

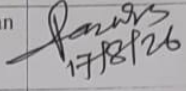
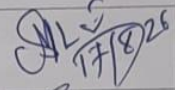
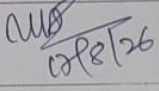
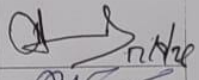
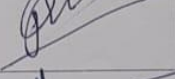
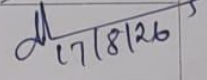
**2026**  
**BOTANY ONE YEAR POST GRADUATE SYLLABUS, 2026**  
**BOTANY 2<sup>nd</sup> YEAR OF PG 2-YEARS SYLLABUS, 2026**

**Department of Botany**  
**Rabindranath Thakur Vishwavidyalaya**  
**Sir J. C. Bose Campus**  
**Sagar Basti, Hojai, Assam, Pin-782435**

**Common syllabus for 1-Year PG (Semester-I and II) and PG 2<sup>nd</sup>  
Year of 2-Years PG (Semester-III and IV)**

**FRAMED ACCORDING TO THE NATIONAL EDUCATION POLICY (NEP), 2020**  
**Date of effect 17<sup>th</sup> August, 2026**

**Composition of Post Graduate Board of Studies (PG-BOS)**  
**Rabindranath Thakur Vishwavidyalaya, Hojai, Assam**  
**Meeting held on 17<sup>th</sup> August, 2026 at 2.00PM**  
**Department of Botany**

| Sl. No. | Name & Designation                               | Deptt. & Institution | Address  | Members         | Signature                                                                                        |
|---------|--------------------------------------------------|----------------------|----------|-----------------|--------------------------------------------------------------------------------------------------|
| 1.      | Dr. Sushil Das<br>Associate Professor & HOD      | Botany Deptt.<br>RTV | Hojai    | Chairman        | <br>17/8/26   |
| 2.      | Dr. Faristha Yasmin<br>Associate Professor & HOD | Botany Deptt.<br>NU  | Nagaon   | External Member |                                                                                                  |
| 3.      | Dr. Bhaben Tanti<br>Professor & Ex HOD           | Botany Deptt.<br>GU  | Guwahati | External Member |                                                                                                  |
| 4.      | Dr. Monjit Saikia<br>Associate Professor         | Botany Deptt.<br>RTV | Hojai    | Member          | <br>17/8/26 |
| 5.      | Dr. Utpal Phukan<br>Associate Professor          | Botany Deptt.<br>RTV | Hojai    | Member          | <br>17/8/26 |
| 6.      | Dr. Nazim Forid Islam<br>Associate Professor     | Botany Deptt.<br>RTV | Hojai    | Member          | <br>17/8/26 |
| 7.      | Dr. Pranjal Morang<br>Associate Professor        | Botany Deptt.<br>RTV | Hojai    | Member          | <br>17/8/26 |
| 8.      | Dr. Dharmwantari L. Singha<br>Asstt. Professor   | Botany Deptt.<br>RTV | Hojai    | Member          | <br>17/8/26 |

**Composition of Post Graduate Board of Studies (PG-BOS)**  
**Rabindranath Thakur Vishwavidyalaya, Hojai, Assam**  
**Meeting held on 17<sup>th</sup> August, 2026 at 2.00PM**  
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|----------------|--------------------------------------------------|---------------------------------|----------------|-----------------|------------------|
| 1.             | Dr. Sushil Das<br>Associate Professor & HOD      | Botany Deptt.<br>RTV            | Hojai          | Chairman        |                  |
| 2.             | Dr. Farishta Yasmin<br>Associate Professor & HOD | Botany Deptt.<br>NU             | Nagaon         | External Member |                  |
| 3.             | Dr. Bhaben Tanti<br>Professor & Ex HOD           | Botany Deptt.<br>GU             | Guwahati       | External Member |                  |
| 4.             | Dr. Monjit Saikia<br>Associate Professor         | Botany Deptt.<br>RTV            | Hojai          | Member          |                  |
| 5.             | Dr. Utpal Phukan<br>Associate Professor          | Botany Deptt.<br>RTV            | Hojai          | Member          |                  |
| 6.             | Dr. Nazim Farid Islam<br>Associate Professor     | Botany Deptt.<br>RTV            | Hojai          | Member          |                  |
| 7.             | Dr. Pranjal Morang<br>Associate Professor        | Botany Deptt.<br>RTV            | Hojai          | Member          |                  |
| 8.             | Dr. Dhanwantari L. Singha<br>Asstt. Professor    | Botany Deptt.<br>RTV            | Hojai          | Member          |                  |

