introduction including branching type. Modification:-Rhizome, stemtuber, bulb, cor stolon, sucker, off-set, phylloclade, cladode, thorn and tendril.

Leaf: General introduction, Types (simple and compound), Phyllotaxy (alternate, opposite and whorled) stipules.

Modification: phyllode, spines, tendril, hooks, Insectivorous plant, pitcher plant, sundew plant .

Floral Morphology: Inflorescence, general account of racemose and cymose including special cymes.

Flower: Complete account of floral morphology - Gamosepalous, polysepalous, gamopetalous, polypetalous condition, aestivation, attachment and dehiscence and cohesion of anthers, apocarpous and syncarpous/ placentation, style and stigma, floral formula and floral diagram.

Fruit: General account including classification and types of fruits. **-15h**

TAXONOMY OF ANGIOSPERMS:

Principles of classification, Binomial nomenclature, species concept, system of classification by Bentham and Hooker, Herbarium techniques and importance of herbaria of India.

Study of following families with plants of economic importance (Bentham and Hooker's system to be followed).

Dicots: Annonaceae, Brassicaceae, Capraidaceae, Malvaceae, Rutaceae, Anacardiaceae, Fabaceae (Ceasalpinioideae, Mimosoideae and Papilionoidae), Myrtaceae, Cucurbitaceae, Apiaceae,

Rubiaceae, Asteraceae, Apocynaceae, Asclepiadaceae, Convolvulaceae, Solonaceae, Acanthaceae, Lamiaceae, Verbinaceae,

Amaranthaceae and Euphorbiaceae.

Monocots: Orchidaceae, Lilaceae, Arecaceae, Poaceae, and Cannaceae. **-22h**

ECONOMOIC BOTANY:

Food: Cereals, Millets and Pulses: Jowar, Ragi, Wheat, Rice, Black gram and Bengal gram.

Oils and Fats: Groundnut, Coconut, Sunflower.

Beverages: Tea, Coffee and Cocoa.

Textile Fibres: Cotton and Coir.

Spices: Cardomom, Clove, and Cinnamon.

Timner: Teak, Rosewood, and Neem.

Narcotic: Tobacco and Opium.

Medicinal plants: *Rauwolfia serpentina*, *Vincarosea*, *Tylophora asthmatica*, *Cinchona officinalis*, *Withania somnifera*, *Tinospora cordifolia*, *Ocimum*, *Garlic*, *Aloe vera*, *Turmeric* and *Ginger*. **-10h**

ETHNOBOTANY:

A general account of Ethno botany and its significance. **-03h**

B.Sc., Botany

FIFTH SEMESTER

Practical Syllabus

Paper- V: Morphology, Taxonomy, Economic Botany and Ethnobotany

Based on theory syllabus

Practical V: Modified Question paper model

Time– 3 hrs Marks - 40

- I. Identify the families , A,B,C,D with reasons - 12
- II. Describe 'E' technical terms and draw floral diagram with floral formula **F-06**
- III. Write the morphological and Biological importance of **G,H, I -06**

- IV. Write the economic importance of **J, K and L** – 06
- V. Viva - 05
- VI. Record - 05

Paper V- Modified Practical syllabus –Morphology, Taxonomy and Economic Botany

Morphology

- 1. Root modification -
Tap root - Fusiform, Napiform and Conical root.
- 2. Stem Modification –
Underground - Rhizome, Tubers, Bulb, and Corm.
- 3. Leaf modification -
Tendrils [Gloriosa /Pea] and Stipules [Smilax] and available insectivorous plant specimens.
- 4. Inflorescence – Types of Racemose (Simple raceme, Spike, Spadix, Corymb, Head, Globose head and Umbel), Cymose inflorescence (Simple, Dichacial, Polychacial) and Special type (Cyathium, and Verticelaster)
- 5. Fruits – Legume, Siliqua, Berry, drupe, Pepo, Hesperidium, Pome, Eterio of berries / Follicle.

Taxonomy

- 1. Any six families from Polypetalae, six from gamopetalae and two families from each Monocots and monoclamydae.
- 2. **Demonstration of herbarium techniques.**
- 3. Botanical tour is compulsory
- 4. **Herbarium submission is deleted from the practical syllabus**

Economic Botany

- 1. As prescribed by the Economic Botany syllabus

B.Sc., Botany

FIFTH SEMESTER

Paper- VI: Cell Biology and Cytogenetic

Theory - 45 hr

Maximum marks - 50

IA Marks- 10

No. Of teaching hours per week -3 hours

Duration of examination -3 hours.

