

TRIPURA UNIVERSITY

Botany (General)

Semester I

(Theoretical)

Paper- BT 101

Full marks-100
Total Lectures - 48 periods
(Each period = 1 hour)

Unit-I: (Fundamental Botany)

(12 Periods)

- 1.1 Origin of life, Difference between plant and animal cell.
- 1.2 Three domains of classification- Archaea, Bacteria, Eukaryota.
- 1.3 History of Plant Classification: Natural (Bentham & Hooker), Artificial (Linnaeus) and Phylogenetic (Hutchinson) system of Classification.
- 1.4 Plant life cycle pattern & alternation of generation.
- 1.5 Darwin's theory of evolution, Species concept, Isolation & mechanism of speciation.

Unit -II: (Environmental Botany)

(12 Periods)

- 2.1 Pollution: Definition and categories
- 2.2 Air pollution: Types and sources of air pollutants and their effects on plants and animals.
- 2.3 Water pollution: Types and sources of pollutants and their effects on plants and animals.
- 2.4 Soil pollution: Sources of pollutants and their effects on living organisms.
- 2.5. Noise pollution, heavy metal pollution and radioactive pollution.

Unit -III: Industrial Botany -I (Agri Industries and Microbial fermentation and food)

(12 Periods)

- 3.1 Organic farming- Concept, need, types of organic fertilizers, advantages and limitations.
- 3.2 Importance of seed industries, Seed production, Seed processing and marketing, major seed industries & corporation of India.
- 3.3. Production of SCP from algae - *Spirulina* culture technique
- 3.4 Mushroom production and harvesting (*Volvariella* sp)
- 3.5. Commercial Production of Ethyl alcohol and Citric acid.

Unit -IV: Industrial Botany – II (Plant Nursery and Floriculture Industry) (12 Periods)

- 4.1 Concept and types of nurseries: ornamental plant nursery, fruit plant nursery and vegetable plant nursery (with reference to infrastructure required and commercial applications).
- 4.2 Propagation methods: Seed propagation, natural vegetative propagation and artificial vegetative propagation ((cutting, layering and grafting),
- 4.3 Introduction to floriculture: Important floricultural crops, open cultivation practices, harvesting and marketing.

Semester-II
Syllabus for B.Sc. Botany (General)
2014
(Theoretical)

Paper- BT 201 Full marks-50

Total Lectures - 33 periods
(Each period = 1 hour)

Unit-I: Algae and Bryophyte

(16 Periods)

1. General account: 1.1 Thallus organization, 1.2, Economic importance of algae.
2. Diatom: 2.1 Cell structure, 2.2 Auxospore formation in Centrales and Pennales.
3. Life history: *Oedogonium*, *Chara*, *Ectocarpus* and *Polysiphonia*.
4. General account : 4.1 Origin of Bryophytes, 4.2 Amphibian nature,
5. Life history: Gametophyte structure & reproduction, Development of sporophyte, Spore dispersal of 5.1 *Marchantia*, 5.2 *Anthoceros*, 5.3 *Funaria*.
6. Evolution of sporophyte - Progressive theory.

Unit-II: Pteridophyta, Gymnosperm & Paleobotany(17 Periods)

1. Life history: Sporophyte structure, reproduction and structure of gametophyte of 1.1 *Lycopodium*, 1.2 *Selaginella*, 1.3 *Equisetum*, 1.4 *Pteris*.
2. Telome concept & its significance.
3. Progymnosperm - A brief concept.
4. Life histories Distribution in India, vegetative and reproductive structure, Development of gametophyte and embryogeny of 4.1 *Cycas*, 4.2 *Pinus*, 4.3 *Gnetum*.
5. Plant fossil- 5.1 Types of fossils, 5.2 Different modes of preservation Schopf(1975),
6. Importance of fossil study.
7. Geological time scale with dominant plant groups through ages.