**Common syllabus of 1<sup>st</sup> Semester (For one-year PG) and 3<sup>rd</sup> Semester (For 2-years PG)**

| Sl No. | Paper Code | Paper   | Paper Title                                       | Credit | Hours | Classes |
|--------|------------|---------|---------------------------------------------------|--------|-------|---------|
| 1.     | DSC-501    | 1.1/3.1 | Mycology and Plant Pathology                      | 4      | 60    | 60      |
| 2.     | DSC-502    | 1.2/3.2 | Advanced Plant Physiology                         | 4      | 60    | 60      |
| 3.     | DSC-503    | 1.3/3.3 | Phytochemistry and Pharmacognosy                  | 4      | 60    | 60      |
| 4.     | DSC-504    | 1.4/3.4 | Genetics, Epigenetics, Plant Breeding & Evolution | 4      | 60    | 60      |
| 5.     | DSM-501    | 1.1/3.1 | Biodiversity Conservation                         | 4      | 60    | 60      |

Total credit=20

**Common syllabus of 2<sup>nd</sup> Semester (For one-year PG) and 4<sup>th</sup> Semester (For 2 -years PG)**

| Sl No. | Paper Code | Paper          | Paper Title                                                               | Credit | Hours | Class |
|--------|------------|----------------|---------------------------------------------------------------------------|--------|-------|-------|
| 1.     | DSC-551    | 2.1/4.1        | Plant Biotechnology and Immunology                                        | 4      | 60    | 60    |
| 2.     | DSC-552    | 2.2/4.2        | Plant Diversity (Algae, Bryophytes, Pteridophytes. Gymnosperms and Fossil | 4      | 60    | 60    |
| 3.     | DSC-553    | 2.3/4.3        | Ecology and Environment                                                   | 4      | 60    | 60    |
| 4.     | DSC-554    | 2.4/4.4        | Applied Microbiology                                                      | 4      | 60    | 60    |
| 5.     | DSC-555    | 2.1/4.1        | Advanced Plant Taxonomy                                                   | 4      | 60    | 60    |
|        |            |                | Total Credit                                                              | 20     |       |       |
| 6.     | DSR-556    | Research Paper | Dissertation in lieu of DSC 5 theory papers                               | 20     | 300   |       |

### DETAILED SYLLABUS OF POST GRADUATE PROGRAMME

Common syllabus of 1<sup>st</sup> Semester (For one-year PG) and 3<sup>rd</sup> Semester (For 2-years PG)

Title of the Course: Mycology & Plant Pathology

Course code: BOT-DSC-501

Nature of the Course: MAJOR/ CORE-1.1/3.1

Total Credits: 04

Distribution of Marks: 100: Theory-45, Practical-25, Internal assessment-30

**Course objectives:** Upon completion of the course, students will be able to: understand fungal diversity, taxonomy, and evolution; explain fungal physiology and molecular biology; identify economically important fungi; understand principles of plant pathology; diagnose plant diseases and their management; and perform laboratory isolation and identification of fungi.

