**Hiralal Mazumdar Memorial Collegefor Women, Dakshineswar, Kolkata-700035**
**Department of Botany**
**Syllabus Distribution cum Academic Calendar 2017-18**
**BOTANY HONOURS**

# SESSION – 2017-18

PART – I
PAPER – I, II & III

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 1. | **Theory: Algae-** General account, Classification, Cyanophyceae, Bacillariophyceae, Thallus organization, Reproduction and Alternation of Generations in - *Oedogonium*, *Chara.* | **4** | **TM/MD/ IC/MK/RA** | July-October |
| 2. | **Fungi & Lichen** – General account, Classification, Lichen. | **3** | **TM/MD** | July-October |
| 3. | **Microbiology** – Microorganisms and study of Microbiology – Primary concept, Archaea, Viruses, Bacteria: General features; Bacterial Growth; Chemical natures, ultra-structures and functions of Glycocalyx, Slime layer, Flagella, Pili, & Fimbriae. | **4** | **MD/ RA / TM** | July-October |
| 4. | **Plant Pathology** - Terms and Definitions: Host - Parasite Interaction | **3** | **TM/ MD** | July-October |
| 5. | **Bryophyta** - General account, Hepaticopsida, Anthocerotopsida. | **2** | **MK** | July-October |
| 6. | **Pteridophyta** - General account: Morphology and Anatomy of …. Alternation of generations in - *Psilotum*, *Lycopodium*, *Selaginella*, *Equisetum* and *Dryopteris*. | **4** | **IC / MD** | July-October |
| 7. | **Gymnosperms** - General characters and Classification, Distribution, vegetative and | **4** | **TM** | July- |

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| | reproductive morphologies ….embryogeny of - *Cycas*, *Pinus* and *Gnetum.* | | | October |
| 8. | **Palaeobotany** – Fossils. | **1** | **IC** | July-October |
| 9. | **Practical:**<br>Algae (Work out), Fungi (Work out), Microbiology (Work out), Plant Pathology (Work out). | | **TM/MD/ IC/MK/RA** | July-October |
| 10. | **Theory: Algae** - Thallus organization Reproduction and Alternation of Generations in - *Vaucheria*, *Laminaria* and *Polysiphonia*. | **3** | **TM / IC** | November-December |
| 11. | **Fungi & Lichen** – Representatives of diverse groups: *Synchytrium*, *Rhizopus*, *Ascobolus* and *Agaricus*. | **4** | **TM / IC / MK** | November-December |
| 12. | **Microbiology** – Cell wall; Bacterial Genome and Plasmid; Genetic Recombination; Bacterial Diversity. | **1** | **RA / MD** | November-December |
| 13. | **Plant Pathology** - Disease Management: Disease Study. | **2** | **TM / MD** | November-December |
| 14. | **Bryophyta** – Bryopsida, Specialized topics, Roles of Bryophytes. | **2** | **MK** | November-December |

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| 15. | **Pteridophyta** - Fossil study, Progymnosperms, Specialized topics. | **1** | **IC** | November-December |
| 16. | **Gymnosperms** - Fossil Gymnosperms. | **1** | **TM** | November-December |
| 17. | **Palaeobotany** - Geological time scale. | **1** | **RA** | November-December |
| 18. | **Practical:** Identification; Algae (Work out), Fungi (Work out), Microbiology (Work out), Plant Pathology (Work out)-(Revision). | | **TM/MD/ IC/MK/RA** | November-December |
| 19. | **Theory: Algae**- Economic Importance and revision. | **1** | **TM** | January-March |
| 20. | **Fungi & Lichen** – Economic & Medicinal Importance and revision. | **1** | **TM** | January-March |
| 21. | **Microbiology** – Applied Bacteriology and revision. | **1** | **RA** | January-March |
| 22. | **Plant Pathology** –Revision. | **3** | **TM** | January-March |
| 23. | **Bryophyta** – Revision. | **2** | **RA/ MK** | January-March |
| 24. | **Pteridophyta** - Specialized topics and revision. | **1** | **IC** | January-March |
| 25. | **Gymnosperms** - Economic importance of Gymnosperms and revision. | **1** | **RA** | January-March |

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| 26. | **Palaeobotany** - Indian Gondwana system with major mega-fossil assemblages and revision. | **2** | **IC** | January-March |
| 27. | **Practical:** Identification (Revision) | | **TM/MD/ IC/MK/RA** | January-March |
| 28. | **Practical:** Identification (Revision) | | **TM/MD/ IC/MK/RA** | January-March |

**SESSION – 2017-18**
**PART – II**
**PAPER –II& III**

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 1. | **Theory: Morphology & Palynology**- 1. Inflorescence, 2. Flower. **Palynology-** upto 4.3 | **5** | **TM / MD** | |
| 2. | **Angiosperms**- 1. Introduction- upto 1.3, 2. Nomenclature, 3. Herbaria & Botanical Gardens, 6. Diagnostic features, systematic positions (as in B&H, and Cronquist's system) and economically important plants (parts used & uses) of the following families:- 6.1 Dicotyledonous families – Magnoliaceae, Malvaceae, Leguminosae (subfamilies), Euphorbiaceae, Solanaceae, Verbenaceae, Scrophulariaceae, Acanthaceae. 6.2 Monocotyledonous families – Alismataceae, Arecaceae, Poaceae. | **20** | **MD / MK / IC** | July-October |
| 3. | **Ecology** -1. Plant and Environment, 2. Population Ecology, 3. Community 3. Ecology3.1 Plant succession (primary & secondary) and Seralstages (with reference to Hydrosere); 3.2 Autogenic and Allogenic succession;3.3 $\alpha$, $\beta$, $\gamma$ - diversity & diversity index (Simpson index) | **15** | **TM / IC /RA** | July-October |
| 4. | **Anatomy & Embryology** - 1. Cell Wall & Stele, 2. Stomata, 3. Cambium, 4. Specialized | **20** | **TM / IC /** | July- |

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| | Growth & Tissue organization: - 4.1 Mechanical Tissues and theirdistribution; 4.2 Anomalous secondary growth – in the stems of *Bignonia, Boerhaavia, Tecoma*and *Dracaena,* -and in the root of *Tinospora*; 4.3 Parastichy, Plastochrone & Leaf – trace. | | **RA** | October |
| 5. | **Biochemistry**- 1. Fundamentals, 2. Biomolecules: - 2.1 Nucleic acids - nucleosides, nucleotides, oligo- & poly -nucleotides, different forms of DNA and RNA, nucleic acids derivatives - 2.4 Lipids - structures of triglycerides, phospholipids and glycolipids; saturated and unsaturated fatty acids. | **15** | **MD / IC /RA** | July-October |
| 6. | **Practical: Angiosperms**: [Binomials & Families] Malvaceae, Fabaceae (Papilionaceae), Solanaceae, Verbenaceae. | | **MK** | July-October |
| 7. | **Anatomy**: 1. Microscopic studies on - Types of Stomata, Sclereids, Raphides, Cystolith, Aleurone grains, Laticiferous ducts and oil glands. 2. Staining, Preparation of permanent slides and study of Anomalous secondary structures - in the stems of *Bignonia*, *Boerhaavia* & *Dracaena*, and in the root of *Tinospora*. | | **IC** | July-October |
| 8. | **Bryophytes**: 1. External Morphology (macroscopic - from preserved specimens) of the gametophyte plant body and Internal Morphological (microscopic - from permanent slides) study of the features given in parentheses, in the genera as – *Riccia* (V.T.S. of Thallus showing Antheridia/ Archegonia/ Sporophyte), *Marchantia* (L.S. of gemma cup/ Antheridiophore/ Archegoniophore), *Anthoceros* (L.S. of sporophyte) and *Funaria* (L.S. of capsule) | | **MK** | July-October |
| 9. | **Theory: Morphology & Palynology**- 3.Fruit: - Types with examples. Palynology- 4.4 Basic concepts of Aeropalynology & Melissopalynology. | **5** | **TM** | November-December |
| 10. | **Angiosperms**- 4. Identification, 5. Systems of Classification, 6. Diagnostic features, systematic positions (as in B & H, and Cronquist's system) and economically important plants (parts used & uses) of the following families:-Lamiaceae, Apiaceae, Rosaceae, | **15** | **MD / MK** | November-Decemb |

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| | Cucurbitaceae, Rubiaceae & Asteraceae. 6.2 Monocotyledonous families - Liliaceae, Zingiberaceae & Orchidaceae | | | er |
| 11. | **Ecology** -4. Conservation, 5. Plant Geography | **5** | **TM** | Novemb er- Decemb er |
| 12. | **Anatomy & Embryology** -5. Development, 6. Embryology | **3** | **IC** | Novemb er- Decemb er |
| 13. | **Biochemistry** -3. Bioenergetics and oxidation-reduction reaction<br><br>**Practical: Angiosperms** [Binomials & Families] Scrophulariaceae, Acanthaceae, Lamiaceae and Rubiaceae.<br>**Pteridophyte**s 1. External Morphology (macroscopic - from preserved specimens) of the sporophyte plant body and Internal Morphological (microscopic - from permanent slides) study of the features found in the conditions / preparations given in parentheses, in the genera as – *Psilotum* (T.S. of synangium), *Lycopodium* (L.S. of strobilus), *Selaginella* (L.S.of strobilus), *Equisetum* (L.S. / T.S. of strobilus), *Ophioglossum* (L.S. of spike), *Dryopteris* (V.T.S. of fertile pinnule through sori) and *Marsilea* (H.L.S. / V.L.S. of sporocarp). | **3** | IC<br><br>MK<br><br>IC / MD | Novemb er- Decemb er |
| 14. | **Gymnosperms** 1. Morphological and Anatomical study (from preserved specimens and permanentslides) of different parts of certain genera as stated in the following – *Cycas* (Megasporophyll, Microsporophyll & L.S. of Ovule), *Pinus* (Male Cone, Female Cone and their L.S. views) and *Gnetum* (Male and Female Cones, and L.S. of male cone and Ovule). | | **TM / RA** | Novemb er- Decemb er |

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| 15. | **Palaeobotany** 1. Morphological study of *Ptilophyllum* and *Glossopteris* leaf fossils. 2. Study from slides - T.S. views of the stems of *Rhynia*, *Lepidodendron*, *Calamites*, *Lyginopteris* and *Cordaites*. | | **TM / RA** | Novemb er-Decemb er |
| 16. | **Theory: Morphology & Palynology**- Revision | **5** | **TM / RA** | January-March |
| 17. | **Angiosperms**- 1. Introduction: - 1.4 Phases and Functions of taxonomy; 1.5 Phenetics – Definition, Character-state, Phenogram and OTU; 1.6 Cladistics Definition, Cladogram, concept of monophyletic, polyphyletic & paraphyletic groups; 1.7 Plesiomorphy & Apomorphy; 1.8 Principles of Parsimony. Revision | **10** | **MD / MK** | January-March |
| 18. | **Ecology** - Revision | **5** | **TM** | January-March |
| 19. | **Anatomy & Embryology** - Revision | **2** | **IC** | January-March |
| 20. | **Biochemistry** - Revision | **2** | **RA** | January-March |
| 21. | **Practical:**Revision | | **TM/MD/ IC/MK/RA** | January-March |
| 22. | Study leave | | | April-June |

**SESSION – 2017-18**
**PART – III**

**PAPER –VII, VIII, IX & X**

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be |
|---|---|---|---|---|

| | | | | taught |
|---|---|---|---|---|
| 1. | **Theory: Plant physiology:** 1.Plant water relations, 2.Transpiration, 3. Membrane Transport, 4. Phloem Transport, 5.Photosynthesis, 7. Nitrogen metabolism. | **20** | **MD / IC / MK** | July - October |
| 2. | **Pharmacognosy:** 1.General account, 2. Secondary metabolites of plants. | **5** | **TM** | July - October |
| 3. | **Plant Biotechnology:** 1. Plant Tissue Culture, 2. Other Culture Techniques, 3. Micropropagation: - 3.1 Definition and applications. | **5** | **RA / MK** | July - October |
| 4. | **Cell Biology:** 1. Microscopy**,** 2. Origin and Evolution of cells**,** 3. Cell Membrane**.** | **6** | **IC / RA** | July - October |
| 5. | **Genetics & Molecular Biology:** 1. Inheritance, 2. Linkage, Crossing over and Gene mapping, 3. Ploidy, 4. Chromosomal aberration, 5. Mutation. | **20** | **TM/MD/ IC/MK/RA** | July - October |
| 6. | **Plant Breeding and Biometry:** 1. Introduction, 2. Methods of plant breeding:- 2.1 Methods of Hybridisation, 2.2 Bulk method and Pedigree method, Male sterility and its use, 3. Biometry: - 3.1 Terms & Definitions 3.2 Central tendency (Arithmetic Mean, Mode, & Median); 3.3 Measurement of Dispersion- standard deviation and standard error of mean. | **8** | **MD / IC / RA** | July - October |
| 7. | **Practical:**<br>**1. Plant Physiology (Major),**<br>**2. Biochemistry (Qualitative & Quantitative- 1,2,3),**<br>**3. Pharmacognosy (Major & Minor-1),**<br>**4. Study of Chromosomes & Mitotic Index (1,2,3,4),**<br>**5. Biometry** | | | July - October |
| 8. | **Theory: Plant physiology:** 6. Respiration, 8. Growth regulators, 9. Photo-morphogenesis, 10. Photoperiodism, 11. Dormancy | **20** | **MD/ IC / MK** | November- December |

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| 9. | **Pharmacognosy:**3. Active constituents: - Source plants, parts used, chemical nature & uses of the following..... Reserpine, Vinblastine). | **5** | **TM** | November- December |
| 10. | **Plant Biotechnology:** 4. Recombinant DNA Technology. | **5** | **MK/ RA** | November- December |
| 11. | **Cell Biology:** 4. Nucleus and Chromosome. | **6** | **IC / RA** | November- December |
| 12. | **Genetics & Molecular Biology:** 6. DNA Replication & Protein Synthesis, 7. Structural organization and sequence complexity of gene, 8. Gene Regulation. | **20** | **TM/MD/ IC/MK/RA** | November- December |
| 13. | **Plant Breeding and Biometry:** 2. Methods of plant breeding 2.3 Back cross and Test cross; 2.4 Heterosis. 3. Biometry: 3.4 Analysis of correlation coefficient; 3.5 Test of significance- Null hypothesis and test for Goodness of Fit; 3.6 Probability (addition and multiplication rules);. | **5** | **MD /IC /RA** | November- December |
| 14. | **Practical: 1. Plant Physiology (Minor),**<br>**2. Biochemistry (Quantitative- 4, 5, 6),**<br>**3. Pharmacognosy (Minor-2),**<br>**4. Study of Chromosomes & Mitotic Index (5,6),**<br>**5. Biometry** | | | November- December |
| 15. | **Theory: Plant physiology:** 10. Photoperiodism, 11. Dormancy, **Revision** | **10** | **MD / MK / IC** | January- March |
| 16. | **Pharmacognosy:** 3. Active constituents: - Source plants, parts used, chemical nature & uses of the following....Reserpine, Vinblastine), **Revision** | **5** | **TM** | January- March |

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| 17. | **Plant Biotechnology:** 5. Genetic Engineering, **Revision** | **5** | **MK / RA** | January-March |
| 18. | **Cell Biology:** 5. Cell Cycle & its Regulation, **Revision** | **8** | **IC / RA** | January-March |
| 19. | **Genetics & Molecular Biology:** 9. Genetic Code, 10. Bioinformatics, **Revision** | **5** | **TM/MD/ IC/MK/RA** | January-March |
| 20. | **Plant Breeding and Biometry:** 2. Methods of plant breeding: 2.5 Maintenance of germplasm. 3. Biometry: 3.7 Measurement of gene frequency (Hardy- Weinberg equilibrium), **Revision** | **2** | **MD / IC /RA** | January-March |
| 21. | **Practical: Revision:-1. Plant Physiology (Major & Minor),**<br>**2. Biochemistry (Qualitative & Quantitative),**<br>**3. Pharmacognosy,**<br>**4. Study of Chromosomes & Mitotic Index,),**<br>**5. Biometry** | | | January-March |

NB: In addition to lectures classes, there will be tutorials, class tests, contact with teachers etc. For details, please refer to departmental time table.