Semester-II
Syllabus for B.Sc. Botany (General)
2014
(Practical)

Paper- BT 202 Full marks-50

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|---|-----------|
| 1. Work out on algae..... | 10 Marks |
| 2. Work out on Pteridophytes | 10 Marks. |
| 3. Identifications with reasons. (2X7)..... | 14 Marks. |
| (Algae-1, Bryophyta-2, Pteridophyta-1, Gymnosperm-2, Paleobotany-1) | |
| 4. Laboratory Note book | 8 Marks. |
| 5. Viva-voce..... | 8 Marks. |

PRACTICAL: BT- 202P

I To learn use of Simple and Compound Microscopes.

II. ALGAE & BRYOPHYTES

1. Work out of the following algae with reproductive structure (Free hand drawing):
Oedogonium, Chara, Ectocarpus.
2. Study of Permanent slides: *Volvox, Polysiphonia.*
3. Morphological study of the plant body (Bryophytes): Genera as mentioned in theoretical syllabus.
4. Study from permanent slides: *Marchantia* (L.S. through gemma cup, antheridiophore, archegoniophore, sporophyte), *Anthoceros* (L.S. of sporophyte), *Funaria* (L.S. of capsule).

III. PTERIDOPHYTES, GYMNOSPERMS & PALAEOBOTANY

1. Morphological study of the sporophytic plant body (Pteridophytes): Genera as mentioned in the theoretical syllabus.
2. Workout of the reproductive structures: *Lycopodium, Selaginella, Pteris.*
3. Study from permanent slides: *Psilotum* (T.S. of synangium), *Equisetum* (T.S. of stem-internode, L.S. of strobilus).
4. Morphological study: *Cycas* (microsporophyll and megasporophyll), *Pinus* (female and male cone), *Gnetum* (female and male cone)
5. Study from permanent slides: *Cycas* (L.S. of ovule), *Pinus* (L.S. of male and female cone), *Gnetum* (L.S. of male cone and ovule).
6. Study of mega fossils.

IV. LABORATORY RECORDS

Laboratory Note Book of each section must be signed by the respective teacher with date during practical classes.

Semester-III
Syllabus for B.Sc. Botany (General)
(Theoretical)

Paper-BT301P

Full marks-50
(IA-10, E.S.E.-40)
Total Lectures - 28
(Each Lecture-1 hr)

Unit I: Fungi and Plant Resource Utilisation

14 Periods

An outline classification of fungi upto class character (Hawksworth-1995). Economic importance of fungi. Lichens and their significance; General account of Phycomycetes, Life history study of *Mucor*; General account of Ascomycetes, Life history study of *Penicillium*; General account of Basidiomycetes, Life history study of *Polyporus*; General account of Deuteromycetes, Life history study of *Fusarium*.

Cereal- Rice, Wheat; Pulses- Gram, Moong and Lens; Beverages- Tea and Coffee; Fruits- Mango, Citrus and Papaya; Drug yielding- Cinchona, Rauwolfia, Digitalis and Papaver; 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 and Sugar beet.

Cultivation of Rice, Jute and Tea.

Unit II: Microbiology and Plant pathology

14 Periods

General characteristics of Plant virus and Bacteriophage; Growth cycle- Lytic (T_4) and Lysogenic (λ , virus); Bacteria- Cell structure and Endospore formation, Genetic recombination-Conjugation, transformation and transduction; Symptoms- necrotic, hypoplastic and hyperplastic; Koch's postulates, Symptoms, Causal organisms, Disease cycle and Control measures of Late blight of potato, Brown spot of rice and Black stem rust of wheat.