The Cell: Ultra structure of a plant cell, organization, function and its components- cell wall, membranes (fluid mosaic model) Endoplasmic reticulum, Golgi apparatus, Lysosomes, Peroxisomes, Ribosomes, Mitochondria, Plastids, Cytoplasm, Vacuole, Cell sap, Non-living inclusions, Nucleus, Nucleoplasm, Nuclear membrane, Pores and Nucleolus.

Chromosomes: Size, number, structure, chromatids, centromere, telomere, satellite, secondary constriction. Nuclear organizer. Types of chromosomes (based on position of centromere), Karyotype, heterochromatin (facultative and constitutive heterochromatin). Euchromatin, Chromosomal Model including nucleosome model; Mitosis and Meiosis in plants Chromosomal aberrations (deletion, duplication, inversion, translocation).

Variation in chromosome number: Polyploidy (Anueploidy, euploidy, autopolyploidy, allopolyploidy- with reference to *Raphanus brassica*), Character of Polyploidy and its significance of Polyploidy. **-15h**

Nucleic acids: Chemical composition of DNA and RNA.

RNA: Occurrence, types, structure, functions.

DNA: Occurrence, types, structure (double helix model), mechanism of DNA replication (semi conservative method)

Gene Mutation: Mutation and Mutagens (spontaneous, induced: point mutation).

Concept of Gene: Gene expression and regulation- exons, introns, inducible and repressible genes: the operon concept; lac operon (inducible) and repressible operon (tryptophan).

Genetic Code: Codon dictionary, properties of genetic code.

Protein synthesis: Central dogma: mechanism of protein synthesis transcription and translation: co-linearity. – 15h

Mendelian Genetics : 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, Dihybrid cross – law or independent assortment, dihybrid test cross. Mention of trihybrid crosses, incomplete dominance (*Mirabilis jalapa*, *Snapdragon*).

Modification of Mendelian Ratios: (With reference to plant examples) Interaction of genes – Epistasis (dominant and recessive); supplementary factors, complementary factors: multiple alleles) self-sterility in *Nicotiana*, Linkage and crossing over (Maize).

Sex determination in plants: Chromosomal mechanisms of sex determination methods- XX-XY, ZZ-ZW and XX-XO (only plant example)- *Melandrium*, *Rumex acetosa* (tripartite), *Humulus lupulus* (tetrapartite). – 15h

B.Sc., Botany

FIFTH SEMESTER

Paper- VI: Cell Biology and Cytogenetics

1. Preparation of Mitotic slides. Ex: Onion root tips.
2. Preparation of Meiotic slides. Ex: Onion flower buds, *Rhus*
3. Study of different stages of mitosis and meiosis from permanent slides.
4. Solve the genetic problems from the given list
5. Technique of making permanent slides in mitosis and meiosis

B.Sc., Botany

FIFTH SEMESTER

Practical syllabus

Paper- VI: Cell Biology and Cytogenetics

Practical question paper –VI

Duration: 3 hrs

Marks - 40

1. Prepare squash of material 'A' Identify, sketch, label the stages with reasons. -08
 2. Prepare smear of material 'B' Identify, sketch, label the stages with reasons. -06
 3. Identify the slides 'C' and 'D' (one from mitosis and one from meiosis) -06
 4. Solve the genetic problem 'E' and 'F' -10
- Viva-05
Record-05

B.Sc., Botany

SIXTH SEMESTER

Paper- VII: Plant Physiology

Theory - 45 hr

Maximum marks - 50

IA Marks - 10

No. of teaching hours per week - 03 hours

Duration of examination -03 hours.

Plant Water Relation: Significance of water for plants. Solutions (Molar and Mole), colloidal systems (hydrophilic and hydrophobic). Osmosis (O.P, T.P, D.P.D, and water potential. Plasmolysis, exosmosis, deplasmolysis and endosmosis)

Absorption of water: Mechanism active osmotic and active non osmotic absorption and passive absorption. Ascent of sap-path (only Balsam experiment) mechanism, Root pressure and T.C.T theory.

Absorption of Mineral Salts: Mechanism of absorption passive absorption (diffusion, mass flow, -exchange, Donnan equilibrium), active absorption (Lundegardh and Burstrom) Cytochrome pump theory, Lecithin cycle, carrier concept)

Mineral Nutrition: Essential and Non-essential elements, Micro and Macro nutrients. Role and deficiency symptoms of N.P.K and Mg, Fe, Cu.

Transpiration: Types of transpiration, mechanism of stomatal transpiration – structure of stomata, mechanism of stomatal movement. Significance of transpiration, Guttation and wilting point.