# HIRALAL MAZUMDAR MEMORIAL COLLEGE FOR WOMEN
## DAKSHINESWAR . KOLKATA – 700035
**E-mail: hmmcw35@gmail.com ; Website: www.hmmcollege.org**
## Academic Calendar
## DEPARTMENT – Botany General

**SESSION – 2017-18**
**PART – I**
**PAPER – I & III**

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 1. | **Theory:** Algae - | 8 | **TM/MD/ IC/MK** | July- October |
| | Fungi & Lichen - | 8 | **TM / IC** | |
| | Bryophyta - | 6 | **MK** | |
| | Pteridophyta - | 6 | **IC** | |
| | Morphology - | 5 | **RA** | |
| | Palynology - | 4 | **RA** | |
| | **Practical:** Cryptogams – Algae, Fungi & Angiosperms | | **TM/MD/ IC/MK/RA** | |
| 2. | **Theory:** Plant Pathology - | 8 | **TM / MD** | November - December |
| | Gymnosperms - | 6 | **RA** | |
| | Taxonomy | 6 | **MK** | |
| | **Practical:** Anatomy | | **IC** | |
| 3. | **Theory:** Microbiology | 6 | **RA** | January- |

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| | Palaeobotany | 5 | **TM** | March |
| | Taxonomy | 6 | **MK** | |
| | **Practical:** Identification | | **TM/MD/ IC/MK/RA** | |
| 4. | Revision | | **TM/MD/ IC/MK/RA** | April-June |

**SESSION – 2017-18**
**PART – II**
**PAPER –II & III**

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 1. | **Theory:** Anatomy<br>Embryology<br>Cell Biology<br>Biochemistry<br>**Practical:** Plant Physiology | 8<br>6<br>8<br>8 | **IC**<br>**TM**<br>**IC**<br>**RA**<br>**MD / MK** | July-Octobe r |
| 2. | **Theory:** Economic Botany | 5 | **TM** | Novem ber-Decem ber |
| | Genetics | 8 | **RA** | |
| | Plant Physiology | 8 | **MD / MK** | |
| | **Practical:** Study of Chromosome | | **RA** | |
| 3. | **Theory:** Ecology | 6 | **TM** | January - March |
| | Genetics | 7 | **RA** | |
| | Plant Physiology | 7 | **MD/ MK** | |
| | **Practical:** Angiosperms [Binomials & Families] | | **MK** | |
| 4. | **Theory:** Genetics | 3 | **RA** | April- |

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| | Plant Physiology | 3 | **IC / MK** | June |
| | **Practical:** Identification | | **TM/MD/ IC/MK/RA** | |
| | Revision | | **TM/MD/ IC/MK/RA** | |

**SESSION – 2017-18**
**PART – III**

**PAPER –IV &V**

| **S.L. NO.** | **TOPICS** | **Number of lectures** | **Teacher's name** | **When to be taught** |
|---|---|---|---|---|
| 1. | **Theory:** Biofertilizer: - [5 Periods] | **5** | **TM** | July - Octobe r |
| | Mushroom: - [5 Periods] | **5** | **TM** | |
| | Plant Breeding: - [5 Periods]<br>**Practical:** Instrumentations<br>Bacterial Staining | **5** | **RA**<br>**TM / IC** | |
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| 2. | **Theory:** Measures of Central Tendency: - [5 Periods] | **5** | **IC** | Novem ber- Decem ber |
| | Plant Tissue Culture: - [5 Periods] | **5** | **MK** | |
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| | Recombinant DNA Technology: - [5 Periods] | **5** | **RA** | |
| | **Practical:** Biometry | | **IC** | |
| | Medicinal plant Identification | | **TM** | |
| 3. | **Theory:** Pharmacognosy: - [5 Periods] | **5** | **TM** | January |

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| | Bioinformatics- [2 Periods] | **2** | **MD / RA** | - March |
| 4. | Revision | | **TM/MD/ IC/MK/RA** | April – June |

**NB:** In addition to lectures classes, there will be tutorials, class tests, contact with teachers etc. For details, please refer to departmental time table

**Hiralal Mazumdar Memorial Collegefor Women, Dakshineswar, Kolkata-700035**
**Department of Botany**
**Syllabus Distribution cum Academic Calendar**

## SESSION - 2018-19

**BOTANY HONOURS**

**PART – II**

**PAPER –II & III**

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| | **Paper - IV Theoretical 100 Marks [4hr.]** | | | |
| 1. | **Theory: Morphology & Palynology**- 1. Inflorescence, 2. Flower. **Palynology-** upto 4.3 | **8** | MD | July-August |

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|---|---|---|---|---|
| 2. | **Angiosperms**- 1. Introduction- upto 1.3, 2. Nomenclature, 3. Herbaria & Botanical Gardens, 6. Diagnostic features, systematic positions (as in B&H, and Cronquist's system) and economically important plants (parts used & uses) of the following families:- 6.1 Dicotyledonous families – Magnoliaceae, Malvaceae, Leguminosae (subfamilies), Euphorbiaceae, Solanaceae, Verbenaceae, Scrophulariaceae, Acanthaceae. 6.2 Monocotyledonous families – Alismataceae, Arecaceae, Poaceae. | **45** | MK/RA/MD | Sept- Nov |
| 3. | **Ecology** -1. Plant and Environment, 2. Population Ecology, 3. Community 3. Ecology3.1 Plant succession (primary & secondary) and Seralstages (with reference to Hydrosere); 3.2 Autogenic and Allogenic succession;3.3 $\alpha$, $\beta$, $\gamma$ - diversity & diversity index (Simpson index)<br><br>**Paper - V Theoretical 50 Marks [2hr.]** | **25** | TM | Dec-Feb |
| 4. | **Anatomy & Embryology** - 1. Cell Wall & Stele, 2. Stomata, 3. Cambium, 4. Specialized Growth & Tissue organization: - 4.1 Mechanical Tissues and theirdistribution; 4.2 Anomalous secondary growth – in the stems of *Bignonia, Boerhaavia, Tecoma*and *Dracaena,* -and in the root of *Tinospora*; 4.3 Parastichy, Plastochrone & Leaf – trace. | **25** | IC | July- August |
| 5. | **Biochemistry**- 1. Fundamentals, 2. Biomolecules: - 2.1 Nucleic acids - nucleosides, nucleotides, oligo- & poly -nucleotides, different forms of DNA and RNA, nucleic acids derivatives - 2.4 Lipids - structures of triglycerides, phospholipids and glycolipids; saturated and unsaturated fatty acids. | **25** | MD | Sept- Nov |
| 6. | **Practical:**<br>**Angiosperms**: [Binomials & Families] Malvaceae, Fabaceae (Papilionaceae), Solanaceae, Verbenaceae. Scrophulariaceae, Acanthaceae, Lamiaceae and Rubiaceae. | | MK/RA | July- August |
| 7. | **Anatomy**: 1. Microscopic studies on - Types of Stomata, Sclereids, Raphides, Cystolith, Aleurone | | RA | July- |

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| | grains, Laticiferous ducts and oil glands. 2. Staining, Preparation of permanent slides and study of Anomalous secondary structures - in the stems of *Bignonia*, *Boerhaavia* & *Dracaena*, and in the root of *Tinospora*. | | | August |
| 8. | **Bryophytes**: 1. External Morphology (macroscopic - from preserved specimens) of the gametophyte plant body and Internal Morphological (microscopic - from permanent slides) study of the features given in parentheses, in the genera as – *Riccia* (V.T.S. of Thallus showing Antheridia/ Archegonia/ Sporophyte), *Marchantia* (L.S. of gemma cup/ Antheridiophore/ Archegoniophore), *Anthoceros* (L.S. of sporophyte) and *Funaria* (L.S. of capsule) | | MD/RA | Dec-Feb |
| 9. | **Theory: Morphology & Palynology**- 3.Fruit: - Types with examples. Palynology- 4.4 Basic concepts of Aeropalynology & Melissopalynology. | **7** | | Dec-Feb |
| 10. | **Practical:**<br>**Pteridophyte**s 1. External Morphology (macroscopic - from preserved specimens) of the sporophyte plant body and Internal Morphological (microscopic - from permanent slides) study of the features found in the conditions / preparations given in parentheses, in the genera as – *Psilotum* (T.S. of synangium), *Lycopodium* (L.S. of strobilus), *Selaginella* (L.S.of strobilus), *Equisetum* (L.S. / T.S. of strobilus), *Ophioglossum* (L.S. of spike), *Dryopteris* (V.T.S. of fertile pinnule through sori) and *Marsilea* (H.L.S. / V.L.S. of sporocarp). | | MD/RA | Dec-Feb |
| 11. | **Gymnosperms** 1. Morphological and Anatomical study (from preserved specimens and permanentslides) of different parts of certain genera as stated in the following – *Cycas* (Megasporophyll, Microsporophyll & L.S. of Ovule), *Pinus* (Male Cone, Female Cone and their L.S. views) and *Gnetum* (Male and Female Cones, and L.S. of male cone and Ovule). | | MD/RA | Dec-Feb |
| 12. | **Palaeobotany** 1. Morphological study of *Ptilophyllum* and *Glossopteris* leaf fossils. 2. Study from slides - T.S. views of the stems of *Rhynia*, *Lepidodendron*, *Calamites*, *Lyginopteris* and *Cordaites*. | | MD/RA | Dec-Feb |

**SESSION – 2018-19**
**PART – III**

**PAPER –VII, VIII, IX & X**

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 1. | **Theory:**<br>**Paper - VII Theoretical 100 Marks**<br><br>**Plant physiology:** 1.Plant water relations, 2.Transpiration, 3. Membrane Transport, 4. Phloem Transport, 5.Photosynthesis, 7. Nitrogen metabolism. | **50** | MD/IC | July-August |
| 2. | **Pharmacognosy:** 1.General account, 2. Secondary metabolites of plants. | **15** | TM | Sept- Nov |
| 3. | **Plant Biotechnology:** 1. Plant Tissue Culture, 2. Other Culture Techniques, 3. Micropropagation: - 3.1 Definition and applications. | **15** | MK | Dec-Feb |
| 4. | **Paper - VIII Theoretical 100 Marks**<br><br>**Cell Biology:** 1. Microscopy**,** 2. Origin and Evolution of cells**,** 3. Cell Membrane**.** | **20** | IC/TM | July-August |
| 5. | **Genetics & Molecular Biology:** 1. Inheritance, 2. Linkage, Crossing over and Gene mapping, 3. Ploidy, 4. Chromosomal aberration, 5. Mutation. | **45** | RA/TM | Sept- Nov |
| 6. | **Plant Breeding and Biometry:** 1. Introduction, 2. Methods of plant breeding:- 2.1 Methods of Hybridisation, 2.2 Bulk method and Pedigree method, Male sterility and its use, 3. Biometry: - 3.1 Terms & Definitions 3.2 Central tendency (Arithmetic Mean, Mode, & Median); 3.3 Measurement of Dispersion- standard deviation and standard error of mean. | **15** | MD/AH | Dec-Feb |

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| 7. | **Practical:**<br>**1.** Plant Physiology (Major), | | IC | July-<br>August |
| 8. | 2. Biochemistry (Qualitative & Quantitative- 1,2,3), | | MD | Sept- Nov |
| 9. | 3. Pharmacognosy (Major & Minor-1), | | TM | Dec-Feb |
| 10. | 4. Study of Chromosomes & Mitotic Index (1,2,3,4), | | RA | July-<br>Nov |
| 11. | 5. Biometry | | MK | Dec-Feb |

## SEMESTER – I

# Course I: Phycology and Microbiology Course Code: BOTACOR01T

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 1. | **Unit 1: Introduction to microbial world**<br>Primary concept of microorganism – 3 domain concept; Economic importance of viruses with reference to vaccine production, role in research, medicine and diagnostics and as causal | 7 | MD/TM(Rem) | July-<br>August<br>July- |

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| | organisms of plant diseases. Economic importance of bacteria with reference to their role in agriculture and industry (fermentation and medicine). | | | August<br>July-<br>August<br>July-<br>August<br>Sept- Nov<br>Sept- Nov |
| 2. | **Unit 2: Viruses**<br>Physiochemical and biological characteristics; general structure with special reference to viroids and prions; groups of virus, DNA virus (T-phage, λ phage), lytic and lysogenic cycle, RNA virus (TMV) – physico-chemical characteristics and its mode of multiplicat | 7 | MD/TM(Rem) | July- August |
| 3. | **Unit 3: Bacteria**<br>General characteristics,Microbial nutrition, growth and metabolism.Types-archaebacteria, eubacteria, and mycoplasma; Cell structure; Nutritional types; Reproduction-vegetative, asexual and recombination (conjugation, transformation and transduction) | 7 | IC/MD(Rem) | July- August |
| 4. | **Unit 4: Algae**<br>General characteristics; ecology and distribution; range of thallus organization; cell structure and components; cell wall, pigment system, reserve food (of only groups represented in the syllabus), flagella and flagellar roots; methods of reproduction; Classification; criteria, evolutionary classification of Lee (only up to groups); Role of algae in the environment, agriculture, biotechnology and industry. | 11 | TM/MD(Rem) | July- August |
| 5. | **Unit 5: Cyanophyta and Xanthophyta**<br>Ecology and occurrence; Range of thallus organization; Cell structure; Reproduction, Morphology and life-cycle of Nostoc and Vaucheria. | 8 | IC/MD(Rem) | Sept- Nov |
| 6. | **Unit 6: Chlorophyta and Charophyta**<br>General characteristics; Occurrence; Range of thallus organization; Cell structure; Reproduction. Morphology and life-cycles of Volvox, Oedogonium,Chara. Evolutionary significance of Prochloron. | 8 | RA/TM (Rem) | Sept- Nov |
| 7. | **Unit 7: Phaeophyta and Rhodophyta**<br>Characteristics; Occurrence; Range of thallus organization; Cell structure; Reproduction. Morphology and life-cycles of Ectocarpus, Fucus and Polysiphonia. | 12 | MK/TM (Rem) | Sept- Nov |

## Practical Course Code: BOTACOR01P

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 1. | Microbiology<br>1. Electron micrographs/Models of viruses – T-Phage and TMV, Line drawings/ Photographs of Lytic and Lysogenic Cycle. | | MD | July-<br>Nov |
| 2. | Types of Bacteria to be observed from temporary/permanent slides/photographs. Electron micrographs of bacteria, binary fission, endospore, conjugation, root nodule. | | MD | July- Nov |
| 3. | Demonstration of the preparation of media, sterilization and sub culturing | | MD | July- Nov |
| 4. | Gram staining; Endospore staining with malachite green using the (endospores taken from soil bacteria). | | MD | July- Nov |
| 5. | Phycology 1. Study of vegetative and reproductive structures of Nostoc,Volvox, Oedogonium, Chara, Vaucheria, Ectocarpus, Fucus and Polysiphonia,through temporary preparations and permanent slides.Procholoron through electron micrographs. | | TM | Sept- Nov |
| 6. | Illustration through drawing prism with magnification of vegetative and reproductive structure ofOedogonium, Chara,Vaucheria and Polysiphonia. | | TM | Sept- Nov |

## Core Course II: Biomolecules and Cell Biology Course Code: BOTACOR02T

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 1. | **Unit 1: Biomolecules**<br>Types and significance of chemical bonds; structure and properties of water; pH and buffers. Carbohydrates: Nomenclature and classification; monosaccharides ; disaccharides; oligosaccharides polysaccharides and sugar derivatives. Lipids: Definition and major classes of storage and structural lipids; fatty acids structure and functions; essential fatty acids; triacylglycerols structure, functions and properties; phosphoglycerides. Proteins: Structure of amino acids; levels of protein structure-primary, secondary, tertiary and quarternary; protein denaturation and biological roles of proteins. Nucleic acids: Structure of nitrogenous bases; | 20 | TM(6)/MD(14)(Rem) | July-<br>August |

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| | structure and function of nucleotides; types of nucleic acids; structure of A, B, Z types of DNA; types of RNA; structure of tRNA. | | | |
| 2. | **Unit 2: Bioenergenetics**<br>Laws of thermodynamics, concept of free energy, endergonic and exergonic reactions, coupled reactions, redox reactions. ATP structure, its role as a energy currency molecule. | 4 | MD(4)/TM(Rem) | July- August |
| 3. | **Unit 3: Enzymes**<br>Structure of enzyme, holoenzyme, apoenzyme, cofactors, coenzymes and prosthetic group; classification of enzymes; features of active site, substrate specificity, mechanism of action (activation energy, lock and key hypothesis, induced - fit theory), Michaelis – Menten equation and Lineweaver-Burk Plot, enzyme inhibition and factors affecting enzyme activity. | 6 | MD(6)/TM(Rem) | July- August |
| 4. | **Unit4: The cell**<br>Cell as a unit of structure and function; characteristics of prokaryotic and eukaryotic cells; origin of eukaryotic cell (Endosymbiotic theory). | 4 | IC(4)/MD(Rem) | July- August |
| 5. | **Unit 5: Cell wall and plasma membrane**<br>Chemistry, structure and function of plant cell wall;overview of membrane function; fluid mosaic model; chemical composition of membranes; membrane transport – passive, active and facilitated transport, endocytosis and exocytosis. | 4 | MD(4)/TM(Rem) | Sept- Nov |
| 6. | **Unit 6: Nucleus**: Structure - nuclear envelope, nuclear pore complex, nuclear lamina, molecular organization of chromatin; nucleolus. Cytoskeleton: Role and structure of microtubules, microfilaments and intermediary filament. Chloroplast, mitochondria and peroxisomes: Structural organization; function; semiautonomous nature of mitochondria and chloroplast. Endomembrane system: Endoplasmic reticulum – structure, targeting and insertion of proteins in the ER, protein folding, processing; smooth ER and lipid synthesis, export of proteins and lipids; Golgi apparatus – organization, protein glycosylation, protein sorting and export from Golgi apparatus; lysosomes. | 16 | IC(5)/MK(11)/MD(Rem) | Sept- Nov |
| 7. | **Cell division**<br>Phases of eukaryotic cell cycle, mitosis and meiosis; regulation of cell cycle - checkpoints, roleof protein kinases | 6 | IC(6)/MD(Rem) | Sept- Nov |

## Practical Course Code: BOTACOR02P

| S.L. NO. | TOPICS | Number of | Teacher's name | When to be taught |
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| | | **lectures** | | |
| 1. | 1. Qualitative tests for carbohydrates, reducing sugars, non-reducing sugars, lipids and proteins | | All | July- Nov |
| 2. | Study of plant cell structure with the help of epidermal peel mount of Onion/Rhoeo/Crinum | | All | July- Nov |
| 3. | 3. Measurement of cell size by the technique of micrometry. | | All | July- Nov |
| 4. | . Counting the cells per unit volume with the help of haemocytometer. (Yeast/pollen grains) | | All | July- Nov |
| 5. | . Study of cell and its organelles with the help of electron micrographs. | | All | July- Nov |
| 6. | Cytochemical staining of: DNA by Feulgen. | | All | July- Nov |
| 7. | Study the effect of organic solvent and temperature on membrane permeability. | | All | July- Nov |
| 8. | Study of the different stages of mitosis and meiosis (from permanent slides). | | All | July- Nov |

# Semester II

## Core Course III: Mycology and Phytopathology Course Code: BOTACOR03T

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 1. | **: Introduction to true fungi**<br>General characteristics; affinities with plants and animals; thallus organization; cell wall composition; nutrition;sexual (with reference to sporocarp) and asexual (spore forming bodies in deuteromycetes) reproduction; classification (Hawksworth et al 1995). | 6 | **TM** | |
| 2. | **Unit 2: Chytridiomycota and Zygomycota**<br>Characteristic features; ecology and significance; thallus organisation; reproduction; life cycle with reference to Synchytrium, Rhizopus. | 5 | **RA / IC** | |