| UNITS                           | CONTENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | L  | T | P  | Total Hours |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|---|----|-------------|
| <b>Unit-I<br/>Marks:15</b>      | <b>Diversity and Taxonomy of Fungi:</b> General characteristics of fungi, Modern classification of fungi, Phylogeny and evolution, characters of different groups of fungi up to the generic level: (a) Myxomycota and (b) Eumycota- i) Mastigomycotina ii) Zygomycotina, iii) Ascomycotina, iv) Basidiomycotina, v) Deuteromycotina. Fungal nomenclature and identification                                                                                                                                                                                                                                                                     | 10 | 2 |    | 12          |
| <b>Unit- II<br/>Marks:15</b>    | <b>Biology and Economic Importance of Fungi:</b> Fungal cell structure, Nutrition and metabolism, Reproduction, Fungal genetics, Secondary metabolites, Industrial mycology, Mushroom cultivation, Mycorrhiza, Lichens, Beneficial fungi in agriculture, Mycotoxins                                                                                                                                                                                                                                                                                                                                                                              | 10 | 1 |    | 11          |
| <b>Unit-III<br/>Marks:15</b>    | <b>Principles of Plant Pathology: Concept</b> of plant disease, Disease triangle, Plant-pathogen interactions, Pathogenesis, Disease resistance, Host defence mechanisms, Disease development, Epidemiology, Disease forecasting, Molecular basis of pathogenicity, A brief idea of recognition concept and infection, symptomatology, Disease development: Role of enzymes, toxins, Phenolics, Phytoalexins, PR proteins and elicitors.                                                                                                                                                                                                         | 9  | 2 |    | 11          |
| <b>Unit-IV<br/>Marks:15</b>     | Plant Diseases and Disease Management: Major diseases of rice, Wheat, Maize, Potato, Tomato, Mustard, Tea, Citrus, and sugarcane<br>Disease management: Cultural methods, Biological control, Chemical control, Resistant varieties, Integrated Disease Management (IDM), Plant quarantine, Recent advances in molecular diagnosis and disease management, Post-harvest diseases, Seed pathology, Genetics of resistance; 'R' genes.                                                                                                                                                                                                             | 10 | 1 |    | 11          |
| <b>Practical's<br/>Marks:25</b> | 1. Isolation of fungi from soil by the dilution plate method.<br>2. Isolation of fungi from infected plant tissues.<br>3. Pure culture techniques.<br>4. Preparation of different fungal media (PDA, Czapek Dox, MEA).<br>5. Microscopic study of fungal reproductive structures.<br>6. Identification of common fungal genera.<br>7. Study of mycorrhiza.<br>8. Disease diagnosis using symptoms and signs.<br>9. Herbarium preparation of diseased plant specimens.<br>10. Measurement of disease incidence and severity.<br>11. Demonstration of Koch's postulates.<br>12. Visit to plant pathology laboratory/farm and submission of report. |    |   | 15 | 15          |

Total=60 classes

**Mode of Internal Assessment:** -1. Sessional examination-15 marks

2. Field trip, Excursion Tour, Seminar, quiz, Home assignment- 15 marks

**DETAILED SYLLABUS OF POST GRADUATE PROGRAMME****Common syllabus of 1<sup>st</sup> Semester (For one-year PG) and 3<sup>rd</sup> Semester (For 2-years PG)****Title of the Course: Advanced Plant Physiology****Course code: BOT-DSC-502****Nature of the Course: MAJOR/ CORE-1.2/3.2****Total Credits: 04****Distribution of Marks: 100: Theory-45, Practical-25, Internal assessment-30****Course objectives:** The objective of this course is to provide knowledge to the students on the molecular, biochemical, and cellular mechanisms underlying photosynthesis, respiration, mineral nutrition, water relations, and assimilate transport

| UNITS                          | CONTENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | L  | T | P  | Total Hours |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|---|----|-------------|
| <b>Unit-I<br/>Marks:15</b>     | <b>Plant Water Relations and Mineral Nutrition</b><br>Water potential and its components; Aquaporins and membrane water transport; Stomatal structure & stomatal regulation, mechanism and significance of transpiration; Essential mineral nutrients; Nutrient sensing and signalling; Nitrogen uptake and assimilation; ABA-mediated drought signalling                                                                                                                                                                                                            | 5  |   |    | 5           |
| <b>Unit- II<br/>Marks:15</b>   | <b>Advanced Photosynthesis and Carbon Metabolism</b><br>Photosynthetic pigments and light harvesting complexes; Photosystems I & II; Regulation of photosynthesis under changing environments; Rubisco engineering and photorespiration; C3, C4, and CAM pathway; Carbon partitioning and source-sink relationships                                                                                                                                                                                                                                                  | 9  | 1 |    | 10          |
| <b>Unit-III<br/>Marks:15</b>   | <b>Plant Signalling</b><br>Hormone biosynthesis, transport, and metabolism; Molecular mechanisms of hormone perception; Auxin signalling (TIR1/AFB pathway); Cytokinin signalling; Hormonal cross-talk in plant development and stress                                                                                                                                                                                                                                                                                                                               | 13 | 2 |    | 15          |
| <b>Unit-IV<br/>Marks:15</b>    | <b>Stress Physiology and Emerging Areas</b><br>Drought, salinity, heat, and cold stress; Heavy metal toxicity; Oxidative stress and antioxidant defence system; Osmotic adjustment; Plant-microbe interactions; Climate change and plant adaptation; Plant metabolomics; Systems biology; Applications of plant physiology in sustainable agriculture                                                                                                                                                                                                                | 13 | 2 |    | 15          |
| <b>Practicals<br/>Marks:25</b> | 1. Determination of water potential using plasmolytic method.<br>2. Determination of Relative Water Content (RWC).<br>3. Measurement of transpiration by potometer.<br>4. Determination of stomatal index and stomatal frequency.<br>5. Determination of chlorophyll and carotenoid content.<br>6. Separation of photosynthetic pigments by paper/TLC chromatography.<br>7. Estimation of proline under stress conditions.<br>8. Preparation of a hydroponic nutrient solution (Hoagland's solution) and cultivation of leafy vegetables under hydroponic conditions |    |   | 15 | 15          |

