



Tripura University
(A Central University)
Suryamaninagar
West Tripura

Syllabus for
Four Years Undergraduate Programme
Subject: Botany (Minor)
(As per NEP-2020)

Year - 2023



Tripura University
(A Central University)

Course Structure of Botany (UG Programme)

As per NEP-2020 under Tripura University

BOTANY (MINOR)

Year	Semester	Paper	Credits	Total marks	Unit-I	Unit-II	Unit-III	Unit-IV
1st	1st	Paper-1A Theory	3	60 (IA=24+ ESE=36)	Microbiology	Phycology-I	Phycology-II	Mycology
		BT-101M Paper-1B Practical	1	40 (IA=16+ ESE=24)	<i>Based on theory paper 1A</i>			
	2nd	Paper-2A Theory	3	60 (IA=24+ ESE=36)	Bryophyta	Pteridophyta	Gymnosperm	Paleobotany
		BT-102M Paper-2B Practical	1	40 (IA=16+ ESE=36)	<i>Based on theory paper 2A</i>			
2nd	3rd	Paper-3A Theory	3	60 (IA=24+ ESE=36)	Phytopathology	Morphology	Embryology	Plant Anatomy
		BT-201M Paper-3B Practical	1	40 (IA=16+ ESE=24)	<i>Based on theory paper 3A</i>			
	4th	Paper-4A Theory	3	60 (IA=24+ ESE=36)	Taxonomy-I	Taxonomy-II	Plant Ecology	Phytogeography
		BT-202M Paper-4B Practical	1	40 (IA=16+ ESE=24)	<i>Based on theory paper 4A</i>			
3rd	5th	Paper-5A Theory	3	60 (IA=24+ ESE=36)	Biochemistry	Plant Physiology-I	Plant Physiology-II	Evolution
		BT-301M Paper-5B Practicals	1	40 (IA=16+ ESE=24)	<i>Based on theory paper 5A</i>			
	6th	Paper-6A Theory	3	60 (IA=24+ ESE=36)	Cell Biology	Molecular Biology-I	Molecular Biology-II	Genetics
		BT-302M Paper-6B Practical	1	40 (IA=16+ ESE=24)	<i>Based on theory paper 6A</i>			
4th	7th	Paper-7A Theory	3	60 (IA=24+ ESE=36)	Biometry	Plant Breeding	Economic Botany-I	Economic Botany-II
		BT-401M Paper-7B Practicals	1	40 (IA=16+ ESE=24)	<i>Based on theory paper 7A</i>			
	8th	Paper-8A Theory	3	60 (IA=24+ ESE=36)	Plant Biotechnology-I	Plant Biotechnology-II	Pharmacognosy	Biodiversity & Sustainable development
		BT-402M Paper-8B Practicals	1	40 (IA=16+ ESE=24)	<i>Based on theory paper 8A</i>			

**DETAILED COURSE CONTENT OF
BOTANY (MINOR)**

1st YEAR

Botany (Minor)

SEMESTER-I

Paper-1A- (Theory)

BT-101M – Microbiology, Phycology & Fungi

Total Marks-60 (IA = 24 + ESE = 36)

(Credits-3)

Unit-1: Microbiology

- 1. Virus:** General properties of plant virus and Bacteriophage, Structure of DNA virus (T4 phage); Lytic and lysogenic cycle; Structure of RNA virus (TMV).
- 2. Bacteria:** General characters of bacteria; Morphological forms, Cell structure (in detail), Bacterial reproduction- binary fission and endospore formation, Genetic recombination in bacteria -(transformation, transduction and conjugation).

Unit-II: Phycology-I

1. General characters of Algae - Thallus organization, Pigments, Outline classification of Lee (1999) up to phylum, Economic importance of algae, *Spirulina* cultivation.
2. Salient features of Cyanophyceae, Chlorophyceae, Phaeophyceae and Rhodophyceae.
3. Bacillariophyceae (Diatom) - Cell structure, reproduction and economic importance.

Unit-III: Phycology-II

Life history of the following: *Nostoc*, *Oedogonium*, *Chara*, *Ectocarpus* and *Polysiphonia*.