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| 3. | **Unit 3: Ascomycota**<br>General characteristics (asexual and sexual fruiting bodies); ecology; life cycle, heterokaryosis and parasexuality; life cycle with reference to Saccharomyces, Aspergillus, Penicillium, Alternaria, Neurospora and Ascobolus. | 10 | **TR / MD** | |
| 4. | **Unit 4: Basidiomycota**<br>General characteristics;ecology; life cycle with reference to Black stem rust of wheat Puccinia (physiological specialization), Loose and covered smut (symptoms only), Agaricus; bioluminescence, fairy rings and mushroom cultivation (general account). | 8 | **TR / RA** | |
| 5. | **Unit 5: Allied Fungi**<br>General characteristics; status of slime molds; occurrence; types of plasmodia;types of fruiting bodies. | 3 | **TM** | |
| 6. | **Unit 6: Oomycota**<br>General characteristics; ecology; life cycle and classification with reference to Phytophthora &Albugo | 4 | **RA** | |
| 7. | **Unit 7: Symbiotic associations**<br>Lichen – Occurrence; general characteristics; growth forms and range of thallus organization; nature of associations of algal and fungal partners; reproduction; mycorrhiza- ectomycorrhiza endomycorrhiza and their significance. | 4 | **TM** | |
| 8. | **Unit 8: Applied Mycology**<br>Role of fungi in biotechnology; application of fungi in food industry (flavour & texture, fermentation, baking, organic acids, enzymes, mycoproteins); secondary metabolites (pharmaceutical preparations); agriculture (biofertilizers); mycotoxins; biological control (mycofungicides, mycoherbicides, mycoinsecticides, myconematicides); Medical mycology. | 10 | **TM / RA** | |
| 9. | **Unit 9: Phytopathology**<br>Terms and concepts; general symptoms; geographical distribution of diseases; etiology;symptomology; host-pathogen relationships; disease cycle and environmental relation;prevention and control of plant disease and role of quarantine. Bacterial diseases – Citrus canker. Viral diseases – TobaccoMosaic virus, vein clearing. Fungal and Oomycete diseases – Early and Late blight of potato, Black stem rust of wheat, Blast of Rice. Pra | 10 | **TM** | |

## Practical Course Code: BOTACOR03P

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 1. | . Introduction to the world of fungi (unicellular, coenocytic/septate mycelium, ascocarps & basidiocarps) through permanent slides. | | **TM** | |
| 2. | Micrometry (measurement of reproductive unit) | | **TM** | |
| 3. | . Rhizopus - study of asexual stage from temporary mounts and sexual structures through permanent slides. | | **TM** | |
| 4. | Aspergillus and Penicillium - study of asexual stage from temporary mounts and sexual stage from permanent slides/photographs. | | **RA** | |
| 5. | . Ascobolus - sectioning through ascocarp and micrometry | | **RA** | |
| 6. | Alternaria - Specimens/photographs and temporary mounts. | | **RA** | |
| 7. | Puccinia - Herbarium specimens of Black Stem Rust of Wheat and infected Barberry leaves; sections/ mounts of spores on wheat and permanent slides of both the hosts. | | **RA** | |
| 8. | Agaricus - Specimens of button stage and full grown mushroom; sectioning of gills of Agaricus, fairy rings and bioluminescent mushrooms to be shown. | | **RA** | |
| 9. | Albugo - Study of symptoms of plants infected with Albugo; asexual phase study through section/temporary mounts and sexual structures through permanent slides | | **RA** | |
| 10. | . Lichens: Study of growth forms of lichens (crustose, foliose and fruticose) on different substrates. Mycorrhizae: ectomycorrhiza and endomycorrhiza (Photographs) | | **TM** | |
| 11. | 11. Phytopathology: Herbarium specimens of bacterial diseases; Citrus canker; Viral diseases: TMV, Vein clearing symptom from any available specimen; Fungal diseases: Early and Late blight of potato, Black stem rust of wheat and Blast of Ri | | **TM** | |

## Core Course IV: Archegoniate Course Code: BOTACOR04T

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 1. | **Unit 1: Introduction** | 4 | **RA** | |

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| | Unifying features of archegoniates; transition to land habit;alternation of generations. | | | |
| 2. | **Unit 2: Bryophytes**<br>General characteristics; adaptations to land habit; classification Proskauer 1954(up to class); range of thallus organization | 6 | **MK** | |
| 3. | **Unit 3: Type Studies- Bryophytes**<br>Systematic position, morphology, anatomy and reproduction of Riccia, Marchantia,Pellia, Porella, Anthoceros, Sphagnum and Funaria; reproduction and evolutionary trends in Riccia, Marchantia, Anthoceros and Funaria (developmental stages not included). Ecological and economic importance of bryophytes with special reference to Sphagnum. | 12 | **MK** | |
| 4. | **Unit 4: Pteridophytes**<br>General characteristics; classification, Sporne 1975 (up to Class); early land plants (Cooksonia and Rhynia). | 6 | **RA** | |
| 5. | **Unit 5: Type Studies- Pteridophytes**<br>Systematic position, morphology, anatomy and reproduction of Psilotum, Selaginella, Equisetum and Pteris (developmental details not to be included). Apogamy and apospory, Heterospory and seed habit, telome theory, stelar evolution; ecological and economic importance. | 14 | **RSD / RA** | |
| 6. | **Unit 6: Gymnosperms**<br>General characteristics, classification (Sporne up to family), morphology, anatomy and reproduction of Cycas, Pinus and Gnetum (developmental details not to be included); ecological and economic importance | 18 | **TM / RSD** | |

## Practical Course Code: BOTACOR04P

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 1. | . Riccia– Morphology of thallus | | **MK** | |
| 2. | Marchantia- Morphology of thallus, whole mount of rhizoids & scales, vertical section of thallus through gemma cup, whole mount of gemmae (all temporary slides), vertical section of antheridiophore, archegoniophore, longitudinal section of sporophyte (all permanent slides). | | **MK** | |
| 3. | Anthoceros- Morphology of thallus, dissection of sporophyte (to show stomata, spores,pseudoelaters, columella), vertical section of thallus (all permanent slide). | | **MK** | |
| 4. | Sphagnum- Morphology of plant, whole mount of leaf (permanent slide only). | | **MK** | |

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| 5. | 5. Funaria- Morphology, whole mount of leaf, rhizoids, operculum, peristome, annulus, spores, longitudinal section of capsule (temporary slides); permanent slides showing antheridial and archegonial heads | | **MK** | |
| 6. | Psilotum- Study of specimen, transverse section of synangium (permanent slide). | | **RSD** | |
| 7. | Selaginella- Morphology, whole mount of leaf with ligule, transverse section of stem, whole mount of strobilus, whole mount of microsporophyll and megasporophyll (temporary slides), longitudinal section of strobilus (permanent slide). | | **RSD** | |
| 8. | Equisetum- Morphology, transverse section of internode, longitudinal section of strobilus, transverse section of strobilus, whole mount of sporangiophore, whole mount of spores (temporary slide). | | **RSD** | |
| 9. | Pteris- Morphology, vertical section of sporophyll, whole mount of sporangium, whole mount of spores (temporary slides), | | **RSD** | |
| 10. | Cycas- Morphology and TS of leaflet, morphology of microsporophyll and megasporophyll (temporary slides) whole mount of spore (temporary slides) ; TS of coralloid root, LS of ovule (all permanent slide). | | **RSD** | |
| 11. | Pinus- Morphology of long and dwarf shoots , male and female cones, transverse section of needle (temporary slide), LS of male cone and femalecone (permanent slide);microspores(permanent slides), | | **TM** | |
| 12. | Gnetum- Morphology (shoot, male & female cones), VS of ovule (permanent slide). | | **TM** | |
| 13. | One Botanical excursion to an appropriate location(with provision of fund from college). | | **TM** | |

## Academic Calendar
## DEPARTMENT – Botany General

**SESSION – 2018-19**
**PART – II**
**PAPER –II & III**

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 1. | **Theory:** Anatomy | 8 | MD/TM/IC | July-August |
| 2. | Embryology | 6 | MD/TM/IC | July-August |
| 3. | Economic Botany | 5 | MD/TM/IC | July-August |
| 4. | Ecology | 6 | MD/TM/IC | July-August |
| 5. | Cell Biology | 8 | TM | Sept-Nov |
| 6. | Genetics | 8 | TM | Sept-Nov |
| 7. | Biochemistry | 8 | MD | Dec-Feb |
| 8. | Plant Physiology | | MD | Dec-Feb |
| 9. | | | | |
| 10. | | | | |
| 11. | **Practical:**<br>1. Cryptogams - Algae/Fungi | | IC | July-August |

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| | | IC/RA<br>IC/RA | | Sept- Nov<br>July- Augu |
| 12. | 2. Angiosperms | | IC | July-August |
| 13. | 3. Anatomy | | IC | Sept-Nov |
| 14. | 4. Plant Physiology | | IC/RA | Sept-Nov |
| 15. | 5. Study of Mitotic Chromosome | | IC/RA | Sept-Nov |
| 16. | 6. Field Work | | IC/RA | July-August |

**SESSION – 2017-18**
**PART – III**

**PAPER –IV &V**

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 1. | **Theory:** Biofertilizer | 5 | MK | July-August |
| 2. | Mushroom | 5 | MD | July-August |

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| 3. | Plant Breeding | 5 | MK | Sept-Nov |
| 4. | Measures of Central Tendency | 5 | MD | Sept-Nov |
| 5. | Plant Tissue Culture | 5 | IC/MK | Sept-Nov |
| 6. | Recombinant DNA Technology | 5 | MK | Sept-Nov |
| 7. | Pharmacognosy | 5 | MD | Dec-Feb |
| 8. | Bioinformatics | 2 | MD | Dec-Feb |
| 9. | **Practical:** Instrumentations | | MD | July-August |
| 10. | Bacterial Staining | | MD | July-August |
| 11. | Biometry | | MD | Sept-Nov |
| 12. | Medicinal plant Identification | | MD | Sept-Nov |

## Semester I

## Core Course: Botany Paper I Biodiversity (Microbes, Algae, Fungi and Archegoniate) COURSE CODE: BOTGCOR01T (Credits: Theory-4, Practicals-2) THEORY

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 1. | **Unit 1: Microbes**<br>Viruses – Discovery, general structure, replication (general account), DNA virus (T-phage); Lytic and lysogenic cycle, RNA virus (TMV); Economic importance; Bacteria – Discovery, General characteristics and cell structure; Reproduction – vegetative, asexual and recombination (conjugation,transformation and transduction); Economic importance. | 10 | **TM / MD / RA** | |
| 2. | **Unit 2: Algae**<br>General characteristics; Ecology and distribution; Range of thallus organization and reproduction; Classification of algae (Lee 1989); Morphology and life-cycles of the following: Nostoc, Chlamydomonas,Oedogonium, Vaucheria, Fucus, Polysiphonia. Economic importance of algae. | 12 | **TM/MD/ IC/MK/RA** | |
| 3. | **Unit 3: Fungi**<br>Introduction- General characteristics, ecology and significance, range of thallus organization, cell wall composition , nutrition, reproduction and classification (Hawksworth et al1995); True FungiGeneral characteristics, ecology and significance, life cycle of Rhizopus (Zygomycota) Penicillium, (Ascomycota), Puccinia,Agaricus (Basidiomycota); Symbiotic Associations-Lichens: General account, reproduction and significance; Mycorrhiza: ectomycorrhiza and endomycorrhiza and their significance. | 12 | **TM/MD/ IC/MK/RA / RSD** | |
| 4. | **Unit 4: Introduction to Archegoniate**<br>Unifying features of archegoniates, Transition to land habit, Alternation of generations. | 2 | **IC** | |
| 5. | **U nit 5: Bryophytes**<br>General characteristics, adaptations to land habit, Classification (Proskauer 1954 up to class), Range of thallus organization. Systematic position, morphology, anatomy and reproduction of Marchantia, Anthoceros and Funaria.(Developmental details not to be included). Ecology and economic importance of bryophytes with special mention of Sphagnum. | 10 | **MK / RSD** | |

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| 6. | **Unit 6: Pteridophytes**<br>General characteristics, classification (Sporne 1975), Early land plants (Cooksonia and Rhynia). Systematic position, morphology, anatomy and reproduction of Selaginella, Equisetum andPteris. (Developmental details not to be included). Heterospory and seed habit, stelar evolution. Ecological and economical importance of Pteridophytes. | 8 | **IC / RA** | |

## Practical COURSE CODE: BOTGCOR01P

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 1. | 1. Gram staining from curd sample. | | **TM** | |
| 2. | 2. Study of vegetative and reproductive structures of Nostoc, (electron micrographs), Oedogonium, Fucus* and Polysiphonia through temporary preparations and permanent slides. (*Fucus - Specimen and permanent slides). | | **TM / IC** | |
| 3. | 3. Rhizopus and Penicillium: Asexual stage from temporary mounts and sexual structures through permanent slides. | | **IC** | |
| 4. | 4. Puccinia: Herbarium specimens of Black Stem Rust of Wheat and infected Barberry leaves; section/tease mounts of spores on Wheat and permanent slides of both the hosts. | | **RA** | |
| 5. | 5. Agaricus: Specimens of button stage and full grown mushroom; Sectioning of gills ofAgaricus. | | **IC** | |
| 6. | 6. Lichens: Study of growth forms of lichens (crustose, foliose and fruticose). | | **TM** | |
| 7. | 7. Mycorrhiza: ecto mycorrhiza and endo mycorrhiza (Photographs). | | **TM** | |
| 8. | 8. Marchantia- morphology of thallus, w.m. rhizoids and scales, v.s. thallus through gemma Page 66 of 81 cup,w.m. gemmae, v.s. antheridiophore, archegoniophore, l.s. sporophyte (all permanent slides). | | **RSD** | |
| 9. | 9. Funaria- morphology, w.m. leaf, rhizoids, operculum, peristome, annulus, spores - permanent slides showing antheridial and archegonial heads, l.s. capsule and protonema. | | **RSD** | |
| 10. | 10. Selaginella- morphology, w.m. leaf with ligule, t.s. stem, w.m. strobilus, w.m. | | **RSD** | |

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| | microsporophyll and megasporophyll, l.s. strobilus (permanent slide). | | | |
| 11. | 11. Equisetum- morphology, t.s. internode, l.s. strobilus, t.s. strobilus, w.m. sporangiophore, w.m.spores (wet and dry); t.s rhizome (permanent slide). | | **IC** | |
| 12. | 12. Pteris- morphology, t.s. rachis, v.s. sporophyll, w.m. sporangium, w.m. spores , t.s. rhizome, w.m. prothallus with sex organs and young sporophyte (permanent slide). | | **IC** | |
| 13. | 13. Cycas- morphology (coralloid roots, bulbil, leaf), t.s. coralloid root, t.s. rachis, v.s. leaflet, v.s.microsporophyll, w.m. spores, l.s. ovule, t.s. root (permanent slide). | | **RA** | |
| 14. | 14. Pinus- morphology (long and dwarf shoots, w.m. dwarf shoot, male and female), w.m. dwarf shoot, t.s. needle, t.s. stem, , l.s./t.s. male cone, w.m. microsporophyll, w.m. microspores, l.s. female cone, t.l.s. & r.l.s. stem (permanent slide). | | **RSD** | |

## Semester II Core Course Botany –Paper II Plant Ecology and Taxonomy COURSE CODE: BOTGCOR02T (Credits: Theory-4, Practicals-2) THEORY

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 1. | **Unit 1: Introduction** | 2 | **TM** | |
| 2. | **Unit 2: Ecological factors**<br>Soil: Origin, composition, soil profile. Water: States of water in the environment, Light and temperature: Variation Optimal and limiting factors; Shelford law of tolerance. Adaptation of hydrophytes and xerophytes. | 10 | **TM / IC / RA** | |
| 3. | **U nit 3: Plant communities**<br>Characters; Ecotone and edge effect; Succession; Processes and types. | 6 | **TM / RSD** | |
| 4. | **Unit 4: Ecosystem**<br>Structure; energy flow trophic organisation; Food chains and food webs, Ecological pyramids production and productivity; Biogeochemical cycling; Cycling of carbon, nitrogen. | 8 | **TM / RSD** | |
| 5. | **Unit 5: Phytogeography**<br>Principle biogeographical zones; Endemism. | 4 | **TM** | |
| 6. | **U nit 6: Introduction to plant taxonomy**<br>Identification, Classification, Nomenclature. | 2 | **MK** | |

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| 7. | **Unit 7: Identification**<br>Functions of Herbarium, important herbaria and botanical gardens of the world and India; Documentation: Flora, Keys. | 4 | **MK** | |
| 8. | **Unit 8:** Taxonomic evidences from palynology, cytology, phytochemistry and moleculardata. | 6 | **IC / MK** | |
| 9. | **Unit 9: Taxonomic hierarchy**<br>Ranks, categories and taxonomic groups. | 2 | **MK** | |
| 10. | **Unit 10: Botanical nomenclature**<br>Page 68 of 81 Principles and rules (ICN); ranks and names; binominal system, typification, author citation,valid publication. | 6 | **IC / MK** | |
| 11. | **U nit 11: Classification**<br>Types of classification- artificial, natural and phylogenetic. Bentham and Hooker (up toseries), General idea of Cronquist's classification (1981). | 6 | **IC / MK** | |
| 12. | **Unit 12 Numerical taxonomy and cladistics**<br>Characters; variations; cluster analysis; phenograms, cladograms (definitions and differences). | 4 | **IC / MK** | |
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## Practical COURSE CODE: BOTGCOR02P

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 1. | 1. Study of instruments used to measure microclimatic variables: Soil thermometer maximum and minimum thermometer, anemometer, psychrometer/hygrometer, rain gauge and lux meter. | | | |
| 2. | 2. Determination of pH, and analysis of two soil samples for carbonates, chlorides, nitrates, organic matter and by rapid field test. | | | |
| 3. | 3. (a) Study of morphological adaptations of hydrophytes (Nymphaea petiole) and xerophytes (Nerium leaf) (four each).<br>(b) Study of biotic interactions of the following: Stem parasite (Cuscuta), Epiphytes (Orchid | | | |