Total=60 classes

**Mode of Internal Assessment:** -1. Sessional examination-15 marks

2. Field trip, Excursion Tour, Seminar, quiz, Home assignment- 15 marks

**DETAILED SYLLABUS OF POST GRADUATE PROGRAMME****Common syllabus of 1<sup>st</sup> Semester (For one-year PG) and 3<sup>rd</sup> Semester (For 2 -years PG)****Title of the Course: Phytochemistry and Pharmacognosy****Course code: BOT-DSC-503****Nature of the Course: MAJOR/ CORE-1.3/3.3****Total Credits: 04****Distribution of Marks: 100: Theory-45, Practical-25, Internal assessment-30**

**Course objectives:** The objective of this course is to provide knowledge to the students on various aspect of plant breeding, methods of crop improvement, quantitative inheritance, inbreeding depression and heterosis, crop improvement and breeding, biostatistics and evolution.

| UNITS                          | CONTENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | L  | T | P  | Total Hours |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|---|----|-------------|
| <b>Unit-I<br/>Marks:15</b>     | <b>Phytochemistry:</b> Introduction and Definition, Importance and scope of phytochemical studies, Application of phytochemistry, Secondary metabolites and its classes.                                                                                                                                                                                                                                                                                                                                                                                                                             | 5  |   |    | 5           |
| <b>Unit- II<br/>Marks:10</b>   | Extraction of phytochemicals, Different types of extraction methods, Solvent selection, Qualitative of analysis of active biomolecules, Fractionation and purification.                                                                                                                                                                                                                                                                                                                                                                                                                              | 9  | 1 |    | 10          |
| <b>Unit-III<br/>Marks:10</b>   | Identification and characterization of phytochemicals, Detection of different classes of phytoconstituents by test tube and TLC method.                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 13 | 2 |    | 15          |
| <b>Unit-IV<br/>Marks:25</b>    | <b>Pharmacognosy:</b> Definition and scope of Pharmacognosy. Drugs and its different sources – plants and animals. Classification of drugs, cultivation, collection, processing and storage of natural drugs, Physical, chemical and biological properties of crude drugs. Basic metabolic pathways and formation of different secondary metabolites through Shikimic acid pathway and Acetate pathway. Principle and function of TLC, HPLC, LCMS, GCMS.                                                                                                                                             | 13 | 2 |    | 15          |
| <b>Practicals<br/>Marks:25</b> | <ol style="list-style-type: none"> <li>Working knowledge of TLC, HPLC, GCMS, LCMS and spectrophotometry.</li> <li>Tests for identification of Alkaloids, Glycosides, Flavanoides, Tanins, Resin and volatile oils.</li> <li>Preparation of extracts of crude drugs/ herbs by successive solvent extraction method.</li> <li>Isolation and purification of –               <ol style="list-style-type: none"> <li>Piperine from black pepper</li> <li>Caffeine from tea powder.</li> </ol> </li> <li>Visit any phytochemistry lab / pharmacognosy industry/ crude drug preparation centre.</li> </ol> |    |   | 15 | 15          |

Total=60 classes

**Mode of Internal Assessment:** -1. Sessional examination-15 marks

2. Field trip, Excursion Tour, Seminar, quiz, Home assignment- 15 marks

**DETAILED SYLLABUS OF POST GRADUATE PROGRAMME**  
**Common syllabus of 1<sup>st</sup> Semester (For one-year PG) and 3<sup>rd</sup> Semester (For 2 -years PG)**

**Title of the Course:** Genetics, Epigenetics, Plant breeding and Evolution

**Course code:** BOT-DSC-504

**Nature of the Course:** MAJOR/ CORE-1.4/3.4

**Total Credits:** 04

**Distribution of Marks:** 100: Theory-45, Practical-25, Internal assessment-30

**Course objectives:** The objective of this course is to provide knowledge to the students on various aspect of plant breeding, methods of crop improvement, quantitative inheritance, inbreeding depression and heterosis, crop improvement and breeding and evolution.