Unit-IV: Mycology

1. General characters of Fungi including fungal mode of nutrition, Classification of Fungi (Ainsworth, 1973) up to sub-division; Economic importance of fungi.
2. Important characteristics of Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina, & Deuteromycotina.
3. General characters of Myxomycetes.
4. Life history of *Rhizopus*, *Penicillium* & *Agaricus*.
5. Mushroom production and harvesting (*Volvariella* sp. and *Pleurotus* sp).

Botany (Minor)
SEMESTER-I
Paper-1B-(Practical)

BT-101M

Total Marks- 40 (IA = 16 + ESE = 24)

(Credit = 1)

Sl. No.	Practical	Marks
1.	Workout on Microbiology	07
2.	Workout on Algae or Workout on Fungi*	07
3	Identification with reasons (2 x 2 marks)	04
4.	Laboratory Note book	03
5.	<i>Viva voce</i>	03
TOTAL		24

CONTENTS

1. Use of Simple and Compound microscope.
2. **Work out on Microbiology:**
 - (a) Gram staining of bacterial population from curd.
 - (b) Demonstration of Sterilization process.
3. **Work out of the following algal genera** with reproductive structures (Free hand drawing only): *Nostoc* sp., *Oedogonium* sp., *Chara* sp., *Ectocarpus* sp., *Polysiphonia* sp.
And
Work out of the following Fungi with reproductive structures (Free hand drawing): *Rhizopus* sp., *Penicillium* sp., *Agaricus* sp., *Polyporus* sp.
**Algal and fungal specimen should be given alternatively to the students during exam.*
4. **Identifications:**
 - a) **Permanent slides of Algae:** *Nostoc*, *Volvox* colony, *Oedogonium* dwarf male, *Polysiphonia* – cystocarp & tetrasporophyte.
 - b) **Permanent slides of Fungi:** Zygosporangium of *Rhizopus*, Conidiophore of *Penicillium*, T.S. of gills of *Agaricus*, T.S. of basidiocarp of *Polyporus*.
 - c) **Macro specimen** - Fruitbody of *Agaricus*, *Polyporus*.
5. **Laboratory Records:** Student must get the laboratory note books duly signed by the respective teacher during practical classes.
6. **Viva voce:** Questions based on theory and practical syllabus of 1st semester.

Botany (Minor)

Semester-II

Paper-2A (Theory)

BT- 102M – Bryophyta, Pteridophyta & Gymnosperms and Paleobotany

Total Marks-60 (IA = 24 + ESE = 36)

(Credits-3)

Unit-I: Bryophyta

1. General characters including Amphibian nature; Origin of Bryophyta.
2. Distinctive features of three major groups – Hepaticopsida, Anthocerotopsida, & Bryopsida.
3. Life history: Gametophyte structure & reproduction, development and structure of sporophyte in of *Riccia*, *Marchantia*, *Anthoceros*, and *Funaria*.

Unit-II: Pteridophyta

1. General characters, Lifecycle pattern (Homosporous & Heterosporous type).
2. Outline classification (Sporne, 1975) up to order with examples.
3. Important characters of the classes – Psilophytopsida, Psilotopsida, Lycopsida, Sphenopsida, Pteropsida.
4. Life history: Sporophyte structure, reproduction and structure of gametophyte of *Lycopodium*, *Selaginella*, *Equisetum*, and *Pteris*.

Unit-III: Gymnosperms

1. General characters of Progymnosperms.
2. Gymnosperms - General characters.
3. Outline classification (Sporne, 1965) up to Order with examples.
4. Important characters of three classes – Cycadopsida, Coniferopsida, & Gnetopsida.
5. Economic importance of Gymnosperms with reference to Wood, Resins, Essential oils, and Drugs.
6. Life cycle (Morphology, anatomy and reproduction) of *Cycas*, *Pinus* and *Gnetum*.