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| | root). | | | |
| 4. | 4. Determination of minimal quadrat size for the study of herbaceous vegetation in the College/ suitable site by species area curve method. (Species to be listed). | | | |
| 5. | 5. Quantitative analysis of herbaceous vegetation in the college campus /suitable site for frequency and comparison with Raunkiaer's frequency distribution law. | | | |
| 6. | 6. Study of vegetative and floral characters of the following families (Description, V.S. of flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification):Brassicaceae – Nastertium indicum; Asteraceae - Eclipta and Tridax;Solanaceae – Nicotiana plumbaginifolia, Solanum nigrum, Lamiaceae - Leonurus sibiricus, Leucas aspera and Ocimum sanctum; Liliaceae - Allium. | | | |
| 7. | 7.Mounting of a properly dried and pressed specimen of any ten wild plant with herbarium label (to be submitted in the record book). | | | |

**Hiralal Mazumdar Memorial Collegefor Women, Dakshineswar, Kolkata-700035**
**Department of Botany**
**Syllabus Distribution cum Academic Calendar 2019-20**
**BOTANY HONOURS**

## SESSION – 2019-20

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**PART – III**

**PAPER –VII, VIII, IX & X**

## SEMESTER – I

# Course I: Phycology and Microbiology Course Code: BOTACOR01T

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 8. | **Unit 1: Introduction to microbial world**<br>Primary concept of microorganism – 3 domain concept; Economic importance of viruses with reference to vaccine production, role in research, medicine and diagnostics and as causal organisms of plant diseases. Economic importance of bacteria with reference to their role in agriculture and industry (fermentation and medicine). | 7 | TM / RSD | By mid of August<br>July-August<br>July-August<br>July-August<br>Sept- Nov |

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|---|---|---|---|---|
| | | | | Sept- Nov |
| 9. | **Unit 2: Viruses**<br>Physiochemical and biological characteristics; general structure with special reference to viroids and prions; groups of virus, DNA virus (T-phage, λ phage), lytic and lysogenic cycle, RNA virus (TMV) – physico-chemical characteristics and its mode of multiplicat | 7 | TM / RSD | By August third week |
| 10. | **Unit 3: Bacteria**<br>General characteristics,Microbial nutrition, growth and metabolism.Types-archaebacteria, eubacteria, and mycoplasma; Cell structure; Nutritional types; Reproduction-vegetative, asexual and recombination (conjugation, transformation and transduction) | 7 | RA | By August third week |
| 11. | **Unit 4: Algae**<br>General characteristics; ecology and distribution; range of thallus organization; cell structure and components; cell wall, pigment system, reserve food (of only groups represented in the syllabus), flagella and flagellar roots; methods of reproduction; Classification; criteria, evolutionary classification of Lee (only up to groups); Role of algae in the environment, agriculture, biotechnology and industry. | 11 | TM | By August third week |
| 12. | **Unit 5: Cyanophyta and Xanthophyta**<br>Ecology and occurrence; Range of thallus organization; Cell structure; Reproduction, Morphology and life-cycle of Nostoc and Vaucheria. | 8 | IC / MK | By August third week |
| 13. | **Unit 6: Chlorophyta and Charophyta**<br>General characteristics; Occurrence; Range of thallus organization; Cell structure; Reproduction. Morphology and life-cycles of Volvox, Oedogonium,Chara. Evolutionary significance of Prochloron. | 8 | MK / IC | By August third week<br>Sept- Nov |
| 14. | **Unit 7: Phaeophyta and Rhodophyta**<br>Characteristics; Occurrence; Range of thallus organization; Cell structure; Reproduction. Morphology and life-cycles of Ectocarpus, Fucus and Polysiphonia. | 12 | IC | By August third week |

## Practical Course Code: BOTACOR01P

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 7. | Microbiology<br>1. Electron micrographs/Models of viruses – T-Phage and TMV, Line drawings/ Photographs of Lytic and Lysogenic Cycle. | | RA / RSD | By September middle |
| 8. | Types of Bacteria to be observed from temporary/permanent slides/photographs. Electron micrographs of bacteria, binary fission, endospore, conjugation, root nodule. | | RA / RSD | By September middle |
| 9. | Demonstration of the preparation of media, sterilization and sub culturing | | RA / RSD | By September middle |
| 10. | Gram staining; Endospore staining with malachite green using the (endospores taken from soil bacteria). | | RA / RSD | By September middle |
| 11. | Phycology 1. Study of vegetative and reproductive structures of Nostoc,Volvox, Oedogonium, Chara, Vaucheria, Ectocarpus, Fucus and Polysiphonia,through temporary preparations and permanent slides.Procholoron through electron micrographs. | | TM / MK | By September middle |
| 12. | Illustration through drawing prism with magnification of vegetative and reproductive structure ofOedogonium, Chara,Vaucheria and Polysiphonia. | | TM / MK | By September middle |

## Core Course II: Biomolecules and Cell Biology Course Code: BOTACOR02T

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 8. | **Unit 1: Biomolecules**<br>Types and significance of chemical bonds; structure and properties of water; pH and buffers. Carbohydrates: Nomenclature and classification; monosaccharides ; disaccharides; oligosaccharides polysaccharides and sugar derivatives. Lipids: Definition and major classes of storage and structural lipids; fatty acids structure and functions; essential fatty acids; triacylglycerols structure, functions and properties; phosphoglycerides. Proteins: Structure of amino acids; levels of protein structure-primary, secondary, tertiary and quarternary; protein | 20 | TM / TR | By Early October |

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| | denaturation and biological roles of proteins. Nucleic acids: Structure of nitrogenous bases; structure and function of nucleotides; types of nucleic acids; structure of A, B, Z types of DNA; types of RNA; structure of tRNA. | | | |
| 9. | **Unit 2: Bioenergenetics**<br>Laws of thermodynamics, concept of free energy, endergonic and exergonic reactions, coupled reactions, redox reactions. ATP structure, its role as a energy currency molecule. | 4 | RA | By Early October |
| 10. | **Unit 3: Enzymes**<br>Structure of enzyme, holoenzyme, apoenzyme, cofactors, coenzymes and prosthetic group; classification of enzymes; features of active site, substrate specificity, mechanism of action (activation energy, lock and key hypothesis, induced - fit theory), Michaelis – Menten equation and Lineweaver-Burk Plot, enzyme inhibition and factors affecting enzyme activity. | 6 | TR | By Early October |
| 11. | **Unit4: The cell**<br>Cell as a unit of structure and function; characteristics of prokaryotic and eukaryotic cells; origin of eukaryotic cell (Endosymbiotic theory). | 4 | TM | By Early October |
| 12. | **Unit 5: Cell wall and plasma membrane**<br>Chemistry, structure and function of plant cell wall;overview of membrane function; fluid mosaic model; chemical composition of membranes; membrane transport – passive, active and facilitated transport, endocytosis and exocytosis. | 4 | TM | By Early October |
| 13. | **Unit 6: Nucleus**: Structure - nuclear envelope, nuclear pore complex, nuclear lamina, molecular organization of chromatin; nucleolus. Cytoskeleton: Role and structure of microtubules, microfilaments and intermediary filament. Chloroplast, mitochondria and peroxisomes: Structural organization; function; semiautonomous nature of mitochondria and chloroplast. Endomembrane system: Endoplasmic reticulum – structure, targeting and insertion of proteins in the ER, protein folding, processing; smooth ER and lipid synthesis, export of proteins and lipids; Golgi apparatus – organization, protein glycosylation, protein sorting and export from Golgi apparatus; lysosomes. | 16 | | By Early October |
| 14. | **Cell division**<br>Phases of eukaryotic cell cycle, mitosis and meiosis; regulation of cell cycle - checkpoints, roleof protein kinases | 6 | IC/MK/RA | By November first week |

# Practical Course Code: BOTACOR02P

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 1. | 1. Qualitative tests for carbohydrates, reducing sugars, non-reducing sugars, lipids and proteins | | RA / TR | |
| 2. | Study of plant cell structure with the help of epidermal peel mount of Onion/Rhoeo/Crinum | | RA / TR | |
| 3. | 3. Measurement of cell size by the technique of micrometry. | | RA / TR | |
| 4. | . Counting the cells per unit volume with the help of haemocytometer. (Yeast/pollen grains) | | RA / TR | |
| 5. | . Study of cell and its organelles with the help of electron micrographs. | | RA / TR | |
| 6. | Cytochemical staining of: DNA by Feulgen. | | RA / TR | |
| 7. | Study the effect of organic solvent and temperature on membrane permeability. | | RA / TR | |
| 8. | Study of the different stages of mitosis and meiosis (from permanent slides). | | RA / TR | |

**Hiralal Mazumdar Memorial Collegefor Women, Dakshineswar, Kolkata-700035**
**Department of Botany**
**Syllabus Distribution cum Academic Calendar 2020 - 21**
**BOTANY HONOURS**

## SESSION – 2020 - 21

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| **1.** | **Unit 1: Introduction to microbial world**<br>Primary concept of microorganism – 3 domain concept; Economic importance of viruses with reference to vaccine production, role in research, medicine and diagnostics and as causal organisms of plant diseases. Economic importance of bacteria with reference to their role in agriculture and industry (fermentation and medicine) | 7 | TM, IC,MK,RA,RSD | By mid-August |
| **2.** | **Unit 2: Viruses**<br>Physiochemical and biological characteristics; general structure with special reference to viroids and prions; groups of virus, DNA virus (T-phage, λ phage), lytic and lysogenic cycle, RNA virus (TMV) – physico-chemical characteristics and its mode of multiplicat | **7** | TM/RSD | By mid-August |
| **3.** | **Unit 3: Bacteria**<br>General characteristics,Microbial nutrition, growth and metabolism.Types-archaebacteria, eubacteria, and mycoplasma; Cell structure; Nutritional types; Reproduction-vegetative, asexual and recombination (conjugation, transformation and transduction) | **7** | RA | By mid-August |

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| **4.** | **Unit 4: Algae**<br>General characteristics; ecology and distribution; range of thallus organization; cell structure and components; cell wall, pigment system, reserve food (of only groups represented in the syllabus), flagella and flagellar roots; methods of reproduction; Classification; criteria, evolutionary classification of Lee (only up to groups); Role of algae in the environment, agriculture, biotechnology and industry. | **11** | **TM** | By mid-August |
| **5.** | **Unit 5: Cyanophyta and Xanthophyta**<br>Ecology and occurrence; Range of thallus organization; Cell structure; Reproduction, Morphology and life-cycle of Nostoc and Vaucheria. | **8** | **IC / MK** | By August third week |
| **6.** | **Unit 6: Chlorophyta and Charophyta**<br>General characteristics; Occurrence; Range of thallus organization; Cell structure; Reproduction. Morphology and life-cycles of Volvox, Oedogonium,Chara. Evolutionary significance of Prochloron. | **8** | **IC / MK** | By August third week |
| **7.** | **Unit 7: Phaeophyta and Rhodophyta**<br>Characteristics; Occurrence; Range of thallus organization; Cell structure; Reproduction. Morphology and life-cycles of Ectocarpus, Fucus and Polysiphonia. | **12** | **IC** | By August third week |

## Practical Course Code: BOTACOR01P

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| **1.** | Microbiology<br>1. Electron micrographs/Models of viruses – T-Phage and TMV, Line drawings/ Photographs of Lytic and Lysogenic Cycle. | | **RA / RSD** | By September middle |

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|---|---|---|---|---|
| **2.** | Types of Bacteria to be observed from temporary/permanent slides/photographs. Electron micrographs of bacteria, binary fission, endospore, conjugation, root nodule. | | **RA / RSD** | By September middle |
| **3.** | Demonstration of the preparation of media, sterilization and sub culturing | | **RA / RSD** | By September middle |
| **4.** | Gram staining; Endospore staining with malachite green using the (endospores taken from soil bacteria). | | **RA / RSD** | By September middle |
| **5.** | Phycology 1. Study of vegetative and reproductive structures of Nostoc,Volvox, Oedogonium, Chara, Vaucheria, Ectocarpus, Fucus and Polysiphonia,through temporary preparations and permanent slides.Procholoron through electron micrographs. | | **TM / MK** | By September middle |
| **6.** | Illustration through drawing prism with magnification of vegetative and reproductive structure ofOedogonium, Chara,Vaucheria and Polysiphonia. | | **TM / MK** | By September middle |

# Core Course II: Biomolecules and Cell Biology Course Code: BOTACOR02T

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 1. | **Unit 1: Biomolecules**<br>Types and significance of chemical bonds; structure and properties of water; pH and buffers. Carbohydrates: Nomenclature and classification; monosaccharides ; disaccharides; oligosaccharides polysaccharides and sugar derivatives. Lipids: Definition and major classes of storage and structural lipids; fatty acids structure and functions; essential fatty acids; triacylglycerols structure, functions and properties; phosphoglycerides. Proteins: Structure of amino acids; levels of protein structure-primary, secondary, tertiary and quarternary; protein denaturation and biological roles of proteins. Nucleic acids: Structure of nitrogenous bases; structure and function of nucleotides; types of nucleic acids; structure of A, B, Z types of DNA; types of RNA; structure of tRNA. | **20** | **TM / IC / MK / TR** | By Early October |
| 2. | **Unit 2: Bioenergenetics**<br>Laws of thermodynamics, concept of free energy, endergonic and exergonic reactions, coupled reactions, redox reactions. ATP structure, its role as a energy currency molecule. | **4** | **TM / TR** | By Early October |
| 3. | **Unit 3: Enzymes**<br>Structure of enzyme, holoenzyme, apoenzyme, cofactors, coenzymes and prosthetic group; classification of enzymes; features of active site, substrate specificity, mechanism of action (activation energy, lock and key hypothesis, induced - fit theory), Michaelis – Menten equation and Lineweaver-Burk Plot, enzyme inhibition and factors affecting enzyme activity. | **6** | **RA** | By Early October |
| 4. | **Unit4: The cell**<br>Cell as a unit of structure and function; characteristics of prokaryotic and eukaryotic cells; origin of eukaryotic cell (Endosymbiotic theory). | **4** | **TR** | By Early October |
| 5. | **Unit 5: Cell wall and plasma membrane**<br>Chemistry, structure and function of plant cell wall;overview of membrane function; fluid mosaic model; chemical composition of membranes; membrane transport – passive, active and facilitated transport, endocytosis and exocytosis. | **4** | **TM** | By November first week |
| 6. | **Unit 6: Nucleus**: Structure - nuclear envelope, nuclear pore complex, nuclear lamina, molecular | **16** | **IC / MK /** | By November |

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|---|---|---|---|---|
| | organization of chromatin; nucleolus. Cytoskeleton: Role and structure of microtubules, microfilaments and intermediary filament. Chloroplast, mitochondria and peroxisomes: Structural organization; function; semiautonomous nature of mitochondria and chloroplast. Endomembrane system: Endoplasmic reticulum – structure, targeting and insertion of proteins in the ER, protein folding, processing; smooth ER and lipid synthesis, export of proteins and lipids; Golgi apparatus – organization, protein glycosylation, protein sorting and export from Golgi apparatus; lysosomes. | | **RA** | first week |
| **7.** | **Cell division**<br>Phases of eukaryotic cell cycle, mitosis and meiosis; regulation of cell cycle - checkpoints, roleof protein kinases | **6** | **IC** | By November first week |

## Practical Course Code: BOTACOR02P

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| **1.** | 1. Qualitative tests for carbohydrates, reducing sugars, non-reducing sugars, lipids and proteins | | **RA / TR** | By November first week |
| **2.** | Study of plant cell structure with the help of epidermal peel mount of Onion/Rhoeo/Crinum | | **RA / TR** | By November first week |
| **3.** | 3. Measurement of cell size by the technique of micrometry. | | | By November first week |
| **4.** | . Counting the cells per unit volume with the help of haemocytometer. (Yeast/pollen grains) | | **RA / TR** | By November first week |
| **5.** | . Study of cell and its organelles with the help of electron micrographs. | | **RA / TR** | By November first week |
| **6.** | Cytochemical staining of: DNA by Feulgen. | | **RA / TR** | By November first week |
| **7.** | Study the effect of organic solvent and temperature on membrane permeability. | | **RA / TR** | By November first week |
| **8.** | Study of the different stages of mitosis and meiosis (from permanent slides). | | **RA / TR** | By November first week |

## SEMESTER III

## Core Course V: Morphology and Anatomy of Angiosperms Course Code: BOTACOR05T (Credits: Theory-4, Practical-2) THEORY

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| | **Unit 1: Inflorescence** – Types with examples, concept of advanced and primitive types. | **2** | **MK / RSD** | By last week of September |
| | **Unit 2: Flower** – Types with examples, aestivation, floral parts – various types of cohesion and adhesion with examples; carpel-types, advance and primitive ones and placentations | **5** | **MK / RSD** | By last week of September |
| | **Unit 3: Fruits and Seeds** – types with examples | **3** | **MK / RSD** | By last week of September |
| | **Unit 4: Introduction and scope of Plant Anatomy** Applications in systematics, forensics and pharmacognosy. | **3** | **MK / RSD** | By last week of September |
| | **Unit 5: Structure and Development of Plant Body** Internal organization of plant body; the three tissue systems, types of cells and tissues | **5** | **MK / RSD** | By last week of September |
| | **Unit 6: Tissues** Classification of tissues; simple and complex tissues (no phylogeny); cytodifferentiation of Page 17 of 81 tracheary elements and sieve elements; pits and plasmodesmata; ergastic substances; hydathodes, cavities, lithocysts and laticifers. | **10** | **MK / RSD** | By last week of November |
| | **Unit 7: Apical meristems** Evolution of the concept of organization of the shoot apex (Apical cell theory, Histogen theory, Tunica Corpus theory) types of vascular bundles; structure of dicot and monocot stem; structure of dicot and monocot leaf, Kranz anatomy; organization of root apex (Apical cell theory, Histogen theory, Korper-Kappe theory); quiescent centre; root cap; structure of dicot and monocot root. | **12** | **MK / RSD** | By last week of November |

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| | **Unit 8: Vascular Cambium and Wood**<br>Structure, function and seasonal activity of cambium; secondary growth in root and stem ; types of rays and axial parenchyma; sapwood and heartwood; ring and diffuse porous wood; early and late wood, tyloses; development and composition of periderm, rhytidome and lenticels. | **12** | **MK / RSD** | By last week of November |
| | **Unit 9: Adaptive and Protective Systems**<br>Epidermal tissue system, cuticle, trichomes (uni and multicellular, glandular and nonglandular, two examples of each), stomata (classification); adcrustation and incrustation; anatomical adaptations of xerophytes and hydrophytes. | **8** | **TM** | By last week of November |