| UNITS                        | CONTENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | L  | T | P | Total Hours |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|---|---|-------------|
| <b>Unit-I<br/>Marks:10</b>   | <b>Genetics:-</b> DNA topology, ancient DNA switches and regulation of plant development, Cell free DNA (cfDNA/exDNA) definition, origin, occurrence in soil and others, physical and structural properties, Biological and practical importance and its extraction technique, QTL mapping using molecular marker                                                                                                                                                                                                                                                                                                                                                                                                                       | 5  |   |   | 5           |
| <b>Unit- II<br/>Marks:15</b> | <b>Epigenetics:</b><br>Definition and concept of epigenetics. Chromatin modification and their mechanism of action, Role of chromatin in gene expression and gene silencing, Types of histones, Histone modification through methylation, acetylation, phosphorylation and its effect on structure and function of chromatin, Heterochromatin formation and gene silencing. Future trends in Plant genetics and Breeding                                                                                                                                                                                                                                                                                                                | 9  | 1 |   | 10          |
| <b>Unit-III<br/>Marks:18</b> | <b>Plant breeding: -</b><br>Introduction, history and Objectives. Breeding systems: modes of reproduction in crop plants. Centre of origin of cultivated plants, Plant introduction, acclimatization domestication of crop plants, quarantine, plant genetic resources, Important achievements and undesirable consequences of plant breeding.<br><b>Methods of crop improvement: -</b><br><b>Selection methods of crop improvement:-</b> For self-pollinated, cross- pollinated and vegetative propagated plants viz. clonal selection, mass selection, pureline selection and their merits and demerits <b>Hybridization:-</b> For self, cross and vegetative propagated plants- hybridization procedure, advantages and limitations. | 13 | 2 |   | 15          |
| <b>Unit-IV<br/>Marks:17</b>  | <b>Quantitative inheritance: -</b><br>Concept, mechanism, examples of inheritance of Kernel colour in wheat, skin colour in human beings. Monogenic vs polygenic inheritance.<br><b>Inbreeding depression and heterosis:-</b><br>History, genetic basis of inbreeding depression and heterosis and commercial application<br><b>Crop improvement and breeding: -</b><br>Role of polyploidy in crop improvement. Distant hybridization technique, barriers to the production of distant hybrids and its limitations<br><br>Evolution, Co-evolution, Lamarckism, Darwinism, synthetic theory, Wiseman's theory and modern theory of evolution.                                                                                            | 13 | 2 |   | 15          |

|                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |    |    |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|----|----|
| <b>Practicals<br/>Marks:25</b> | <ol style="list-style-type: none"> <li>1. Extraction of cell free DNA (cf DNA) from sand/soil sample.</li> <li>2. To demonstrate the procedure of germplasm collection.</li> <li>3. To identify the seeds of economically important crop plants.</li> <li>4. To determine the moisture content of seeds of various crops.</li> <li>5. Viability test of pollen grain.</li> <li>6. To study the procedures of emasculation and hybridization in self and cross pollinated crops.</li> <li>7. To study the induction of polyploidy by colchicine treatment in crop plants.</li> </ol> |  |  | 15 | 15 |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|----|----|

Total=60 classes

**Mode of Internal Assessment:** -1. Sessional examination-15 marks

2. Field trip, Excursion Tour, Seminar, quiz, Home assignment- 15 marks

## DETAILED SYLLABUS OF POST GRADUATE PROGRAMME

Common syllabus of 1<sup>st</sup> Semester (For one-year PG) and 3<sup>rd</sup> Semester (For 2 -years PG)

**Title of the Course: Biodiversity Conservation**

**Course code: BOT-DSM-501**

**Nature of the Course: MINOR-1.1/3.1**

**Total Credits: 04**

**Distribution of Marks: 100: Theory-45, Practical-25, Internal assessment-30**

### Course Objectives

The Biodiversity Conservation course is designed to enable students to:

1. Develop a comprehensive understanding of the concepts, levels, patterns, and significance of biodiversity and its role in maintaining ecological balance and human well-being.
2. Understand the major threats to biodiversity, including habitat degradation, climate change, invasive species, pollution, and overexploitation, and evaluate their ecological and socio-economic impacts.
3. Acquire knowledge of *in-situ* and *ex-situ* conservation strategies, protected area management, restoration ecology, and modern approaches to biodiversity conservation.
4. Familiarize students with national and international biodiversity policies, conventions, and legal frameworks, including the Biological Diversity Act, Convention on Biological Diversity (CBD), CITES, and the Ramsar Convention.
5. Develop practical skills in biodiversity assessment, species identification, field documentation, biodiversity monitoring, and the use of biodiversity indices.
6. Promote awareness of sustainable utilization of biological resources, ecosystem services, traditional ecological knowledge, and community participation in biodiversity conservation.
7. Encourage critical thinking and problem-solving skills for addressing contemporary conservation challenges and designing sustainable biodiversity management strategies.

| UNITS                        | CONTENTS                                                                                                                                                                                                                                                                                                                                                                                                         | L  | T | P | Total Hours |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|---|---|-------------|
| <b>Unit-I<br/>Marks:11</b>   | <b>Introduction to Biodiversity:</b> Concept, definitions, levels of biodiversity (genetic, species, ecosystem); patterns of biodiversity; biodiversity hotspots; biodiversity of India and North-East India; ecosystem services and values of biodiversity.                                                                                                                                                     | 5  |   |   | 5           |
| <b>Unit- II<br/>Marks:11</b> | <b>Threats to Biodiversity:</b> Habitat loss and fragmentation, invasive alien species, pollution, overexploitation, climate change, biodiversity loss and extinction; IUCN Red List categories; causes and consequences of species extinction.                                                                                                                                                                  | 9  | 1 |   | 10          |
| <b>Unit-III<br/>Marks:18</b> | <b>Biodiversity Conservation Approaches:</b> <i>In-situ</i> and <i>ex-situ</i> conservation; protected area network (National Parks, Wildlife Sanctuaries, Biosphere Reserves, Community and Conservation Reserves); botanical gardens, seed banks, gene banks, cryopreservation; restoration ecology.                                                                                                           | 13 | 2 |   | 15          |
| <b>Unit-IV<br/>Marks:20</b>  | <b>Policies, Community Participation and Sustainable Conservation:</b> Convention on Biological Diversity (CBD), Kunming-Montreal Global Biodiversity Framework, CITES, Ramsar Convention, Biological Diversity Act, 2002 (India), National Biodiversity Authority, People's Biodiversity Registers, Access and Benefit Sharing (ABS), role of indigenous knowledge and community participation in conservation. | 13 | 2 |   | 15          |

|                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |    |    |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|----|----|
| <b>Practicals<br/>Marks:25</b> | <ol style="list-style-type: none"> <li>1. Documentation of local biodiversity using quadrat/transect methods.</li> <li>2. Preparation of herbarium specimens and digital biodiversity records.</li> <li>3. Estimation of biodiversity indices (Shannon–Wiener, Simpson's Index).</li> <li>4. Identification of threatened and endemic plant species of Assam/North-East India.</li> <li>5. Visit to a protected area, botanical garden, wetland, or biodiversity park and submission of a field report.</li> <li>6. Preparation of a People's Biodiversity Register (sample exercise).</li> <li>7. Seminar/Case study on biodiversity conservation initiatives.</li> </ol> |  |  | 15 | 15 |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|----|----|

Total=60 classes

**Mode of Internal Assessment: -**

1. Sessional examination-15 marks
2. Field trip, Excursion Tour, Seminar, quiz, Home assignment- 15 marks

**Course Outcomes (COs)**

After successful completion of the course, students will be able to:

1. Explain the concepts, patterns, and importance of biodiversity.
2. Analyze major threats leading to biodiversity loss.
3. Apply biodiversity assessment techniques in field situations.
4. Evaluate conservation strategies and relevant national and international policies.
5. Design community-based and sustainable biodiversity conservation approaches.

**Suggested References**

1. Primack, R.B. *Essentials of Conservation Biology*.
2. Groom, M.J., Meffe, G.K. & Carroll, C.R. *Principles of Conservation Biology*.
3. Hunter, M.L. *Fundamentals of Conservation Biology*.
4. Odum, E.P. & Barrett, G.W. *Fundamentals of Ecology*.
5. Biological Diversity Act, 2002 (India).
6. Convention on Biological Diversity (CBD) documents.
7. IUCN Red List Guidelines.