Semester-III
Syllabus for B.Sc. Botany (General)
2014
(Practical)

Time: 3 hrs

Full marks-50
(IA-10, E.S.E.-40)

1. Work out on fungi (excluding measurement).....10
2. Work out on microbiology.....10
3. Identification with reasons.....6x2=12
 - a) Plant resource utilization.....2 specimens
 - b) Plant disease.....2 specimens
 - c) Fungi/Microbiology.....2 specimens
4. Laboratory note book with submission.....(3+1)=04
5. Viva-voce.....04

Practical – BT302P

1. Work out of the following fungi with reproductive structures (excluding microscopic measurement of reproductive structures) *Mucor*, *Penicillium*, *Polyporus*.
2. Study from permanent slides: Zygosporangium of *Mucor*, Conidiophore of *Penicillium*, Conidia of *Fusarium*
3. Microscopic examination of bacteria from natural habitat (curd) by simple staining.
4. Preparation of fungal media (PDA).
5. Sterilization process.
6. Identification: Pathological specimens of Brown spot of rice, Loose smut of wheat, Stem rot of jute, Late blight of potato; Slides of uredial, telial, pycnial & aecial stages of *Puccinia graminis*.

Semester-IV
Syllabus for B.Sc. Botany (General)
(Theoretical)

Paper-BT401P

Full marks-50
(IA-10, E.S.E.-40)
Total Lectures -24
(Each Lecture-I hr)

Unit I: Morphology and Taxonomy

12 Periods

Morphology- Inflorescence- types with examples, flower types, floral parts- calyx, corolla (Forms and aestivation), stamens (cohesion and adhesion), carpel (Apocarpous and Syncarpous), Placentation types, fertilization process; Fruits-types; Taxonomy- Magnoliaceae, Poaceae, Orchidaceae, Mimosaceae, Caesalpiniaceae, Fabaceae, Malvaceae, Brassicaceae, Solanaceae, Apocynaceae, Lamiaceae, Rubiaceae and Asteraceae.

Unit II: Anatomy, Ecology and Phytogeography

12 Periods

Anatomy-Cell wall (Gross structure and chemical composition), Meristematic and Permanent tissue (structure, distribution and function); Vascular bundles- types, stele- types and evolution, Normal secondary growth; Ecology- Habitat and Niche (preliminary idea), Ecological succession- Hydrosere and Xerosere, Endemism, Red Data Book; Phytogeography-Phytogeographical regions of India (D. Chatterjee-1960); Vegetation of Western and Eastern Himalaya and Tripura.

Semester-IV
Syllabus for B.Sc. Botany (General)
2014
(Practical)

Time: 3 hrs

Total marks-50
(IA-10, E.S.E.-40)

1. Work out on Angiosperm.....10
2. Work out on Anatomy.....06
3. Spotting identification.....03
4. Identification with reasons(4x2)=08
(Morphology/Embryology/Anatomy-3 Ecology-2)
5. Lab note book and herbarium.....(3+3)=06
6. Field record.....03
7. Viva voce.....04

Practical - BT 402 P

1. Work out on angiospermic plants- specimens to be selected from the families included in the theory paper.
2. Study of primary structures- Monocot stem, Dicot stem, Dorsiventral leaf, Isobilateral leaf, Monocot root, Dicot root.
3. Identification
 - a) Morphology
 - i) Types of Placentation
 - ii) Types of fruits
 - b) Types of stomata, Raphides, Cystolithn and Starch grain.
 - c) Aadaptive anatomical features of *Nymphaea* petiole and *Nerium* leaf
4. At least 15 herbarium sheets must be submitted.
5. Students are required to go for at least 1 field study tours.

SEMESTER – V

BT-501 (Theory) Marks: 100 (Elective)

Internal Assessment: 10 **40 Periods**

End Semester Examination: 40 **20 Periods**

Unit – I: Cell and Molecular Biology, Cytogenetics and Plant Breeding

Cell cycle and Cell division, Structure and function of Cell Organelles (Nucleus, Mitochondria, Chloroplast, Ribosome) Chromosome morphology and Organization of eukaryotic Chromosome (Nucleosome concept); Structure, forms and salient features of Nucleic Acids (DNA and RNA); DNA replication, Mechanism of DNA replication in Prokaryotes, Transcription: Initiation, elongation and termination in Prokaryotes. Translation in Prokaryotes: Amino-acylation of tRNA, initiation, elongation and termination of polypeptide chain; Gene Mutation: Transition, Transversion and Frame shift mutation, Lac Operon (brief idea).