## Practical Course Code: BOTACOR05P

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| | Study of anatomical details of the following through permanent slides/temporary stain mounts/ macerations/museum specimens with the help of suitable representatives.<br>a. Apical meristem of root, shoot and vascular cambium. b. Distribution and types of parenchyma, collenchyma and sclerenchyma.<br>c. Xylem: Tracheary elements- tracheids, vessel elements; thickenings; perforation plates; Xylem fibres(permanent slides).<br>d. Wood: ring porous; diffuse porous; tyloses; heart and sapwood (permanent slides).<br>e. Phloem: Sieve tubes-sieve plates; companion cells; phloem fibres. (permanent slides).<br>f. Epidermal system: cell types, stomata types; trichomes: non-glandular and glandular (permanent slides)<br>g. Periderm; lenticels; C4 leaves (Kranz anatomy); Secretory tissues: cavities, lithocysts Page 18 of 81 and laticifers | | **TM** | By last week of September |
| | 2. Workout and preparation of permanent slides by following double staining method.<br>a. Root anatomy (monocot – Orchid), dicot (Sunflower); secondary growth.<br>b. Stem anatomy (monocot- maize), (dicot – Cucurbita) - primary and secondary growth.<br>c. Leaf: isobilateral (Tube rose), dorsiventral (Mango), d. Adaptive anatomy: xerophytes (Nerium leaf), hydrophytes (Nymphaea petiole). | | **RSD** | By last week of November |

## Core Course VI: Economic Botany Course Code: BOTACOR06T (Credits: Theory-4, Practical-2) THEORY

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| | **Unit 1: Origin of Cultivated Plants**<br>Concept of centres of origin, their importance with reference to Vavilov's work; examples of major plant introductions; crop domestication and loss of genetic diversity. | **6** | **TM** | By last week of September |
| | **Unit 2: Cereals**<br>Wheat and rice- origin, morphology, cultivation & uses; brief account on millets | **6** | **TM** | By last week of September |
| | **Unit 3: Legumes**<br>Origin, morphology and uses of Chick pea & Pigeon pea; importance to man and ecosystem. | **6** | **TM** | By last week of September |
| | **Unit 4: Sources of sugars and starches**<br>Morphology and processing of sugarcane; products and by-products of sugarcane industry. Potato – morphology, propagation & uses. | **4** | **TM** | By last week of September |
| | **Unit 5: Spices**<br>Listing of important spices, their family and part used. Economic importance with special Page 19 of 81 reference to fennel, saffron, clove and black pepper. | **6** | **TM** | By last week of September |
| | **Unit 6: Beverages**<br>Tea and coffee - morphology, processing & uses. | **4** | **IC** | By last week of September |
| | **Unit 7: Sources of oils and fats**<br>General description, classification, extraction, their uses and health implications of groundnut, linseed, soybean, mustard and coconut (botanical name, family & uses). Essential oils - Santalum and Eucalyptus: general account, extraction methods, comparison with fatty oils & their uses. | **10** | **TR** | By last week of September |
| | **Unit 8: Natural Rubber**<br>Para-rubber, tapping, processing and uses | **3** | **TR** | By last week of September |
| | **Unit 9: Drug yielding plants**<br>Therapeutic and habit-forming drugs with special reference to Cinchona, Digitalis, Papaver and Cannabis; Tobacco - Morphology, processing, uses and health hazards. | **8** | **TR** | By last week of September |
| | **Unit 10: Timber plants**<br>General account with special reference to teak, sal and pine | **3** | **TR** | By last week of September |
| | **Unit 11: Fibers** Classification based on the origin of fibers; Cotton and Jute - morphology, extraction and uses. | **4** | **IC** | |

## Practical Course Code: BOTACOR06P

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| | 1. Cereals: Wheat : habit sketch, L. S/T.S. grain, starch grains – type; micro-chemical tests – iodine spot test. Rice: habit sketch, study of paddy and grain, starch grains– type; micro-chemical tests – iodine spot test. | | **TM** | By last week of September |
| | 2.Legumes: Soybean and Ground nut: habit sketch, fruit, seed structure and micro-chemical tests (Millon test- Soyabean, Sudan IV test- Groundnut). | | **TM** | By last week of September |
| | 3.Sources of sugars and starches: Sugarcane - habit sketch; cane juice- micro-chemical tests (Molisch test). Potato - habit sketch, tuber morphology, T.S. of tuber to show localization of starch grains, w.m. starch grains, micro-chemical tests (Iodine test) | | **TM** | By last week of September |
| | 4. Spices: Black pepper, Fennel and Clove - Demonstration, habit sketch and comments | | **MK** | By last week of September |
| | Beverages: Tea leaf and coffee bean - extraction (Biochemical Tests for Tannin and Alkaloid) and comments. | | **MK** | By last week of September |
| | Sources of oils and fats: Coconut - kernel and Mustard - seeds: tests for fats (Sudan IVtest) | | **TM** | By last week of September |
| | 7. Essential oil-yielding plants: Habit sketch of Santalum and Eucalyptus (specimens /photographs). | | **MK** | By last week of November |
| | 8. Rubber: specimen, photograph/model of tapping, samples of rubber products. | | **TM** | By last week of November |
| | 9. Drug-yielding plants: Specimens of Digitalis, Papaver and Cannabis. | | **TM** | By last week of November |
| | 10. Tobacco: specimen and products of Tobacco. | | **TM** | By last week of November |
| | 11.Woods: Tectona, Pinus and Shorea; Specimen; Section of young stem specimen | | **TM** | By last week of November |
| | 12. Fiber-yielding plants: Cotton – specimen whole mount of fiber and test for cellulose – general test with benzene and/or aniline acetate test. Jute - transverse section of stem, test for lignin – phloroglucinol test on transverse section of stem and fiber. | | **TM** | By last week of November |

## Core Course VII: Genetics Course Code: BOTACOR07T (Credits: Theory-4, Practical-2) THEORY

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| | **Unit 1: Mendelian genetics and its extension**<br>Mendelism: Principles of inheritance; chromosome theory of inheritance; autosomes and sex chromosomes; probability and pedigree analysis; incomplete dominance and codominance; Page 21 of 81 multiple alleles, lethal alleles, epistasis, pleiotropy, recessive and dominant traits, penetrance and expressivity, numericals; polygenic inheritance. | **16** | **IC / RA** | By last week of September |
| | **Unit 2: Extrachromosomal Inheritance**<br>Chloroplast mutation: Variegation in Four o'clock plant; mitochondrial mutations in yeast; maternal effects-shell coiling in snail; infective heredity- kappa particles in Paramecium. | **6** | **IC / RA** | By last week of September |
| | **Unit 3: Linkage, crossing over and chromosome mapping**<br>Linkage and crossing over-cytological basis of crossing over; recombination frequency, two factor and three factor crosses; interference and coincidence; numericals based on gene mapping; sex Linkage | **12** | **IC / RA** | By last week of September |
| | **Unit 4: Variation in chromosome number and structure**<br>Deletion, duplication, inversion, translocation, position effect, euploidy and aneuploidy | **8** | **IC / RA** | By last week of September |
| | **Unit 5: Gene mutations**<br>Types of mutations; molecular basis of mutations; mutagens – physical and chemical (Base analogs, deaminating, alkylating and intercalating agents); detection of mutations: CIB method. Role of transposons in mutation; DNA repair mechanisms. | **6** | **IC / RA** | By last week of September |
| | **Unit 6: Fine structure of gene**<br>Classical vs molecular concepts of gene; Cis-Trans complementation test for functional allelism; structure of phage T4, rII locus. | **6** | **IC / RA** | By last week of September |
| | **Unit 7. Population and Evolutionary Genetics**<br>Allele frequencies, genotype frequencies, Hardy-Weinberg Law, role of natural selection, mutation, genetic drift. Genetic variation and speciation. | **6** | **IC / RA** | By last week of September |

## Practical Course Code: BOTACOR07P

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| | 1a. Mitosis through temporary squash preparation (Allium cepa, Lens esculentus, Aloe vera).<br>b. Meiosis through temporary smear preparation (Allium cepa, Rhoeo discolour). | | **IC / RA** | By last week of September |
| | 2. Mendel's laws through seed ratios(3:1, 1:1, 9:3:3:1, 1:1:1:1). Laboratory exercises in probability and chi-square. | | **IC / RA** | By last week of September |
| | 3. Chromosome mapping using point test cross data. | | **IC / RA** | By last week of September |
| | 4. Incomplete dominance and gene interaction through seed ratios (9:7, 9:6:1, 13:3, 15:1, 12:3:1, 9:3:4). | | **IC / RA** | By last week of September |
| | 5. Study of aneuploidy: Down's, Klinefelter's and Turner's syndromes (demonstration through pictures). | | **IC / RA** | By last week of September |
| | 6. Photographs and permanent slides showing translocation ring, Laggards and Inversion Bridge, Multipolarity, Sticky Bridge, Fragmentation and Pollen mitosis. | | **IC / RA** | By last week of November |
| | 7. Study of human genetic traits: Sickle cell anemia, xeroderma pigmentosum, albinism, red-green colour blindness, widow's peak, rolling of tongue, Hitchhiker's thumb and attached ear lobe. (demonstration through pictures) | | **IC / RA** | By last week of November |

# 3rd Year

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| **1.** | Paper - VII Theoretical 100 Marks<br>(Code - 121107) | | | By November |
| **2.** | 1. Plant Physiology 60 Marks [50 Periods] | **50** | TM/RA/IC/MK/R | By November |

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| | | | SD/TR | |
| **3.** | 2. Pharmacognosy 20 Marks [15 Periods] | **15** | **TM** | By November |
| **4.** | 3. Plant Biotechnology 20 Marks [15 Periods] | **15** | MK/RA | By November |
| **5.** | *Practical as per theory class | | | By November |
| **6.** | Paper - VIII Theoretical 100 Marks<br>(Code - 121108) | | | |
| **7.** | 1. Cell Biology 25 Marks [20 Periods] | **20** | IC/TR | By November |
| **8.** | 2. Genetics & Molecular Biology 55 Marks [45 Periods] | **45** | RA/TR | By November |
| **9.** | 3. Plant Breeding & Biometry 20 Marks [15 Periods] | **15** | MK | By November |

**Hiralal Mazumdar Memorial Collegefor Women, Dakshineswar, Kolkata-700035**
**Department of Botany**
**Syllabus Distribution cum Academic Calendar 2021 - 22**
**BOTANY HONOURS**

## SESSION – 2021 - 22

## Semester V

## Core Course XI: Reproductive Biology of Angiosperms Course Code: BOTACOR11T (Credits: Theory-4, Practical-2)

## THEORY

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 1. | **Unit 1: Introduction**<br>History and scope. | 4 | MK | July - August |
| 2. | **Unit 2: Reproductive development**<br>Induction of flowering; flower as a modified determinate shoot. Flower development: genetic and molecular aspects. | 6 | MK | July - August |
| 3. | **Unit 3: Anther and pollen biology**<br>Anther wall: Structure and functions, microsporogenesis, callose deposition and its significance. Page 30 of 81 Microgametogenesis; pollen wall structure, MGU (male germ unit) structure, NPC system; palynology and scope (a brief account); pollen wall proteins; pollen viability. | 10 | MK | September - November |
| 4. | **Unit 4: Anther and pollen biology**<br>Anther wall: Structure and functions, microsporogenesis, callose deposition and its significance. Page 30 of 81 Microgametogenesis; pollen wall structure, MGU (male germ unit) structure, NPC system; palynology and scope (a brief account); pollen wall proteins; pollen viability. | 10 | TM + RSD | July - August |
| 5. | **Unit 5: Pollination and fertilization**<br>Pollination - types and significance; adaptations; structure of stigma and style; path of pollen | 6 | MK | September - November |

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| | tube in pistil; double fertilization. | | | |
| **6.** | **Unit6: Self incompatibility**<br>Basic concepts (interspecific, intraspecific, homomorphic, heteromorphic, GSI and SSI); methods to overcome self-incompatibility - mixed pollination, bud pollination, stub pollination; intraovarian and in vitro pollination, parasexual hybridization; cybrids, in vitro fertilization. | **10** | **TM** | **July - August** |
| **7.** | **Unit 7: Embryo, Endosperm and Seed**<br>Structure and types; general pattern of development of dicot and monocot embryo and endosperm; suspensor - structure and functions; embryo-endosperm relationship; nutrition of embryo; unusual features; embryo development in Capsella bursa-pastorisseed structure, importance anddispersal mechanisms. | **10** | **RA** | **July - August** |
| **8.** | **Units 8: Polyembryony and apomixis**<br>Introduction; classification; causes and applications. | **6** | **TM** | **September - November** |

## Practical Course Code: BOTACOR11P

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| **1.** | Anther: Tapetum (amoeboid and glandular); spore tetrads, uninucleate, bicelled and dehisced anther stages through slides/micrographs, male germ unit (MGU) through photographs and schematic representation. | | **MK** | **July - August** |
| **2.** | Pollen grains: Fresh and acetolyzed showing ornamentation and aperture, monads, dyads, polyads, pollinia (slides/photographs,fresh material), ultrastructure of pollen wall(micrograph); Pollen viability: Tetrazolium test germination: Calculation of percentage germination in different media using hanging drop method. | | **MK** | **July - August** |
| **3.** | Ovule: Types-anatropous, orthotropous, amphitropous/campylotropous, circinotropous, unitegmic, bitegmic; Tenuinucellate and crassinucellate; Special structures: Endothelium, obturator, hypostase, caruncle and aril (permanent slides/specimens/photographs). | | **TM + RSD** | **July - August** |
| **4.** | Female gametophyte through permanent slides/ photographs: Types, ultrastructure of mature egg apparatus. | | **MK** | **September - November** |
| **5.** | Endosperm: Dissections of developing seeds for endosperm with free-nuclear haustoria. | | **RA** | **September -** |

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| | | | | **November** |
| **6.** | Embryogenesis: Study of dicot embryo through permanent slides/photoghraphs;Study of embryos at various developmental stages through permanent slide/ photographs; Study of suspensor through electron micrographs | | **TM** | **September - November** |

## Core Course XII: Plant Physiology Course Code: BOTACOR12T (Credits: Theory-4, Practical-2) THEORY

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| **1.** | **Unit 1: Plant-water relations**<br>Water potential and its components, water absorption by roots, aquaporins, pathway of water movement, symplast, apoplast, transmembrane pathways, root pressure, guttation. Ascent of sap– cohesion-tension theory ;transpiration and factors affecting transpiration, antitranspirants, mechanism of stomatal movement. | **10** | **RA** | **July - August** |
| **2.** | **Unit 2: Mineral nutrition**<br>Essential and beneficial elements, macro and micronutrients, methods of study and use of nutrient solutions, criteria for essentiality, mineral deficiency symptoms, roles of essential elements, chelating agents. | **8** | **IC** | **July - August** |
| **3.** | **Unit 3: Nutrient Uptake**<br>Soil as a nutrient reservoir, transport of ions across cell membrane, passive absorption, electrochemical gradient, facilitated diffusion, active absorption, role of ATP, carrier systems, proton ATPase pump and ion flux, uniport, co-transport, symport, antiport. | **8** | **IC** | **September - November** |
| **4.** | **Unit 4: Translocation in the phloem**<br>Experimental evidence in support of phloem as the site of sugar translocation; pressure flow model; phloem loading and unloading; source- sink relationship. | **8** | **MD** | **September - November** |
| **5.** | **Unit 5: Plant growth regulators**<br>Discovery, chemical nature (basic structure), bioassay and molecular aspects of the physiological roles of auxin, gibberellins, cytokinin, abscisic acid, ethylene. Brief account of Brassinosteroids | **14** | **RSD** | **July - August** |

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| | and Jasmonic acid. | | | |
| **6.** | **Unit 6: Physiology of flowering**<br>Photoperiodism, flowering stimulus, florigen concept, vernalization, seed dormancy and germination. | **6** | **MD** | **July - August** |
| **7.** | **Unit 7: Phytochrome , crytochromes and phototropins**<br>Discovery, chemical nature, role in photomorphogenesis, low energy responses (LER) and high irradiance responses (HIR), mode of action. | **6** | **MD** | **September - November** |

## Practical Course Code: BOTACOR12P

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| **1.** | 1. Determination of osmotic potential of plant cell sap by plasmolytic method. | | **RA** | **July - August** |
| **2.** | 2. Determination of water potential of given tissue (potato tuber) by weight method. | | **RA** | **July - August** |
| **3.** | 3. Study of the effect of wind and light on the rate of transpiration in Colocasia leaf. | | **RA** | **July - August** |
| **4.** | 4. Calculation of stomatal index and stomatal frequency from the two surfaces of leaves of a mesophyte (Basella) and xerophytes (Ficus benghalensis). | | **RA** | **July - August** |
| **5.** | 5. To determine the proportion of area covered by stomatal pore with respect to the total leaf area Page 33 of 81 for mesophyte (Basella) and xerophyte (Ficus benghalensis) (both surfaces). | | **RA** | **July - August** |
| **6.** | 6. To study the phenomenon of epigeal and hypogeal seed germination with respect to light (gramand corn seeds). | | **RSD** | **September - November** |
| **7.** | 7. To study the effect of different concentrations of IAA on Avena coleoptile elongation (IAAbioassay). | | **RSD** | **September - November** |
| **8.** | 8. To study the induction of amylase activity in germinating wheat/barley grains. | | **RSD** | **September - November** |
| **9.** | Demonstration experiments<br>1. To demonstrate suction due to transpiration. | | **RA** | **September - November** |
| **10.** | 2. Fruit ripening/rooting from cuttings (demonstration). | | **RSD** | **September - November** |
| **11.** | 3. Bolting experiment/Avena coleptile bioassay (demonstration). | | **RSD** | **September - November** |