Unit-IV: Paleobotany:

1. Definition of fossil, Conditions required for fossilization, Fossilization process.
2. Types of fossil (Microfossil, Mega fossil and its types on the basis of nature of fossilization); Modes of preservation (after Schopf, 1975).
3. Importance of fossil study.
4. Geological Time scale with dominant plant groups through ages.
5. Study of fossil plants:- *Rhynia*, *Williamsonia*

Botany (Minor)
Semester-II
Paper-2B (Practical)
BT- 102M

Total Marks- 40 (IA = 16 + ESE = 24)

(Credit = 1)

Sl. No.	Practical	Marks
1.	Workout on Pteridophyta	07
2.	Workout on Gymnosperm	07
3	Identification with reasons (2 x 2 marks)	04
4.	Laboratory Note book	03
5.	<i>Viva voce</i>	03
TOTAL		24

CONTENTS

1. Work out on:

- (a) **Pteridophytes:** Workout on reproductive structures of the following Pteridophytes: *Lycopodium* sp., *Selaginella* sp., *Equisetum* sp., *Pteris* sp.
- (b) **Gymnosperms:** Leaflet of *Cycas* sp, Needle leaf of *Pinus* sp., Microsporophyll of *Cycas* sp.

2. Identification:

- (a) **Study of Bryophytes from permanent slides** – *Riccia* (V.S. of thallus), *Marchantia* (L.S. of: Gemma cup, antheridiophore, archegoniophore, sporophyte), *Anthoceros* (L.S. of sporophyte), *Funaria* (L.S. capsule).
- (b) **Study of macroscopic structures of Gymnosperm:** *Cycas* microsporophylls, *Cycas* megasporophyll, *Pinus* male cone, *Pinus* female cone, *Gnetum* male cone, *Gnetum* female cone.
- (c) **Study of Gymnosperms from permanent slides** – L.S. of *Cycas* ovule, L.S. of *Pinus* male cone, L.S. of *Pinus* female cone, Pollen grains of *Pinus*, L.S. of *Gnetum* male cone, L.S. of *Gnetum* female cone/ovule.
- (d) Study from permanent slides/macroscopic fossil specimen.

3. Laboratory Records: Student must get the laboratory note books duly signed by the respective teacher during practical classes.

4. Viva voce: Questions based on theory and practical syllabus of 2nd semester.

Botany (Minor)

Semester-III

Paper- 3A (Theory)

BT- 201M- Phytopathology, Morphology & Plant Anatomy

Total Marks-60 (IA = 24 + ESE = 36)

(Credits-3)

Unit-I: Phytopathology

1. Terms and concepts (Infection ,disease, Pathogen, Pathogenecity, Pathogenesis, Incubation period, Symptom, Necrotroph, , Inoculum, Inoculum potential, Causal complex, Disease cycle, Endemic disease, Epidemic disease, Sporadic disease);Koch's postulates, Types of symptoms (Necrotic, Atrophic, Hypertrophic); Plant quarantine.
2. Symptoms, Casual organisms, Disease cycle and Control measures of the following diseases: Late blight of Potato, Brown sport of Rice, Black stem rust of Wheat.

Unit-II: Morphology

1. Root- Types and modification.
2. Leaf – Types, Shape of lamina, Apex, Margin, Phyllotaxy, Venation, Stipule types.
3. Inflorescence - types with examples.
4. Flower - Flower types, Floral parts- Calyx (types & modifications), Corolla (types & forms), Aestivation; Stamens (types, cohesion andadhesion); Carpel (Apocarpous and Syncarpous), Ovary (types), Style (types), Placentation types.
5. Fruits- types.
6. Seed types and their dispersal.

Unit-III: Embryology

1. Microsporogenesis.
2. Megasporogenesis (types – monosporic, bisporic & tetrasporic).
3. Structure of ovule and its type.
4. Process of double fertilization.
5. Embryo development (dicot & monocot type),
6. Endosperm development – Nuclear, Cellular & Hellobial types.

Unit-IV: Plant Anatomy

1. Cell wall (Chemical composition & Gross structure).
2. Meristematic tissue: General characters & Classification.
3. Permanent tissue (structure, distribution and function).
4. Cell types of Xylem and Phloem, Vascular bundles – Types; Stele – Types.
5. General anatomical characters of monocot stem and root, Dicot stem and root, Dorsiventral and isobilateral leaf.
6. Normal secondary growth in dicot stem and root.