Mendelian inheritance; Gene interactions: Incomplete Dominance (1:2:1), Modified dihybrid ratio (12:3:1, 9:3:4, 9:7) Crossing Over: Cytological proof of crossing over (McClintock's experiment); Complete and incomplete linkage, Aneuploidy and Euploidy, role of polyploidy in crop improvement; Chromosomal aberration: deletion, duplication, translocation and inversion; Methods of plant breeding: Introduction, emasculation, Hybridization and Acclimatization; Selection: Mass selection and pure selection; Male sterility: Genetic, Cytoplasmic and Cytoplasmic-genetic male sterility, Heterosis and hybrid vigour.

Unit II: Plant Physiology and Plant Biotechnology **20 Periods**

Water potential and its components; Water absorption by roots (apoplastic and symplastic pathways); Photosynthesis: photochemical reactions, Mechanism of electron transport in PS-I and PS-II, Calvin cycle; C₃ and C₄ plants and photosynthetic efficiency, photorespiration, Crassulacean acid metabolism (CAM); Transpiration and anti-transpirant. Respiration: glycolysis, Oxidative Phosphorylation, Mitochondrial ETS; N-metabolism: Assimilation of Nitrogen, Biological Nitrogen fixation: role of nitrogenase in N₂ fixation; Photoperiodism: Photoperiodic responses and classification of plants, Photomorphogenesis; Plant growth regulators, physiological role and modes of action (IAA, Gibberellins and Cyokinins).

2

Totipotency and concept of plant tissue culture; Function and organization of a typical plant tissue culture laboratory; Techniques of plant tissue culture: cell suspension culture technique, protoplast culture technique; Modes of in vitro regeneration and applications; Callus culture and applications; Haploid and embryo culture; Transformation: *Agrobacterium* mediated gene transfer.

SEMESTER-V
Practical – 502

Full Marks: 50

Internal Assessment: 10

End Semester Examination: 40

1. Mitotic Study: Temporary preparation of metaphase chromosomes from root tips of *Allium cepa*
2. Identification with reasons from permanent slides: Different stages of mitosis and meiosis including abnormalities like Sticky Bridge, laggard chromosome(s), chromosomal fragmentation, ring chromosome, early separation.
3. Study of pollen sterility by Aceto-carmin staining technique.
4. Detection of organic acids: citric, tartaric, oxalic and malic acids from unknown samples.
5. Detection of the nature of carbohydrate: glucose, fructose and sucrose from unknown samples.
6. Determination of released oxygen during photosynthesis.
7. To extract and separate chlorophyll pigment by chromatography.
8. Relationship between transpiration and evaporation.
9. Measurement of oxygen uptake by respiring tissue (per g/hr).
10. Effect of temperature on absorption of water by storage tissue and determination of Q_{10} .
11. Comparison of imbibitions of water by starchy, proteinaceous and fatty seeds.
12. Demonstration and function of autoclave, laminar airflow, pH meter and culture room.
13. Aseptic techniques of explants culture.

Laboratory records:

2. Laboratory note book of each section must be signed by the respective teacher with date during practical classes.

Semester-V
Practical - Paper 502

End Semester Examination – 40

Questions pattern:

1. Mitotic Study: Temporary preparation of metaphase chromosomes from root tips of material provided 08
2. Identification with reasons (any two – Identification- 1, Reasons -1) (2X2) = 04
3. Experiment on biochemical works as per practical workout 05
4. To perform a major physiological experiment from the list of the experiments as per contents of practical syllabus 10
5. Demonstration on Plant tissue culture technique 05
6. Practical Note Book 04
7. *Viva voce* 04