Translocation of Solutes: Types (upward, radial and downward), path (phloem ringing experiment, protoplasmic streaming theory, and mass flow theory).

Enzymes: Nomenclature, structure, classification and properties.– **15h**

Photosynthesis: Structure and function of chloroplast, photosynthesis pigment, Photosystem I and Photosystem II. The Z scheme the light, and dark reaction, C₃ and C₄ pathway. The law of limiting factor, factors affecting photosynthesis. Photosynthesis in bacteria. CAM photosynthesis.

Respiration: Introduction, types, Biochemical pathways of respiration –glycolysis. TCA cycle, electron transport system and terminal oxidation. An account of photorespiration and its significance. An account of anaerobic respiration and fermentation. Significance as an industrial process. - **15h**

Carbohydrate Metabolism: Importance of carbohydrates, definition, classification, common carbohydrates in plant glucose, fructose, sucrose, starch, cellulose, pectose, metabolism.

Phytohormones: Definition, types of hormones, physiological and practical application of auxins, gibberellins, cytokinins, ethylene, ABA.

Physiology of flowering: Photoperiodism, types, role of phytochrome, vernalisation, seed dormancy.

Plant Movement: Introduction, classification, tropic movement. – **15h**

Paper VII – Plant Physiology

Based on theory syllabus

Time– 3 hrs

Marks - 40

Practical VII: Question paper model

1. Conduct major experiment **A**. Write Requirement, Procedure, Record the Results with conclusions (Requirement-02, Procedure-04, Experiment settings-04, Record the Results with conclusions -02). **-12**

2. Comment on experiment **B**, **C** and **D**. **-12**

3. Investigate the chemical nature of **E**. **-06**

4. Viva - **05**

B.Sc., Botany
SIXTH SEMESTER
Practical Syllabus

List of major experiments.

1. Measurement of DPD in plants (Potato) by gravimetric method.
2. Ganong's photometer – Rate of transpiration under different conditions of light and wind.
3. Relation between absorption and transpiration.
4. Suction force due to transpiration.
5. Evolution of oxygen by bubble counting method under different wave length of light using color transparencies – Normal, Red, blue, yellow or green (During examination different condition need not to be asked).
6. Experiment to demonstrate the presence of starch in leaves.
7. Separation of chlorophyll pigments by paper chromatographic method.
8. Ganong's respirometer- demonstrated that CO₂ is liberated during respiration.

List of Minor experiments

1. Potato osmoscope to demonstrate endosmosis and exosmosis
2. Bell jar experiment
3. Light's screen experiment
4. Mohl's half leaf experiment.
5. Dewar's flask expt

6. Kuhne's fermentation vessel
7. Phototropism
8. Hydrotropism
9. Geotropism
10. Arc indicator

B.Sc., Botany

SIXTH SEMESTER

Paper- VIII: Plant Breeding, Biotechnology, Plant tissue culture and Evolution

Theory - 45 hr

Maximum marks - 50

IA Marks - 10

No. of teaching hours per week - 03 hours

Duration of examination -03 hours.

Plant breeding: Principles and objective :Methods of breeding(Mass selection, single plant or pure line selection, clonal selection, progeny selection, recurrent selection).Significance of plant breeding- increase in yield, resistance to disease and insect pests.Plant breeding in producing new and improved varieties of medicinal plants and other plants of industrial importance.

Hybridization: Objectives, techniques of emasculation, artificial pollination, intraspecific and intergeneric crosses.

Propagation: Cutting, Gootylayering (air layering), Grafting, wedge grafting, approach grafting, Bud grafting.

Evolution: Brief account of theories of evolution – Lamarck, Weismann, Darwin and De-varies, Modern synthetic theories. **- 17h**

Biotechnology: Introduction: Scope of genetic engineering (DNA technology), PCR technology, production of polyclonal and monoclonal antibodies, genetic manipulation through tissue culture, Gene mapping.

Application of biotechnology in pharmaceutical ,agriculture, Industrial, Environmental field and oil spill,(Greenpeacemovement),(Waste disposal management , and sewage water treatment .

DNA finger printing and its application

Transgenic plants- Btcotton, Tomato, Arabidopsis thaliana-**18h**

Tissueculture: Aim and scope, Totipotency, callus culture, organogenesis through callus culture, somatic embryogenesis, haploid culture (example anther culture). Application of tissue culture in agriculture and human welfare.-**10h**

Paper VIII – Project work

Time– 3 hrs

Marks - 40

Practical VIII: Question paper model

- | | |
|--------------------------------------|------|
| 1. Practical proper - Presentation. | -10 |
| 2. Record – Project work Submission. | -20 |
| 3. Viva | - 10 |