Botany (Minor)
Semester-III
Paper-3B (Practical)
BT-201M

Total Marks- 40 (IA = 16 + ESE = 24)

(Credit = 1)

Sl. No.	Practical	Marks
1.	Workout on Anatomy	08
2.	Identification with reasons (4 x 2 marks)	08
3.	Laboratory Note book	04
4.	<i>Viva voce</i>	04
TOTAL		24

CONTENTS

- 1. Work out on Plant Anatomy:** Study of Primary structures by preparing temporary slides of the following: **Monocot stem:** T. S. of *Canna* scape / T. S. of Maize stem, **Dicot stem:** T. S. of *Cucurbita* stem / T. S. of Sunflower stem, **Monocot root:** T. S. of Arum root / T. S. of Orchid root, **Dicot root:** T. S. of *Pisum* root, **Dorsiventral leaf:** T. S. of Mango leaf, Isobilateral leaf: T. S. of Bamboo leaf / T. S. of *Phoenix* leaf.
- 2. Identification:**
Types of placentation: Study of different types of placentation.
Types of fruits: Study from fresh or preserved specimens.
Minor anatomy: Types of Stomata, Cystolith, Raphides, Starch grains.
Pathological specimens (fresh or preserved): Name of the disease, Name of Pathogen, symptoms, Identifying characters of – Late blight of Potato, Brown sport of Rice, Black stem rust of Wheat.
- 3. Laboratory Records:** Student must get the laboratory note books duly signed by the respective teacher during practical classes.
- 4. Viva voce:** Questions based on theory and practical syllabus of 3rd semester.

Botany (Minor)
Semester-IV
Paper- 4A (Theory)

BT- 202M - Plant Taxonomy, Plant Ecology & Phytogeography

Total Marks-60 (IA = 24 + ESE = 36)

(Credits-3)

Unit I: Plant Taxonomy-I

1. Components of Plant taxonomy (identification, nomenclature, classification).
2. Aims and phases of taxonomy.
3. Elementary knowledge of ICN- Principles.
4. Herbaria and Botanical Gardens – Functions of Herbaria and Botanical Gardens , Important Herbaria and Botanical Gardens of India and world (3 each).
5. History of Plant classification: Artificial (Linnaeus), Natural (Bentham & Hooker) and Phylogenetic (Hutchinson).

Unit II: Plant Taxonomy-II

Study of the following families (Diagnostic characters, General characters & Economic importance):

Poaceae, Orchidaceae, Magnoliaceae, Leguminosae (with sub- families Caesalpiniaceae, Mimosaceae, Papilionaceae), Malvaceae, Cucurbitaceae, Brassicaceae, Solanaceae, Apocynaceae, Lamiaceae, Rubiaceae and Asteraceae.

Unit-III: Plant Ecology

1. Soil- Origin, Formation, Composition, Physical and Chemical properties, Soil types; Water – Types of soil water.
2. Basic ecological concepts (Trophic levels, Food chain, Food web, Ecological pyramids, Energy flow, Production and Productivity).
3. Habitat and Ecological niche (definition).
4. Succession - Hydrosere and Xerosere.
5. Adaptations of Hydrophytes, Xerophytes and Halophytes.
6. Biogeochemical cycles - Cycling of Carbon and Nitrogen.
7. Red Data book.

Unit-IV: Phytogeography

1. Phytogeographical regions of India (D. Chatterjee, 1960),
2. Vegetations of Eastern Himalaya, Western Himalaya, Sunderban, and Tripura.
3. Endemism - Definition, types, theories of endemism & factors responsible for endemism.

Botany (Minor)
Semester-IV
Paper-4B (Practical)
BT-202M

Total Marks- 40 (IA = 16 + ESE = 24)

(Credit = 1)

Sl. No.	Practical	Marks
1.	Workout on Angiospermic plant	08
2.	Workout on Ecological anatomy	05
3	Spot identification of plants (2 x 1 mark)	02
4.	Submission of Herbarium sheets	03
5.	Laboratory Note book	03
6.	<i>Viva voce</i>	03
TOTAL		24

CONTENTS

- 1. Workout on Angiospermic plants:** Flower dissection, diagram of plant parts, floral diagram, description of plant, floral formula, identification of the family from the families included in the theory syllabus.
- 2. Study of Ecological anatomy:** Hydrophytes (*Hydrilla* stem / *Nymphaea* petiole), Xerophytes (*Nerium* leaf).
- 3. Spot identification:** Scientific names of common wild plants from the families included in theory syllabus.
- 4. Submission of Herbarium sheets:** At least **15 herbarium sheets** must be submitted.
- 5. Laboratory Records:** Student must get the laboratory note books duly signed by the respective teacher during practical classes.
- 6. Viva voce:** Questions based on theory and practical syllabus of 4th semester.