## Discipline Specific Elective Courses Discipline Specific Elective Natural Resource Management

## COURSE CODE: BOTADSE01T

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 1. | **Unit 1: Natural resources** Definition and types. | 2 | MD | July - August |
| 2. | **Unit 2: Sustainable utilization** Concept, approaches (economic, ecological and socio-cultural). | 8 | MD | July - August |
| 3. | **Unit 3: Land** Utilization (agricultural, pastoral, horticultural, silvicultural); Soil degradation and management. | 8 | TM | July - August |
| 4. | **Unit 4: Water** Fresh water (rivers, lakes, groundwater, aquifers, watershed); Marine; Estuarine; Wetlands; Threats and management strategies | 8 | IC | July - August |
| 5. | **Unit 5: Biological Resources** Biodiversity-definition and types; Significance; Threats; Management strategies; Bioprospecting; IPR; CBD; National Biodiversity Action Plan. | 12 | TM + RSD | September - November |
| 6. | **Unit 6: Forests** Definition, Cover and its significance (with special reference to India); Major and minor Forest products; Depletion; Management. | 6 | MK | July - August |
| 7. | **Unit 7: Energy** Renewable and non-renewable sources of energy | 6 | RA | July - August |
| 8. | **Unit 8: Contemporary practices in resource management** EIA, GIS, Participatory Resource Appraisal, Ecological Footprint with emphasis on carbon footprint, Resource Accounting; Waste management. | 8 | IC +MK + RA | September - November |
| 9. | **Unit 9:** National and international efforts in resource management and conservation IUCN, UNESCO,UNEP, IBIN, WBBDB, BSI, ZSI | 4 | MD | September - November |

## Practical COURSE CODE: BOTADSE01P

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| | 1. Estimation of solid waste generated by a domestic system (biodegradable and non biodegradable). | | **IC + MK + RA** | **July - August** |
| | 2. Collection of data on vegetation covers of specific area | | **MK** | **July - August** |
| | 3. Measurement of dominance of woody species by DBH (diameter at breast height) method. | | **MK** | **September - November** |
| | 4. Calculation and analysis of ecological footprint. | | **IC + MK + RA** | **September - November** |

## Discipline Specific Elective Horticultural Practices and Post-Harvest Technology COURSE CODE: BOTADSE02T (Credits: Theory-4, Practical-2) THEORY

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| | **Unit 1: Introduction**<br>Scope and importance, Branches of horticulture; Role in rural economy and employment generation; Importance in food and nutritional security; Urban horticulture and ecotourism. | **4** | **TM** | **July - August** |
| | **Unit 2: Ornamental plants**<br>Types, classification (annuals, perennials, climbers and trees); Identification and salient features of some ornamental plants [rose, marigold, gladiolus, carnations, orchids, poppies, gerberas, tuberose, sages, cacti and succulents (Opuntia, Agave and Spurges)] Ornamental flowering trees (Indian laburnum, gulmohar, Jacaranda, Lagerstroemia, fishtail and areca palms, semul, Coral tree). | **4** | **MD** | **July - August** |
| | **Unit 3: Fruit and vegetable crops**<br>Production, origin and distribution; Description of plants and their economic products; Management and marketing of vegetable and fruit crops; Identification of some fruits and vegetable varieties (citrus, banana, mango, chillies and cucurbits). | **4** | **IC** | **July - August** |

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| | **Unit 4: Horticultural techniques**<br>Application of manure, fertilizers, nutrients and PGRs; Weed control; Biofertilizers, biopesticides; Irrigation methods (drip irrigation, surface irrigation, furrow and border irrigation); Hydroponics; Propagation Methods: asexual (grafting, cutting, layering, budding), sexual (seed propagation), Scope and limitations. | **8** | **MK** | **July - August** |
| | **Unit 5: Landscaping and garden design**<br>Planning and layout (parks and avenues); gardening traditions - Ancient Indian, European, Mughal and Japanese Gardens; Urban forestry; policies and practices. | **6** | **MD** | **September - November** |
| | **Unit 6: Floriculture**<br>Cut flowers, bonsai, commerce (market demand and supply); Importance of flower shows and exhibitions. | **6** | **TM** | **September - November** |
| | **Unit 7: Post-harvest technology**<br>Importance of post harvest technology in horticultural crops; Evaluation of quality traits; Harvesting and handling of fruits, vegetables and cut flowers; Principles, methods of preservation and processing; Methods of minimizing loses during storage and transportation; Food irradiation - advantages and disadvantages; food safety. | **10** | **RSD** | **September - November** |
| | **Unit 8: Disease control and management**<br>Field and post-harvest diseases; Identification of deficiency symptoms; remedial measures and Page 41 of 81 nutritional management practices; Crop sanitation; IPM strategies (genetic, biological and chemical methods for pest control); Quarantine practices; Identification of common diseases and pests of ornamentals, fruits and vegetable crops. | **8** | **IC + RSD** | **September - November** |
| | **Unit 9: Horticultural crops - conservation and management**<br>Documentation and conservation of germplasm; Role of micropropagation and tissue culture techniques; Varieties and cultivars of various horticultural crops; IPR issues; National, international and professional societies and sources of information on horticulture. | **10** | **RA** | **September - November** |

## Practical COURSE CODE: BOTADSE02P

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| **1.** | 1. Field visits to gardens, standing crop sites, nurseries, vegetable gardens and horticultural fields at Agri-Horticultural Society/ Agricultural Research stations/ State/Central Agricultural Universities/ IARI or other suitable locations. | | **ALL TEACHERS** | **As and when possible** |

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| **2.** | 2. Identification only (not work out) of ornamental and horticultural plants based on theoretical syllabus. | | **MK** | **September - November** |

## SEMESTER III

## Core Course V: Morphology and Anatomy of Angiosperms Course Code: BOTACOR05T (Credits: Theory-4, Practical-2) THEORY

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| **1.** | **Unit 1: Inflorescence** – Types with examples, concept of advanced and primitive types. | **2** | **MK / RSD** | By last week of September |
| **2.** | **Unit 2: Flower** – Types with examples, aestivation, floral parts – various types of cohesion and adhesion with examples; carpel-types, advance and primitive ones and placentations | **5** | **MK / RSD** | By last week of September |
| **3.** | **Unit 3: Fruits and Seeds** – types with examples | **3** | **MK / RSD** | By last week of September |
| **4.** | **Unit 4: Introduction and scope of Plant Anatomy** Applications in systematics, forensics and pharmacognosy. | **3** | **MK / RSD** | By last week of September |
| **5.** | **Unit 5: Structure and Development of Plant Body** Internal organization of plant body; the three tissue systems, types of cells and tissues | **5** | **MK / RSD** | By last week of September |
| **6.** | **Unit 6: Tissues** Classification of tissues; simple and complex tissues (no phylogeny); cytodifferentiation of Page 17 of 81 tracheary elements and sieve elements; pits and plasmodesmata; ergastic substances; hydathodes, cavities, lithocysts and laticifers. | **10** | **MK / RSD** | By last week of November |
| **7.** | **Unit 7: Apical meristems** | **12** | **MK /** | By last week of |

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| | Evolution of the concept of organization of the shoot apex (Apical cell theory, Histogen theory, Tunica Corpus theory) types of vascular bundles; structure of dicot and monocot stem; structure of dicot and monocot leaf, Kranz anatomy; organization of root apex (Apical cell theory, Histogen theory, Korper-Kappe theory); quiescent centre; root cap; structure of dicot and monocot root. | | **RSD** | November |
| **8.** | **Unit 8: Vascular Cambium and Wood**<br>Structure, function and seasonal activity of cambium; secondary growth in root and stem ; types of rays and axial parenchyma; sapwood and heartwood; ring and diffuse porous wood; early and late wood, tyloses; development and composition of periderm, rhytidome and lenticels. | **12** | **MK / RSD** | By last week of November |
| **9.** | **Unit 9: Adaptive and Protective Systems**<br>Epidermal tissue system, cuticle, trichomes (uni and multicellular, glandular and nonglandular, two examples of each), stomata (classification); adcrustation and incrustation; anatomical adaptations of xerophytes and hydrophytes. | **8** | **TM** | By last week of November |

## Practical Course Code: BOTACOR05P

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| **1.** | Study of anatomical details of the following through permanent slides/temporary stain mounts/ macerations/museum specimens with the help of suitable representatives.<br>a. Apical meristem of root, shoot and vascular cambium. b. Distribution and types of parenchyma, collenchyma and sclerenchyma.<br>c. Xylem: Tracheary elements- tracheids, vessel elements; thickenings; perforation plates; Xylem fibres(permanent slides).<br>d. Wood: ring porous; diffuse porous; tyloses; heart and sapwood (permanent slides).<br>e. Phloem: Sieve tubes-sieve plates; companion cells; phloem fibres. (permanent slides).<br>f. Epidermal system: cell types, stomata types; trichomes: non-glandular and glandular (permanent slides)<br>g. Periderm; lenticels; C4 leaves (Kranz anatomy); Secretory tissues: cavities, lithocysts Page 18 of 81 and laticifers | | **TM** | By last week of September |
| **2.** | 2. Workout and preparation of permanent slides by following double staining method.<br>a. Root anatomy (monocot – Orchid), dicot (Sunflower); secondary growth.<br>b. Stem anatomy (monocot- maize), (dicot – Cucurbita) - primary and secondary growth. | | **RSD** | By last week of November |

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| | c. Leaf: isobilateral (Tube rose), dorsiventral (Mango), d. Adaptive anatomy: xerophytes (Nerium leaf), hydrophytes (Nymphaea petiole). | | | |

## Core Course VI: Economic Botany Course Code: BOTACOR06T (Credits: Theory-4, Practical-2) THEORY

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 1. | **Unit 1: Origin of Cultivated Plants**<br>Concept of centres of origin, their importance with reference to Vavilov's work; examples of major plant introductions; crop domestication and loss of genetic diversity. | 6 | TM | By last week of September |
| 2. | **Unit 2: Cereals**<br>Wheat and rice- origin, morphology, cultivation & uses; brief account on millets | 6 | TM | By last week of September |
| 3. | **Unit 3: Legumes**<br>Origin, morphology and uses of Chick pea & Pigeon pea; importance to man and ecosystem. | 6 | TM | By last week of September |
| 4. | **Unit 4: Sources of sugars and starches**<br>Morphology and processing of sugarcane; products and by-products of sugarcane industry. Potato – morphology, propagation & uses. | 4 | TM | By last week of September |
| 5. | **Unit 5: Spices**<br>Listing of important spices, their family and part used. Economic importance with special Page 19 of 81 reference to fennel, saffron, clove and black pepper. | 6 | TM | By last week of September |
| 6. | **Unit 6: Beverages**<br>Tea and coffee - morphology, processing & uses. | 4 | IC | By last week of September |
| 7. | **Unit 7: Sources of oils and fats**<br>General description, classification, extraction, their uses and health implications of groundnut, linseed, soybean, mustard and coconut (botanical name, family & uses). Essential oils - Santalum and Eucalyptus: general account, extraction methods, comparison with fatty oils & their uses. | 10 | TR | By last week of September |
| 8. | **Unit 8: Natural Rubber**<br>Para-rubber, tapping, processing and uses | 3 | TR | By last week of September |
| 9. | **Unit 9: Drug yielding plants**<br>Therapeutic and habit-forming drugs with special reference to Cinchona, Digitalis, Papaver and Cannabis; Tobacco - Morphology, processing, uses and health hazards. | 8 | TR | By last week of September |
| 10. | **Unit 10: Timber plants**<br>General account with special reference to teak, sal and pine | 3 | TR | By last week of September |

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| | **Unit 11: Fibers** Classification based on the origin of fibers; Cotton and Jute - morphology, extraction and uses. | **4** | **IC** | |

## Practical Course Code: BOTACOR06P

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| **1.** | 1. Cereals: Wheat : habit sketch, L. S/T.S. grain, starch grains – type; micro-chemical tests – iodine spot test. Rice: habit sketch, study of paddy and grain, starch grains– type; micro-chemical tests – iodine spot test. | | **TM** | By last week of September |
| **2.** | 2.Legumes: Soybean and Ground nut: habit sketch, fruit, seed structure and micro-chemical tests (Millon test- Soyabean, Sudan IV test- Groundnut). | | **TM** | By last week of September |
| **3.** | 3.Sources of sugars and starches: Sugarcane - habit sketch; cane juice- micro-chemical tests (Molisch test). Potato - habit sketch, tuber morphology, T.S. of tuber to show localization of starch grains, w.m. starch grains, micro-chemical tests (Iodine test) | | **TM** | By last week of September |
| **4.** | 4. Spices: Black pepper, Fennel and Clove - Demonstration, habit sketch and comments | | **MK** | By last week of September |
| **5.** | Beverages: Tea leaf and coffee bean - extraction (Biochemical Tests for Tannin and Alkaloid) and comments. | | **MK** | By last week of September |
| **6.** | Sources of oils and fats: Coconut - kernel and Mustard - seeds: tests for fats (Sudan IVtest) | | **TM** | By last week of September |
| **7.** | 7. Essential oil-yielding plants: Habit sketch of Santalum and Eucalyptus (specimens /photographs). | | **MK** | By last week of November |
| **8.** | 8. Rubber: specimen, photograph/model of tapping, samples of rubber products. | | **TM** | By last week of November |
| **9.** | 9. Drug-yielding plants: Specimens of Digitalis, Papaver and Cannabis. | | **TM** | By last week of November |
| **10.** | 10. Tobacco: specimen and products of Tobacco. | | **TM** | By last week of November |
| **11.** | 11.Woods: Tectona, Pinus and Shorea; Specimen; Section of young stem specimen | | **TM** | By last week of November |
| **12.** | 12. Fiber-yielding plants: Cotton – specimen whole mount of fiber and test for cellulose – general test with benzene and/or aniline acetate test. Jute - transverse section of stem, test for lignin – | | **TM** | By last week of November |

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| | phloroglucinol test on transverse section of stem and fiber. | | | |

## Core Course VII: Genetics Course Code: BOTACOR07T (Credits: Theory-4, Practical-2) THEORY

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 1. | **Unit 1: Mendelian genetics and its extension**<br>Mendelism: Principles of inheritance; chromosome theory of inheritance; autosomes and sex chromosomes; probability and pedigree analysis; incomplete dominance and codominance; Page 21 of 81 multiple alleles, lethal alleles, epistasis, pleiotropy, recessive and dominant traits, penetrance and expressivity, numericals; polygenic inheritance. | 16 | IC / RA | By last week of September |
| 2. | **Unit 2: Extrachromosomal Inheritance**<br>Chloroplast mutation: Variegation in Four o'clock plant; mitochondrial mutations in yeast; maternal effects-shell coiling in snail; infective heredity- kappa particles in Paramecium. | 6 | IC / RA | By last week of September |
| 3. | **Unit 3: Linkage, crossing over and chromosome mapping**<br>Linkage and crossing over-cytological basis of crossing over; recombination frequency, two factor and three factor crosses; interference and coincidence; numericals based on gene mapping; sex Linkage | 12 | IC / RA | By last week of September |
| 4. | **Unit 4: Variation in chromosome number and structure**<br>Deletion, duplication, inversion, translocation, position effect, euploidy and aneuploidy | 8 | IC / RA | By last week of September |
| 5. | **Unit 5: Gene mutations**<br>Types of mutations; molecular basis of mutations; mutagens – physical and chemical (Base analogs, deaminating, alkylating and intercalating agents); detection of mutations: CIB method. Role of transposons in mutation; DNA repair mechanisms. | 6 | IC / RA | By last week of September |
| 6. | **Unit 6: Fine structure of gene**<br>Classical vs molecular concepts of gene; Cis-Trans complementation test for functional allelism; structure of phage T4, rII locus. | 6 | IC / RA | By last week of September |
| 7. | **Unit 7. Population and Evolutionary Genetics**<br>Allele frequencies, genotype frequencies, Hardy-Weinberg Law, role of natural selection, mutation, genetic drift. Genetic variation and speciation. | 6 | IC / RA | By last week of September |

## Practical Course Code: BOTACOR07P

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| **1.** | 1a. Mitosis through temporary squash preparation (Allium cepa, Lens esculentus, Aloe vera).<br>b. Meiosis through temporary smear preparation (Allium cepa, Rhoeo discolour). | | **IC / RA** | By last week of September |
| **2.** | 2. Mendel's laws through seed ratios(3:1, 1:1, 9:3:3:1, 1:1:1:1). Laboratory exercises in probability and chi-square. | | **IC / RA** | By last week of September |
| **3.** | 3. Chromosome mapping using point test cross data. | | **IC / RA** | By last week of September |
| **4.** | 4. Incomplete dominance and gene interaction through seed ratios (9:7, 9:6:1, 13:3, 15:1, 12:3:1, 9:3:4). | | **IC / RA** | By last week of September |
| **5.** | 5. Study of aneuploidy: Down's, Klinefelter's and Turner's syndromes (demonstration through pictures). | | **IC / RA** | By last week of September |
| **6.** | 6. Photographs and permanent slides showing translocation ring, Laggards and Inversion Bridge, Multipolarity, Sticky Bridge, Fragmentation and Pollen mitosis. | | **IC / RA** | By last week of November |
| **7.** | 7. Study of human genetic traits: Sickle cell anemia, xeroderma pigmentosum, albinism, red-green colour blindness, widow's peak, rolling of tongue, Hitchhiker's thumb and attached ear lobe. (demonstration through pictures) | | **IC / RA** | By last week of November |

## SEMESTER – I

# Course I: Phycology and Microbiology Course Code: BOTACOR01T

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 15. | **Unit 1: Introduction to microbial world**<br>Primary concept of microorganism – 3 domain concept; Economic importance of viruses with reference to vaccine production, role in research, medicine and diagnostics and as causal organisms of plant diseases. Economic importance of bacteria with reference to their role in agriculture and industry (fermentation and medicine). | 7 | TM / RSD | By mid of August<br>July-August<br>July-August<br>July-August<br>Sept- Nov<br>Sept- Nov |
| 16. | **Unit 2: Viruses**<br>Physiochemical and biological characteristics; general structure with special reference to viroids and prions; groups of virus, DNA virus (T-phage, λ phage), lytic and lysogenic cycle, RNA virus (TMV) – physico-chemical characteristics and its mode of multiplicat | 7 | TM / RSD | By August third week |
| 17. | **Unit 3: Bacteria**<br>General characteristics,Microbial nutrition, growth and metabolism.Types-archaebacteria, eubacteria, and mycoplasma; Cell structure; Nutritional types; Reproduction-vegetative, asexual and recombination (conjugation, transformation and transduction) | 7 | RA | By August third week |
| 18. | **Unit 4: Algae**<br>General characteristics; ecology and distribution; range of thallus organization; cell structure and components; cell wall, pigment system, reserve food (of only groups represented in the syllabus), flagella and flagellar roots; methods of reproduction; Classification; criteria, evolutionary classification of Lee (only up to groups); Role of algae in the environment, agriculture, biotechnology and industry. | 11 | TM | By August third week |
| 19. | **Unit 5: Cyanophyta and Xanthophyta**<br>Ecology and occurrence; Range of thallus organization; Cell structure; Reproduction, Morphology and life-cycle of Nostoc and Vaucheria. | 8 | IC / MK | By August third week |
| 20. | **Unit 6: Chlorophyta and Charophyta**<br>General characteristics; Occurrence; Range of thallus organization; Cell structure; | 8 | MK / IC | By August third week<br>Sept- Nov |