### DETAILED SYLLABUS OF POST GRADUATE PROGRAMME

Common syllabus of 2<sup>nd</sup> Semester (For one-year PG) and 4<sup>th</sup> Semester (For 2 -years PG)

**Title of the Course:** Plant Biotechnology and Plant Immunology

**Course code:** BOT- DSC-551

**Nature of the Course:** MAJOR/ CORE-2.1/4.1

**Total Credits:** 04

**Distribution of Marks: 100: Theory-45, Practical-25, Internal assessment-30**

**Course objectives:** The objective of this course is to provide knowledge to the students on plant biotechnology, including plant tissue culture, molecular biology, genetic engineering, and genome editing techniques, plant–pathogen interactions

| UNITS                          | CONTENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | L  | T | P  | Total Hours |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|---|----|-------------|
| <b>Unit-I<br/>Marks:13</b>     | <b>Plant Tissue Culture and Micropropagation</b><br>Introduction, scope and applications of plant biotechnology; Laboratory organization and aseptic techniques; Culture media and media preparation (MS medium); Plant tissue culture techniques; Callus culture, cell suspension culture, Meristem culture, anther culture; Somatic embryogenesis and synthetic seeds; Micropropagation; Application of plant tissue culture                                                                                               | 5  |   |    | 5           |
| <b>Unit- II<br/>Marks:11</b>   | <b>Molecular Biotechnology and Genome Editing</b><br>Plant genetic transformation ( <i>Agrobacterium</i> -mediated and biolistic transfer methods); Selectable marker and reporter genes; PCR, RNA interference (RNAi); CRISPR/Cas9 based genome editing                                                                                                                                                                                                                                                                     | 9  | 1 |    | 10          |
| <b>Unit-III<br/>Marks:18</b>   | <b>Plant Immunology</b><br>Overview of plant immune system; Pattern-Triggered Immunity (PTI); Effector-Triggered Immunity (ETI); PAMPs, PRRs and pathogen effectors; Hypersensitive response (HR); Gene-for-gene hypothesis; Systemic Acquired Resistance (SAR) and Induced Systemic Resistance (ISR); Plant microbiome and beneficial microorganisms                                                                                                                                                                        | 13 | 2 |    | 15          |
| <b>Unit-IV<br/>Marks:18</b>    | <b>Applications in Crop Improvement and Disease Resistance•</b><br>Development of transgenic crops; Disease-resistant crop development using biotechnology; Molecular diagnostics of plant pathogens; Phytoremediation and molecular farming; Secondary metabolite production; Biosafety regulations, intellectual property rights (IPR) and biosafety guidelines                                                                                                                                                            | 13 | 2 |    | 15          |
| <b>Practicals<br/>Marks:25</b> | 1. Preparation of stock solutions and culture media (MS medium).<br>2. Sterilization techniques: autoclaving, filtration, and surface sterilization.<br>3. Callus induction from leaf, stem, or root explants.<br>4. Micropropagation of a selected medicinal or horticultural plant.<br>5. Isolation of genomic DNA from plant tissues.<br>6. Quantification and purity assessment of DNA (spectrophotometry/ NanoDrop).<br>7. Agarose gel electrophoresis of isolated DNA.<br>8. Plasmid isolation from bacterial culture. |    |   | 15 | 15          |

Total=60 classes

**Mode of Internal Assessment:** -1. Sessional examination-15 marks

2. Field trip, Excursion Tour, Seminar, quiz, Home assignment- 15 marks

### DETAILED SYLLABUS OF POST GRADUATE PROGRAMME

**Common syllabus of 1<sup>st</sup> Semester (For one-year PG) and 3<sup>rd</sup> Semester (For 2 -years PG)**

**Title of the Course: Plant Diversity (Algae, Bryophytes, Pteridophytes, Gymnosperms & Palaeobotany)**

**Course code: BOT-DSC-552**

**Nature of the Course: MAJOR/ CORE-2.2/4.2**

**Total Credits: 04**

**Distribution of Marks: 100: Theory-45, Practical-25, Internal assessment-30**

**Course objectives:** The objective of this course is to provide knowledge to the students on various aspect of plant diversity specially on advance knowledge on Algae, Bryophytes, Pteridophytes, Gymnosperms and fossil.