3rd YEAR

Botany (Minor)

Semester-V

Paper- 5A (Theory)

BT-301M - Biochemistry, Plant Physiology & Evolution

Total Marks-60 (IA = 24 + ESE = 36)

(Credits-3)

Unit-I: Biochemistry

1. Water molecule – general properties.
2. Carbohydrates – Classification with example.
3. Lipids – Classification with example & function.
4. Proteins - Levels of protein structure, Classification of proteins with example and biological roles.
5. Nucleic acids - Types of DNA and RNA; Enzymes: General properties and classification with examples.

Unit-II: Plant Physiology-I

1. Water potential and its components and their relation, Osmosis, Plasmolysis.
2. Water absorption by roots (Apoplastic and Symplastic pathways), Ascent of sap - Cohesion-tension theory.
3. Transpiration and antitranspirant.
4. Photosynthesis: Structure of PSI and PSII, Photosynthetic electron transport (Cyclic & non-cyclic), C3 cycle, C4 cycle, CAM cycle.

Unit-III: Plant Physiology-II

1. Glycolysis, Oxidative decarboxylation, TCA cycle, Mitochondrial electron transport, Oxidative Phosphorylation and ATPsynthesis.
2. Photorespiration; Photoperiodism: Photoperiodic responses and classification of plants.
3. Source, physiological role and mode of action of IAA, Gibberellins and Cytokinins.
4. Nitrogen metabolism: Biological N₂ fixation (nodule formation, role of Nitrogenase and leg hemoglobin), function of *nif* and *nod* genes.

Unit-IV: Evolution

1. Origin of life (Oparin-Haldane concept, Urey-Miller experiment, RNA world hypothesis, Protein first model).
2. Biological species concept, Modes of speciation (Allopatric, Peripatric, Parapatric, & Sympatric); Natural selection - Definition and types (Directional, Stabilizing, Disruptive).
3. Macro and Micro evolution (definition).
4. Darwinism and its limitations, Neo Darwinism (only brief idea).

Botany (Minor)
Semester-V
Paper-5B (Practical)
BT-301M

Total Marks- 40 (IA = 16 + ESE = 24)

(Credit = 1)

Sl. No	Practical	Mark
1.	Detection of Biochemical compound from unknown sample.	06
2.	Plant Physiology experiment	12
3.	Laboratory Note book	03
4.	<i>Viva voce</i>	03
TOTAL		24

CONTENTS

1. Biochemical compound detection:

- (a) **Detection of the nature of carbohydrate:** Glucose, Fructose, Sucrose & Starch.
- (b) **Detection of organic acids:** Oxalic acid, Tartaric acid, Citric acid.

2. Plant Physiological experiments:

- i. Comparison of imbibitions of water by Starchy, Proteinaceous and Fatty seeds.
- ii. Comparison of water loss in dorsiventral leaf by Cobalt Chloride method.
- iii. Relationship between transpiration and evaporation.
- iv. Separation of Chlorophyll pigments by paper chromatography.
- v. Determination of released oxygen during photosynthesis (ml/gm/hr).
- vi. Measurement of oxygen uptake by respiring tissue (per gram/hour).

3. Laboratory Records: Student must get the laboratory note books duly signed by the respective teacher during practical classes.

4. Viva voce: Questions based on theory and practical syllabus of 5th semester.

Botany (Minor)

Semester-VI

Paper- 6A (Theory)

BT-302M- Cell biology, Molecular Biology & Genetics

Total Marks-60 (IA = 24 + ESE = 36)

(Credits-3)

Unit-I: Cell biology

1. Composition and structure of Plasma membrane.
2. Structural organization and functions of Mitochondria, Chloroplast, Endoplasmic reticulum, Ribosome, Semiautonomous nature of Mitochondria and Chloroplast.
3. Structure of Nucleus; Chromosome morphology and organization of eukaryotic chromosome (Nucleosome concept), Euchromatin and Heterochromatin, Telomere & Centromere (properties).
4. Cell cycle – Various phases & events (G1, S, G2, M), Cell division- Stages of Mitosis & Meiosis.