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| | Reproduction. Morphology and life-cycles of Volvox, Oedogonium,Chara. Evolutionary significance of Prochloron. | | | |
| 21. | **Unit 7: Phaeophyta and Rhodophyta**<br>Characteristics; Occurrence; Range of thallus organization; Cell structure; Reproduction. Morphology and life-cycles of Ectocarpus, Fucus and Polysiphonia. | 12 | IC | By August third week |

## Practical Course Code: BOTACOR01P

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 13. | Microbiology<br>1. Electron micrographs/Models of viruses – T-Phage and TMV, Line drawings/ Photographs of Lytic and Lysogenic Cycle. | | RA / RSD | By September middle |
| 14. | Types of Bacteria to be observed from temporary/permanent slides/photographs. Electron micrographs of bacteria, binary fission, endospore, conjugation, root nodule. | | RA / RSD | By September middle |
| 15. | Demonstration of the preparation of media, sterilization and sub culturing | | RA / RSD | By September middle |
| 16. | Gram staining; Endospore staining with malachite green using the (endospores taken from soil bacteria). | | RA / RSD | By September middle |
| 17. | Phycology 1. Study of vegetative and reproductive structures of Nostoc,Volvox, Oedogonium, Chara, Vaucheria, Ectocarpus, Fucus and Polysiphonia,through temporary preparations and permanent slides.Procholoron through electron micrographs. | | TM / MK | By September middle |
| 18. | Illustration through drawing prism with magnification of vegetative and reproductive structure ofOedogonium, Chara,Vaucheria and Polysiphonia. | | TM / MK | By September middle |

# Core Course II: Biomolecules and Cell Biology Course Code: BOTACOR02T

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 15. | **Unit 1: Biomolecules**<br>Types and significance of chemical bonds; structure and properties of water; pH and buffers. Carbohydrates: Nomenclature and classification; monosaccharides ; disaccharides; oligosaccharides polysaccharides and sugar derivatives. Lipids: Definition and major classes of storage and structural lipids; fatty acids structure and functions; essential fatty acids; triacylglycerols structure, functions and properties; phosphoglycerides. Proteins: Structure of amino acids; levels of protein structure-primary, secondary, tertiary and quarternary; protein denaturation and biological roles of proteins. Nucleic acids: Structure of nitrogenous bases; structure and function of nucleotides; types of nucleic acids; structure of A, B, Z types of DNA; types of RNA; structure of tRNA. | 20 | TM / TR | By Early October |
| 16. | **Unit 2: Bioenergenetics**<br>Laws of thermodynamics, concept of free energy, endergonic and exergonic reactions, coupled reactions, redox reactions. ATP structure, its role as a energy currency molecule. | 4 | RA | By Early October |
| 17. | **Unit 3: Enzymes**<br>Structure of enzyme, holoenzyme, apoenzyme, cofactors, coenzymes and prosthetic group; classification of enzymes; features of active site, substrate specificity, mechanism of action (activation energy, lock and key hypothesis, induced - fit theory), Michaelis – Menten equation and Lineweaver-Burk Plot, enzyme inhibition and factors affecting enzyme activity. | 6 | TR | By Early October |
| 18. | **Unit4: The cell**<br>Cell as a unit of structure and function; characteristics of prokaryotic and eukaryotic cells; origin of eukaryotic cell (Endosymbiotic theory). | 4 | TM | By Early October |
| 19. | **Unit 5: Cell wall and plasma membrane**<br>Chemistry, structure and function of plant cell wall;overview of membrane function; fluid mosaic model; chemical composition of membranes; membrane transport – passive, active and facilitated transport, endocytosis and exocytosis. | 4 | TM | By Early October |
| 20. | **Unit 6: Nucleus**: Structure - nuclear envelope, nuclear pore complex, nuclear lamina, molecular organization of chromatin; nucleolus. Cytoskeleton: Role and structure of | 16 | | By Early October |

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| | microtubules, microfilaments and intermediary filament. Chloroplast, mitochondria and peroxisomes: Structural organization; function; semiautonomous nature of mitochondria and chloroplast. Endomembrane system: Endoplasmic reticulum – structure, targeting and insertion of proteins in the ER, protein folding, processing; smooth ER and lipid synthesis, export of proteins and lipids; Golgi apparatus – organization, protein glycosylation, protein sorting and export from Golgi apparatus; lysosomes. | | | |
| 21. | **Cell division**<br>Phases of eukaryotic cell cycle, mitosis and meiosis; regulation of cell cycle - checkpoints, roleof protein kinases | 6 | IC/MK/RA | By November first week |

## Practical Course Code: BOTACOR02P

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 9. | 1. Qualitative tests for carbohydrates, reducing sugars, non-reducing sugars, lipids and proteins | | RA / TR | By Early October |
| 10. | Study of plant cell structure with the help of epidermal peel mount of Onion/Rhoeo/Crinum | | RA / TR | By Early October |
| 11. | 3. Measurement of cell size by the technique of micrometry. | | RA / TR | By Early October |
| 12. | . Counting the cells per unit volume with the help of haemocytometer. (Yeast/pollen grains) | | RA / TR | By November first week |
| 13. | . Study of cell and its organelles with the help of electron micrographs. | | RA / TR | By November first week |
| 14. | Cytochemical staining of: DNA by Feulgen. | | RA / TR | By November first week |
| 15. | Study the effect of organic solvent and temperature on membrane permeability. | | RA / TR | By November first week |

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| 16. | Study of the different stages of mitosis and meiosis (from permanent slides). | | RA / TR | By November first week |

# Semester – VI

# BOTACOR13T

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| **1.** | **Unit 1: Concept of metabolism**<br>Introduction, anabolic and catabolic pathways, regulation of metabolism, enzymes - mechanism and factors, kinetics, role of regulatory enzymes (allosteric, covalent modulation and isozymes), | **6** | **RSD** | **March - April** |

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| | enzyme inhibition. | | | |
| **2.** | **Unit 2: Carbon assimilation**<br>Photosynthetic pigments, role of photosynthetic pigments (chlorophylls and accessory pigments), antenna molecules and reaction centres, photochemical reactions, photosynthetic electron transport, PSI, PSII, Q cycle, $CO_2$ reduction,photorespiration,C4pathways; Crassulacean acid metabolism; factors affecting $CO_2$ reduction. | **14** | **MK** | **March - April** |
| **3.** | **Unit 3: Carbohydrate metabolism**<br>Synthesis and catabolism of sucrose and starch. | **2** | **RA** | **March - April** |
| **4.** | **Unit 4: Carbon Oxidation**<br>Glycolysis, fate of pyruvate, regulation of glycolysis, oxidative pentose phosphate pathway, oxidative decarboxylation of pyruvate, regulation of PDH, NADH shuttle; TCA cycle, amphibolic role, anaplerotic reactions, regulation of the cycle, mitochondrial electron transport, oxidative phosphorylation, cyanide-resistant respiration, factors affecting respiration. | **10** | **IC** | **March - April** |
| **5.** | **Unit 5: ATP-Synthesis**<br>Mechanism of ATP synthesis, substrate level phosphorylation, chemiosmotic mechanism (oxidative and photophosphorylation), ATP synthase; role of uncouplers. | **8** | **MD** | **May - June** |
| **6.** | **Unit 6: Lipid metabolism**<br>Synthesis and breakdown of triglycerides, β-oxidation, glyoxylate cycle, gluconeogenesis and its role in mobilisation of lipids during seed germination, α oxidation. | **8** | **RSD** | **May - June** |
| **7.** | **Unit 7: Nitrogen metabolism**<br>Nitrate assimilation, biological nitrogen fixation (examples of legumes and non-legumes); Page 35 of 81 Physiology and biochemistry of nitrogen fixation; ammonia assimilation and transamination | **8** | **TM** | **May - June** |
| **8.** | **Unit 8: Mechanisms of signal transduction**<br>Receptor-ligand interactions; G protein; second messenger concept, calcium calmodulin, MAP kinase cascade. | **4** | **TM** | **May - June** |

# BOTACOR13P

| S.L. | TOPICS | Number | Teacher' | When to be |
|---|---|---|---|---|

| NO. | | of lectures | s name | taught |
|---|---|---|---|---|
| 1. | Chemical separation of photosynthetic pigments. | | MD | March - April |
| 2. | Demonstration of absorption spectrum of photosynthetic pigments (spectrophotometer). | | MD | March - April |
| 3. | To study the effect of light intensity on the rate of photosynthesis. | | MK | March - April |
| 4. | Effect of carbon dioxide on the rate of photosynthesis (volume measurement) | | MK | March - April |
| 5. | To compare the rate of respiration in different parts of a plant. | | TM | May - June |
| 6. | To demonstrate activity of Nitrate reductase in germinating leaves of different plant sources. | | RSD | May - June |
| 7. | To study the activity of lipases in germinating oilseeds. | | TM + RSD | May - June |

# BOTACOR14T

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 1. | **Unit 1: Plant Tissue Culture**<br>Historical perspective; composition of media; nutrient and hormone requirements (role of vitamins and hormones); totipotency; organogenesis; embryogenesis (somatic and zygotic); protoplast isolation, culture and fusion; Tissue culture applications (micropropagation, androgenesis, virus elimination, secondary metabolite production, haploids, triploids and hybrids; cryopreservation; germplasm conservation), hardening of the tissue culture raised plants for field plantation. | 16 (6+10) | MD + RA | March - April |
| 2. | **Unit 2: Recombinant DNA technology**<br>Restriction Endonucleases (Types I-IV, biological role and application); Restriction mapping (linear and circular); cloning vectors: prokaryotic (pBR322, Ti plasmid, BAC); lambda phage, cosmid; eukaryotic vectors (YAC). | 12 | MD +MK | March - April |
| 3. | **Unit 3: Gene Cloning**<br>Recombinant DNA, bacterial transformation and selection of recombinant clones, PCR-mediated gene cloning; gene construct; construction of genomic and cDNA libraries, screening DNA libraries to obtain gene of interest by genetic selection; complementation, colony hybridization; | 10 | IC | March - April |

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| | PCR. | | | |
| **4.** | **Unit 4: Methods of gene transfer**<br>Agrobacterium-mediated direct gene transfer by electroporation, microinjection,Microprojectile bombardment; selection of transgenics– selectable marker and reporter genes (luciferase, GUS, GFP). | **8** | **MD + RSD** | **May - June** |
| **5.** | **Unit 5: Applications of Biotechnology**<br>Pest resistant (Bt-cotton); herbicide resistant plants (round up ready soybean); transgenic crops with improved quality traits (Golden rice); improved horticultural varieties (Moondust carnations); role of transgenics in bioremediation (Superbug); edible vaccines; industrial enzymes (aspergillase, protease, lipase); genetically engineered products–human growth hormone; humulin; biosafety concerns. | **14** | **TM** | **May - June** |

# BOTACOR14P

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| **1.** | (a) Preparation of MS medium.<br>(b) Process of in vitro sterilization and inoculation methods by using differentexplants (leaf, nodal bud and seeds of tobacco, Datura, Brassica) | | **MD** | **March - April** |
| **2.** | Study of anther, embryo and endosperm culture, micropropagation, somatic embryogenesis & artificial seeds through photographs. | | **MD** | **March - April** |
| **3.** | Construction of restriction map of circular and linear DNA from the data provided. | | **MK** | **March - April** |
| **4.** | Study of methods of gene transfer through photographs: Agrobacterium-mediated, direct gene transfer by electroporation, microinjection, microprojectile bombardment. | | **MK** | **May - June** |
| **5.** | Study of steps of genetic engineering for production of Bt cotton, Golden rice, Flavr Savr tomato through photographs. | | **TM** | **May - June** |
| **6.** | Isolation of genomic DNA and its gel electrophoresis. | | **RSD** | **May - June** |

# BOTADSE04T

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 1. | **Unit 1: Imaging and related techniques**<br>Principles of microscopy; Light microscopy; Fluorescence microscopy; Confocal microscopy; Use of fluorochromes: (a) Flow cytometry (FACS); (b) Applications of fluorescence microscopy: Chromosome banding, FISH, chromosome painting; Transmission and Scanning electron microscopy – sample preparation for electron microscopy, cryofixation, negative staining, shadow casting, freeze fracture, freeze etching. | 15 | IC | March - April |
| 2. | **Unit 2: Cell fractionation**<br>Centrifugation: Differential and density gradient centrifugation, sucrose density gradient, CsCl2 gradient, analytical centrifugation, ultracentrifugation, marker enzymes. | 8 | TM | March - April |
| 3. | **Unit 3: Radioisotopes**<br>Use in biological research, auto-radiography, pulse chase experiment. | 4 | MK | March - April |
| 4. | **Unit 4: Spectrophotometry**<br>Principle and its application in biological research. | 4 | MK | March - April |
| 5. | **Unit 5: Chromatography**<br>Principle; Paper chromatography; Column chromatography, TLC, GLC, HPLC, Ion-exchange chromatography; Molecular sieve chromatography; Affinity chromatography. | 8 | TM | May - June |
| 6. | **Unit 6: Characterization of proteins and nucleic acids**<br>Mass spectrometry; X-ray diffraction; X-ray crystallography; Characterization of proteins and nucleic acids; Electrophoresis: AGE, PAGE, SDS-PAGE | 6 | RA | May - June |
| 7. | **Unit 7:Biostatistics**<br>Statistics, data, population, samples, parameters; Representation of Data: Tabular, Graphical; Measures of central tendency: Arithmetic mean, mode, median; Measures of dispersion: Range, mean deviation, variation, standard deviation; Chi-square test for goodness of fit. | 15 | MD + RSD | May - June |

# BOTADSE04P

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
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|---|---|---|---|---|
| **1.** | Study of Blotting techniques: Southern, Northern and Western, DNA fingerprinting, DNA sequencing, PCR through photographs. | | **RSD** | **March - April** |
| **2.** | To separate nitrogenous bases by paper chromatography | | **TM** | **March - April** |
| **3.** | To separate sugars by thin layer chromatography. | | **TM** | **March - April** |
| **4.** | To estimate protein concentration through Lowry's methods. | | **RSD** | **March - April** |
| **5.** | To separate proteins using PAGE. | | **RA** | **May - June** |
| **6.** | To separate DNA (marker) using AGE | | **RA** | **May - June** |
| **7.** | Study of different microscopic techniques using photographs/micrographs (freeze fracture, freeze etching, negative staining, positive staining, fluorescence and FISH). | | **MK** | **May - June** |
| **8.** | Preparation of permanent slides (double staining)- any material with saffranin and light green stain. | | **MK** | **May - June** |

# BOTADSE06T

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| **1.** | **Unit 1:Biostatistics**<br>Definition - statistical methods - basic principles. Variables - measurements, functions, limitations and uses of statistics. | **12** | **MD** | **March - April** |
| **2.** | **Unit 2:Collection of data primary and secondary**<br>Types and methods of data collection procedures - merits and demerits. Classification - tabulation and presentation of data - sampling methods. | **12** | **MD** | **March - April** |
| **3.** | **Unit 3:Measures of central tendency**<br>Mean, median, mode, geometric mean - merits & demerits. Measures of dispersion - range, standard deviation, mean deviation, quartile deviation - merits and demerits; Co- efficient of variations. | **14** | **MD + RSD** | **March - April** |
| **4.** | **Unit 4:Correlation**<br>Types and methods of correlation, regression, simple regression equation, fitting prediction, similarities and dissimilarities of correlation and regression | **12** | **MD** | **May - June** |
| **5.** | **Unit 5:Statistical inference**<br>Hypothesis - simple hypothesis - student 't' test - chi square test | **10** | **RSD** | **May - June** |

# BOTADSE06P

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 1. | Calculation of mean, standard deviation and standard error. | | MD | March - April |
| 2. | Calculation of correlation coefficient values and finding out the probability | | MD | May - June |
| 3. | Calculation of 'F' value and finding out the probability value for the F value. | | RSD | May - June |

# Semester – IV

# BOTACOR08T

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 1. | **Unit 1: Nucleic acids**:<br>Carriers of genetic information DNA as the carrier of genetic information (Griffith's, Hershey & Chase,Avery, McLeod & McCarty, Fraenkel-Conrat's experiment). | 4 | IC | March - April |
| 2. | **Unit 2. The Structures of DNA and RNA / Genetic Material**<br>DNA Structure: Watson and Crick - historic perspective, DNA structure, salient features of double helix, types of DNA, types of genetic material, denaturation and renaturation, cot curves; organization of DNA- prokaryotes, viruses, eukaryotes.RNA structure; organelle DNA - mitochondria and chloroplast DNA. The nucleosome,Chromatin structure- euchromatin, heterochromatin- constitutive and facultative heterochromatin. | 10 | IC | March - April |
| 3. | **Unit 3: The replication of DNA**<br>Chemistry of DNA synthesis (Kornberg's discovery); general principles – bidirectional, semi conservative and semi discontinuous replication, RNA priming; various models of DNA | 4 | MD | March - April |