Unit-II: Molecular Biology-I

1. Nucleoside and Nucleotide, DNA structure (Watson & Crick model).
2. Central Dogma of molecular biology.
3. DNA replication - General properties & DNA replication mechanism in prokaryotes.
4. Transcription- Initiation, Elongation and Termination in prokaryotes.

Unit-III: Molecular Biology-II

1. Genetic code- Properties.
2. Translation in prokaryotes.
3. Regulation of Gene expression in Prokaryotes - Operon model (general concept), mechanism of lac-operon.
4. Gene mutation- Base substitution (Transition & Transversion) and Frame shift mutation.

Unit-IV: Genetics

1. Mendelian genetics-Principles of segregation and independent assortment; Concept of Dominance, Incomplete dominance, Codominance.
2. Gene interactions with modified dihybrid ratios (12:3:1, 9:7, 9:3:4, 9:6:1, 13:3, 15:1).
3. Definition of Penetrance, Expressivity, Pleiotropism, Phenocopy effect.
4. Linkage (definition of complete, incomplete, coupling phase and repulsion phase linkage, linkage group) and Crossing over & its cytological basis (McClintock experiment).
5. Chromosomal aberration- Numerical changes (aneuploidy and euploidy), Polyploidy types, Structural changes (definition and types of deletion, duplication, inversion and translocation).

Botany (Minor)
Semester-VI
Paper-6B (Practical)
BT-302M

Total Marks- 40 (IA = 16 + ESE = 24)

(Credit = 1)

Sl. No	Practical	Mark
1.	Work out on Mitotic stages	10
2.	Identification with reasons (3 x 2 marks)	06
3.	Laboratory Note book	04
4.	<i>Viva voce</i>	04
TOTAL		24

CONTENTS

- 1. Work out on Mitotic study:** Temporary preparation of mitotic stages from directly fixed root tips of *Allium cepa*.
- 2. Identification:** Study of different stages of Mitosis and Meiosis (Normal and /or Abnormal) from permanent slides.
- 3. Laboratory Records:** Student must get the laboratory note books duly signed by the respective teacher during practical classes.
- 4. Viva voce:** Questions based on theory and practical syllabus of 6th semester.

4th YEAR

Botany (Minor)

Semester-VII

Paper- 7A (Theory)

BT- 401M - Biometry, Plant Breeding & Economic Botany

Total Marks-60 (IA = 24 + ESE = 36)

(Credits-3)

Unit-I: Biometry

1. Presentation of statistical data – Concept of variable and attribute, Primary and Secondary data, Population and Sample, Frequency and frequency distribution, Graphical presentation of data – Bardigram & Histogram, Pie chart.
2. Measures of central tendency (Mean, Mode, Median).
3. Measures of dispersion (Mean deviation, SD, SE).
4. Test of significance – Null hypothesis and Alternate hypothesis, Degree of Freedom, Level of Significance, Student t-test, chi square test for Goodness of fit.

Unit-II: Plant Breeding

1. Aims of plant breeding.
2. Methods of plant breeding: Plant introduction, Acclimatization, Plant domestication.
3. Selection-Mass selection, Pureline selection, Clonal selection.
4. Hybridization (different steps) & Production of synthetic variety.
5. Heterosis (definition, genetic and biochemical basis, importance in plant breeding) & Inbreeding depression.
6. Male sterility (definition, types, importance in plant breeding).

Unit-III: Economic Botany-I

Scientific name, family, part used, and uses of following plants:

Cereal – Rice, Wheat; **Pulses** – Gram, Moong and Lens; **Beverages** – Tea and Coffee; **Fruits** – Mango, Citrus and Papaya; **Drug yielding** – Cinchona, Rauwolfia, Digitalis, Papaver, Andrographis; **Spices** – Ginger, Cumin and Clove; **Oil yielding** – Mustard, Groundnut, Coconut and Linseed; **Vegetables** – Potato, Radish and Cabbage; **Fibre yielding** – Cotton and Jute; **Timber yielding** – Teak and Sal; **Sugar yielding** – Sugarcane.

Unit-IV: Economic Botany-II

1. Rice cultivation- Conventional method & SRI system.
2. Jute Cultivation and processing.
3. Tea cultivation and processing (orthodox & CTC methods).
4. Rubber cultivation and processing.