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| | replication, including rolling circle, θ (theta) mode of replication, replication of linear ds-DNA, replication of the 5'end of linear chromosome; Enzymes involved in DNA replication. | | | |
| **4.** | **Unit 4: Central dogma and genetic code**<br>Key experiments establishing-the central dogma (adaptor hypothesis and discovery of mRNA template), Genetic code: salient features and deciphering (triplete binding assay). | **10** | **RA** | **May - June** |
| **5.** | **Unit 5: Transcription**<br>Transcription in prokaryotes and eukaryotes. Principles of transcriptional regulation (Operon concept). Prokaryotes: regulation of lactose metabolism and tryptophan synthesis in E.coli. Eukaryotes: transcription factors, heat shock proteins, steroids and peptide hormones; Gene silencing | **10** | **RA + RSD** | **May - June** |
| **6.** | **Unit 6: Processing and modification of RNA**<br>Split genes-concept of introns and exons, removal of introns, spliceosome machinery, splicing Page 24 of 81 pathways, group I and group II intron splicing, alternative splicing eukaryotic mRNA processing (5' cap, 3' polyA tail); Ribozymes; RNA editing and mRNA transport | **2** | **RA** | **May - June** |
| **7.** | **Unit 7: Translation**<br>Ribosome structure and assembly, mRNA; charging of tRNA, aminoacyl tRNA synthetases; various steps in protein synthesis, proteins involved in initiation, elongation and termination of polypeptides; fidelity of translation; inhibitors of protein synthesis; post-translational modifications of proteins. | **18** | **IC** | **May - June** |

# BOTACOR08P

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| **1.** | 1. Preparation of LB medium | | **IC** | **March - April** |
| **2.** | 2. DNA isolation from cauliflower head | | **IC** | **March - April** |
| **3.** | 3. DNA estimation by diphenylamine reagent/UV Spectrophotometry | | **MD** | **March - April** |
| **4.** | 4. Study of DNA replication mechanisms through photographs (Rolling circle, Theta replication and semi-discontinuous replication). | | **MD** | **May - June** |
| **5.** | 5. Study of structures of prokaryotic RNA polymerase and eukaryotic RNA polymerase II throughphotographs. | | **RSD** | **May - June** |
| **6.** | 6. Photographs establishing nucleic acid as genetic material (Messelson and Stahl's, Avery et al, Griffith's, Hershey & Chase's and Fraenkel & Conrat's experiments) | | **RSD** | **May - June** |

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| **7.** | 7. Study of the following through photographs: assembly of Spliceosome machinery; splicing mechanism in group I & group II introns; ribozyme and alternative splicing | | **RA** | **May - June** |

# BOTACOR09T

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| **1.** | **Unit 1: Introduction**<br>Basic concepts; Levels of organization. Homeostasis. | **4** | **MD** | **March - April** |
| **2.** | **Unit 2: Soil**<br>Importance; origin; formation; composition; physical; chemical and biological components; soil profile; role of climate in soil development. | **8** | **TM** | **March - April** |
| **3.** | **Unit 3: Water**<br>Importance;states of water in the environment; atmospheric moisture; hydrological cycle; water in soil; water table. | **4** | **IC** | **March - April** |
| **4.** | **Unit 4:**<br>Light, temperature, wind and fire Variations; adaptations of plants to their variation. | **6** | **RSD** | **March - April** |
| **5.** | **Unit 5: Biotic interactions**<br>Trophic organization, basic source of energy; symbiosis,commensalism, parasitism; food chains and webs; ecological pyramids; biomass, standing crop. | **2** | **TM** | **March - April** |
| **6.** | **Unit 6: Population ecology**<br>Characteristics and Dynamics, r and k selection, Ecological Speciation. | **4** | **RSD** | **May - June** |
| **7.** | **Unit 7: Plant communities**<br>Concept of ecological amplitude; habitat and niche; characters- analytical and synthetic; ecotone and edge effect; dynamics - succession: processes, types; climax concepts. | **8** | **TM** | **May - June** |
| **8.** | **Unit 8: Ecosystems**<br>Structure and processes; trophic organisation; food chains and food webs; ecological pyramids. | **4** | **TM** | **May - June** |
| **9.** | **Unit 9: Functional aspects of ecosystem**<br>Principles and models of energy flow; production and productivity; ecological efficiencies; biogeochemical cycles; cycling of carbon, nitrogen and phosphorus. | **8** | **TM** | **May - June** |

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| **10.** | **Unit 10: Phytogeography**<br>Principles; continental drift and theory of tolerance (brief account); endemism; brief description of major terrestrial biomes – Tropical rain forest, Temperate grassland and Tundra; Phytogeographical division of India(BSI 1996); Local Vegetation. | **4** | **TM** | **May - June** |

# BOTACOR09P

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| **1.** | Study of instruments used to measure microclimatic variables: Soil thermometer, maximum andminimum thermometer, anemometer, psychrometer/hygrometer, rain gauge and lux meter. | | **TM** | **March - April** |
| **2.** | Determination of pH of various soil and water samples (pH meter, universal indicator/Lovibond comparator and pH paper). | | **TM** | **March - April** |
| **3.** | Analysis for carbonates, chlorides, nitrates, organic matter and base deficiency from two soil samples by rapid field tests. | | **TM** | **March - April** |
| **4.** | Determination of organic carbon of different soil samples by Walkley & Black rapid titration method. | | **TM** | **March - April** |
| **5.** | Determination of dissolved oxygen and carbon dioxide of water samples from polluted and unpolluted sources. | | **TM** | **March - April** |
| **6.** | (a). Study of anatomical adaptations of hydrophytes and xerophytes – by preparation of temporary slides of Nymphaea petiole, Hydrilla stem, Nerium and Casuarinaleaf.<br>(b). Study of biotic interactions of the following: Stem parasite (Cuscuta), Epiphytes (Vanda root), Predation (Insectivorous plants) – from permanent slides and preserved specimens. | | **RSD** | **May - June** |
| **7.** | Determination of minimum size of quadrate for the study of herbaceous vegetation by species area curve method (species to be listed). | | **IC** | **May - June** |
| **8.** | Quantitative analysis of herbaceous vegetation for frequency and comparison with Raunkiaer's frequency distribution law. | | **IC** | **May - June** |
| **9.** | Quantitative analysis of herbaceous vegetation for density and abundance. | | **IC** | **May - June** |
| **10.** | Field visit to familiarize students with ecology of different sites. | | **ALL** | **May - June** |

# BOTACOR10T

| S.L. | TOPICS | Number | Teacher' | When to be |
|---|---|---|---|---|

| NO. | | of lectures | s name | taught |
|---|---|---|---|---|
| 1. | **Unit 1: Significance of Plant systematics**<br>Introduction to systematics; plant identification, classification, nomenclature. Evidences from palynology, cytology, phytochemistry and molecular data. Functions of herbarium and botanical gardens; importance of herbaria and botanical gardens of the world and India; virtual herbarium; eflora; documentation: flora, monographs, journals; keys: single access and multi-access. | 12 | MK | March - April |
| 2. | **Unit 2: Taxonomic hierarchy**<br>Concept of taxa (family, genus, species); categories and taxonomic hierarchy; species concept (taxonomic, biological, evolutionary). | 6 | MD | March - April |
| 3. | **Unit 3: Botanical nomenclature**<br>Principles and rules (ICN); ranks and names; typification, author citation, valid publication, rejection of names, principle of priority and its limitations; names of hybrids. | 10 | MD | March - April |
| 4. | **Unit 4: Systems of classification**<br>Major contributions of Theophrastus, Linnaeus, Hutchinson, Takhtajan and Cronquist; classification systems of Bentham and Hooker (up to series) and Engler and Prantl (up to series); brief reference of angiosperm phylogeny Group (APG III) classification. | 12 | MK | May - June |
| 5. | **Unit 5: Biometrics, numerical taxonomy and cladistics** Characters; variations; OTUs, character weighting and coding; cluster analysis; phenograms, Cladograms (definitions and differences). | 10 | MD | May - June |
| 6. | **Unit 6: Phylogeny of Angiosperms**<br>Terms and concepts (primitive and advanced, homology and analogy, parallelism and convergence, monophyly, paraphyly, polyphyly and clades). Origin and evolution of angiosperms(Brief Idea). | 12 | RA + RSD | May - June |

# BOTACOR10P

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| 1. | 1.Study of the vegetative and floral characters of the following families (fifteen species among them) description, VS of flower, section of ovary, floral diagram/s, floral formula and systematic position according to Bentham & Hooker's system of classification: Asteraceae (Compositae) - Sonchus/Launaea, Vernonia/Ageratum, Eclipta/Tridax/Synedrella Solanaceae - Solanum spp./Withania/Physalis Brassicaceae (Cruciferae) –Nasturtium sp. Lamiaceae (Labiatae)- Salvia/Ocimum/Leucus/Leonurus/Anisomeles/Hyptis Euphorbiaceae - Euphorbia spp., | | MD + MK | March - April |

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| | Jatropha/Acalypha/Croton Malvaceae –Sida spp./Urena/Malachra capitata/Hibiscus vitifolius Polygonaceae – Polygonum spp/Rumex Acanthaceae –Justicia/Rungia/Ecbolium/Hygrophila Scrophulariaceae – Lindenbergia/Mazus/Vandellia (Lindernia)/ Rubiaceae – Oldenlandia/ Dentella/ Spermacocce | | | |
| **2.** | 2. Botanical excursion – at least three in number (with provision of fund from college)<br>a. Visit to Botanic Garden (Acharya Jagadish Chandra Bose Indian Botanic Garden, BSI).<br>b. Field visit (Local).<br>c. At two different ecological zones. | | **ALL** | **As and when attainable** |
| **3.** | 3.Mounting of properly dried and processed specimens (25 in no.) of wild plants with herbarium label (to be arranged after Bentham and Hooker system of Classification). | | **MD** | **May - June** |

# Semester – II

# BOTACOR03T

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| **1.** | **Introduction to true fungi**<br>General characteristics; affinities with plants and animals; thallus organization; cell wall composition; nutrition;sexual (with reference to sporocarp) and asexual (spore forming bodies in deuteromycetes) reproduction; classification (Hawksworth et al 1995). | **6** | **TM** | **March - April** |
| **2.** | **Unit 2: Chytridiomycota and Zygomycota**<br>Characteristic features; ecology and significance; thallus organisation; reproduction; life cycle with reference to Synchytrium, Rhizopus. | **5** | **RA** | **March - April** |
| **3.** | **Unit 3: Ascomycota**<br>General characteristics (asexual and sexual fruiting bodies); ecology; life cycle, heterokaryosis and parasexuality; life cycle with reference to Saccharomyces, Aspergillus, Penicillium, Alternaria, Neurospora and Ascobolus. | **10** | **IC** | **March - April** |
| **4.** | **Unit 4: Basidiomycota**<br>General characteristics;ecology; life cycle with reference to Black stem rust of wheat Puccinia (physiological specialization), Loose and covered smut (symptoms only), Agaricus; bioluminescence, fairy rings and mushroom cultivation (general account). | **8** | **RSD** | **March - April** |

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| **5.** | **Unit 5: Allied Fungi**<br>General characteristics; status of slime molds; occurrence; types of plasmodia;types of fruiting bodies. | **3** | **TM** | **May - June** |
| **6.** | **Unit 6: Oomycota**<br>General characteristics; ecology; life cycle and classification with reference to Phytophthora &Albugo | **4** | **MK** | **May - June** |
| **7.** | **Unit 7: Symbiotic associations**<br>Lichen – Occurrence; general characteristics; growth forms and range of thallus organization; nature of associations of algal and fungal partners; reproduction; mycorrhiza- ectomycorrhiza endomycorrhiza and their significance. | **4** | **TM** | **May - June** |
| **8.** | **Unit 8: Applied Mycology**<br>Role of fungi in biotechnology; application of fungi in food industry (flavour & texture, fermentation, baking, organic acids, enzymes, mycoproteins); secondary metabolites (pharmaceutical preparations); agriculture (biofertilizers); mycotoxins; biological control (mycofungicides, mycoherbicides, mycoinsecticides, myconematicides); Medical mycology. | **10** | **TM** | **May - June** |
| **9.** | **Unit 9: Phytopathology**<br>Terms and concepts; general symptoms; geographical distribution of diseases; etiology;symptomology; host-pathogen relationships; disease cycle and environmental relation;prevention and control of plant disease and role of quarantine. Bacterial diseases – Citrus canker. Viral diseases – TobaccoMosaic virus, vein clearing. Fungal and Oomycete diseases – Early and Late blight of potato, Black stem rust of wheat, Blast of Rice. Pra | **10** | **MD + TM** | **May - June** |

# BOTACOR03P

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| **1.** | Introduction to the world of fungi (unicellular, coenocytic/septate mycelium, ascocarps & basidiocarps) through permanent slides. | | **TM** | **March - April** |
| **2.** | Micrometry (measurement of reproductive unit) | | **TM** | **March - April** |
| **3.** | Rhizopus - study of asexual stage from temporary mounts and sexual structures through | | **IC** | **March - April** |

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| | permanent slides. | | | |
| **4.** | Aspergillus and Penicillium - study of asexual stage from temporary mounts and sexual stage from permanent slides/photographs. | | **IC** | **March - April** |
| **5.** | Ascobolus - sectioning through ascocarp and micrometry | | **IC** | **March - April** |
| **6.** | Alternaria - Specimens/photographs and temporary mounts. | | **MD** | **March - April** |
| **7.** | Puccinia - Herbarium specimens of Black Stem Rust of Wheat and infected Barberry leaves; sections/ mounts of spores on wheat and permanent slides of both the hosts. | | **MD** | **May - June** |
| **8.** | Agaricus - Specimens of button stage and full grown mushroom; sectioning of gills of Agaricus, fairy rings and bioluminescent mushrooms to be shown. | | **RSD** | **May - June** |
| **9.** | Albugo - Study of symptoms of plants infected with Albugo; asexual phase study through section/temporary mounts and sexual structures through permanent slides | | **RSD** | **May - June** |
| **10.** | Lichens: Study of growth forms of lichens (crustose, foliose and fruticose) on different substrates. Mycorrhizae: ectomycorrhiza and endomycorrhiza (Photographs) | | **TM** | **May - June** |
| **11.** | Phytopathology: Herbarium specimens of bacterial diseases; Citrus canker; Viral diseases: TMV, Vein clearing symptom from any available specimen; Fungal diseases: Early and Late blight of potato, Black stem rust of wheat and Blast of Ri | | **TM** | **May - June** |

# BOTACOR04T

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| **1.** | **Unit 1: Introduction**<br>Unifying features of archegoniates; transition to land habit;alternation of generations. | **4** | **MD** | **March - April** |
| **2.** | **Unit 2: Bryophytes**<br>General characteristics; adaptations to land habit; classification Proskauer 1954(up to class); range of thallus organization | **6** | **MK** | **March - April** |
| **3.** | **Unit 3: Type Studies- Bryophytes**<br>Systematic position, morphology, anatomy and reproduction of Riccia, Marchantia,Pellia, Porella, Anthoceros, Sphagnum and Funaria; reproduction and evolutionary trends in Riccia, Marchantia, Anthoceros and Funaria (developmental stages not included). Ecological and economic importance of bryophytes with special reference to Sphagnum. | **12** | **MK + RSD** | **March - April** |
| **4.** | **Unit 4: Pteridophytes**<br>General characteristics; classification, Sporne 1975 (up to Class); early land plants (Cooksonia and | **6** | **IC** | **May - June** |

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| | Rhynia). | | | |
| **5.** | **Unit 5: Type Studies- Pteridophytes**<br>Systematic position, morphology, anatomy and reproduction of Psilotum, Selaginella, Equisetum and Pteris (developmental details not to be included). Apogamy and apospory, Heterospory and seed habit, telome theory, stelar evolution; ecological and economic importance. | **14** | **MD** | **May - June** |
| **6.** | **Unit 6: Gymnosperms**<br>General characteristics, classification (Sporne up to family), morphology, anatomy and reproduction of Cycas, Pinus and Gnetum (developmental details not to be included); ecological and economic importance | **18** | **MD + RA + RSD** | **May - June** |

# BOTACOR04P

| S.L. NO. | TOPICS | Number of lectures | Teacher's name | When to be taught |
|---|---|---|---|---|
| **1.** | Riccia– Morphology of thallus | | **MD** | **March - April** |
| **2.** | Marchantia- Morphology of thallus, whole mount of rhizoids & scales, vertical section of thallus through gemma cup, whole mount of gemmae (all temporary slides), vertical section of antheridiophore, archegoniophore, longitudinal section of sporophyte (all permanent slides). | | **MD** | **March - April** |
| **3.** | Anthoceros- Morphology of thallus, dissection of sporophyte (to show stomata, spores,pseudoelaters, columella), vertical section of thallus (all permanent slide). | | **MD** | **March - April** |
| **4.** | Sphagnum- Morphology of plant, whole mount of leaf (permanent slide only). | | **MK** | **March - April** |
| **5.** | Funaria- Morphology, whole mount of leaf, rhizoids, operculum, peristome, annulus, spores, longitudinal section of capsule (temporary slides); permanent slides showing antheridial and archegonial heads | | **MK** | **March - April** |
| **6.** | Psilotum- Study of specimen, transverse section of synangium (permanent slide). | | **IC** | **March - April** |
| **7.** | Selaginella- Morphology, whole mount of leaf with ligule, transverse section of stem, whole mount of strobilus, whole mount of microsporophyll and megasporophyll (temporary slides), longitudinal section of strobilus (permanent slide). | | **IC** | **March - April** |
| **8.** | Equisetum- Morphology, transverse section of internode, longitudinal section of strobilus, transverse section of strobilus, whole mount of sporangiophore, whole mount of spores (temporary slide). | | **IC** | **May - June** |
| **9.** | Pteris- Morphology, vertical section of sporophyll, whole mount of sporangium, whole mount of | | **MK** | **May - June** |

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| | spores (temporary slides), | | | |
| **10.** | Cycas- Morphology and TS of leaflet, morphology of microsporophyll and megasporophyll (temporary slides) whole mount of spore (temporary slides) ; TS of coralloid root, LS of ovule (all permanent slide). | | **RSD** | **May - June** |
| **11.** | Pinus- Morphology of long and dwarf shoots , male and female cones, transverse section of needle (temporary slide), LS of male cone and femalecone (permanent slide);microspores(permanent slides), | | **RSD** | **May - June** |
| **12.** | Gnetum- Morphology (shoot, male & female cones), VS of ovule (permanent slide). | | **TM** | **May - June** |
| **13.** | One Botanical excursion to an appropriate location(with provision of fund from college). | | **RSD** | **May - June** |