Botany (Minor)
Semester-VII
Paper-7B (Practical)
BT- 401M

Total Marks- 40 (IA = 16 + ESE = 24)

(Credit = 1)

Sl. No	Practical	Mark
1.	Testing goodness of fit of modified di-hybrid ratios (12:3:1, 9:7, 9:3:4, 9:6:1, 13:3, 15:1)	08
2.	Study of economically important plants (Scientific name, Family, Economically important part, and Uses) as per theory syllabus (2 x 4 marks)	08
3.	Laboratory Note book	04
4.	<i>Viva voce</i>	04
TOTAL		24

CONTENTS

- 1. Biometry:** Determination of goodness of fit (chi square test) of modified di-hybrid ratios(12:3:1, 9:7, 9:3:4, 9:6:1, 13:3, 15:1).
- 2. Study of economically important plants** (Scientific name, Family, Economically important part, and Uses of the prescribed syllabus).
- 3. Laboratory Records:** Student must get the laboratory note books duly signed by therespective teacher during practical classes.
- 4. Viva voce:** Questions based on theory and practical syllabus of 7th semester.

Botany (Minor)
Semester-VIII
Paper-8A (Theory)
BT- 402M - Plant Biotechnology, Pharmacognosy & Biodiversity

Total Marks-60 (IA = 24 + ESE = 36)

(Credits-3)

Unit-I: Plant Biotechnology-I

1. Totipotency and concept of plant tissue culture.
2. Function and organization of a typical plant tissue culture laboratory.
3. Composition of plant tissue culture medium.
4. Techniques of plant tissue culture: Callus culture, Cell suspension culture technique, Haploid culture and Embryo culture.
5. Definition of micropropagation and importance.

Unit-II: Plant Biotechnology-II

1. Definition of Recombinant DNA technology.
2. Enzymes in DNA cloning – Restriction endonuclease (Type I, II & III).
3. Definition of cDNA library and Genomic library.
4. Criteria for good Vector, Brief concept of cloning Vectors (plasmid, lambda phage, YAC).
5. Production of transgenic plant: *Agrobacterium* mediated gene transfer.

Unit-III: Pharmacognosy

1. Definition of Pharmacognosy & Pharmacology, Crude drug & Commercial drug.
2. Classification of drugs – Morphological, Chemical, & Pharmacological.
3. Preparation of crude drug for commercial market.
4. Drug adulteration (types).
5. Evaluation of drugs – Physical, Chemical, Organoleptic & Microscopical.
6. Anatomical characters, active principles and pharmacological effects – Leaf of *Adhatoda*, Rhizome of *Zingiber*, Bark of *Alstonia*, and Tuber of *Dioscoria sp.*

Unit-IV: Biodiversity & Sustainable development

1. Definition, Levels of Biodiversity – Genetic diversity, Species diversity & Ecosystem diversity.
2. Values and uses of Biodiversity.
3. Agro-biodiversity (definition and concept).
4. Causes of biodiversity loss - Loss of Genetic diversity, Loss of Species diversity, Loss of Ecosystem diversity, Loss of Agro-biodiversity.
5. Definition & concept of Sustainable Development, Goals of sustainable development.
6. Organic farming (principle, advantages, & disadvantages), Bio fertilizers (definition, examples & importance), Biofuels (definition, example, sources & importance).

Botany (Minor)
Semester-VIII
Paper - 8B (Practical)
BT- 402M

Total Marks- 40 (IA = 16 + ESE = 24)

(Credit = 1)

Sl. No	Practical	Mark
1.	Demonstration on aseptic explant preparation (from shoot tip and nodes) and aseptic inoculation of explants.	08
2.	Study of powdered drugs	08
3.	Laboratory Note book	04
4.	<i>Viva voce</i>	04
TOTAL		24

CONTENTS

1. Demonstration on functioning of Autoclave, pH meter, Laminar Air Flow.
2. Demonstration on sterilization technique.
3. Demonstration of aseptic inoculation technique.
4. Organoleptic and microscopic study of powdered drugs - Leaf of *Adhatoda*, Rhizome of *Zingiber*, Bark of *Alstonia*, Tuber of *Dioscoria sp.*
5. **Laboratory Records:** Student must get the laboratory note books duly signed by the respective teacher during practical classes.
6. **Viva voce:** Questions based on theory and practical syllabus of 8th semester.

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