| UNITS                          | CONTENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | L  | T | P  | Total Hours |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|---|----|-------------|
| <b>Unit-I<br/>Marks:7</b>      | <b>Algae:</b><br>Diversity & classification of algae, recent trends in classification, role of pigmentation in classification, phylogeny and interrelationship of among different groups of algae, Pattern of life cycles, morphology and reproduction and post fertilization changes/stages in Chlorophyta, Xanthophyta, Phaeophyta and Rhodophyta. Algae and environment, Ecology of algae, method of collection, method of preservation and preparation of slides, culture and cultivation of algae. Algae as food, industry, agriculture.   | 5  |   |    | 5           |
| <b>Unit- II<br/>Marks:17</b>   | <b>Bryophytes:</b><br>Theories of origin and evolution of bryophytes, biochemistry, physiology and ecology, diversity and distribution in north east India, Evolution of sporophytes and gametophytes, bryophytes as pollution indicator and monitoring, Morphological and reproductive diversity among different species of bryophytes such as Funaria, Sphagnum, Anthoceros                                                                                                                                                                   | 9  | 1 |    | 10          |
| <b>Unit-III<br/>Marks:18</b>   | <b>Pteridophytes:</b><br>Origin and evolution of pteridophytes, Telome theory, Stellar evolution, heterospory and origin of seed habit, morphology, anatomical and reproductive diversity among different species, Soral evolution of fern, gametophytic structure in eusporangiate and leptosporangiate fern, evolution of sex and economic importance. Prothallus.                                                                                                                                                                            | 13 | 2 |    | 15          |
| <b>Unit-IV<br/>Marks:18</b>    | <b>Gymnosperms &amp; Palaeobotany:</b><br>Classification and salient features of major taxa, characteristics, affinities and relationship of Ginkgoales, Coniferales, Taxales and Gnetales.<br>Geological time scale, theories of fossilization process, classification and nomenclature of fossil, technique of fossil study. General account of Psilophytales, Zosterophyales, Sphenophytales, Calamitales and Coenopteridales                                                                                                                | 13 | 2 |    | 15          |
| <b>Practicals<br/>Marks:25</b> | <ol style="list-style-type: none"> <li>1. Study of vegetative and reproductive parts of Helimida, Polysiphonia and Vaucheria.</li> <li>2. Study of vegetative and reproductive parts of Anthoceros, Polytrichum.</li> <li>3. Study of sorus structure of any Pteridophytes.</li> <li>4. Study of vegetative and reproductive structure of Cycas and Gnetum.</li> <li>5. Study of different types of fossil slides and Stones with characters &amp; classification.</li> <li>6. Excursion tour to Research organization (other state)</li> </ol> |    |   | 15 | ,           |

Total=60 classes

**Mode of Internal Assessment:** -1. Sessional examination-15 marks

2. Field trip, Excursion Tour, Seminar, quiz, Home assignment- 15 marks

**DETAILED SYLLABUS OF POST GRADUATE PROGRAMME**  
**Common syllabus of 2<sup>nd</sup> Semester (For one-year PG) and 4<sup>th</sup> Semester (For 2 -years PG)**

**Title of the Course: Ecology and Environment**

**Course code: BOT-DSC-553**

**Nature of the Course: MAJOR/ CORE-2.3/4.3**

**Total Credits: 04**

**Distribution of Marks: 100: Theory-45, Practical-25, Internal assessment-30**

**Course objectives:** The objective of this course is to provide knowledge to the students on various aspect of plant breeding, methods of crop improvement, quantitative inheritance, inbreeding depression and heterosis, crop improvement and breeding, biostatistics and evolution.

| UNITS                          | CONTENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | L  | T | P  | Total Hours |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|---|----|-------------|
| <b>Unit-I<br/>Marks:12</b>     | <b>Ecology &amp; Ecosystem:</b> Basic concept, Environmental factors, their interrelationship, Ecological Niche, habitat, limiting factors, Structure and functions of ecosystem, environmental pollution and threats to global ecosystem, pesticides and health hazards, Global climate change and different treaties.                                                                                                                                                                                                                      | 5  |   |    | 5           |
| <b>Unit- II<br/>Marks:15</b>   | <b>Plant population &amp; community:</b> Characteristics, carrying capacity, r-K selected population, Ecological amplitude, Adaptation, Methods of plant community study, Types and theories of plant Succession, Keystone and flagship species.                                                                                                                                                                                                                                                                                             | 9  | 1 |    | 10          |
| <b>Unit-III<br/>Marks:18</b>   | <b>Natural resources and conservation:</b> Forest and wetland resources, Solar energy, Hydroelectric power generation, Dams and impacts, Wind energy, Soil types, degradation and management, Concept of integrated water management.                                                                                                                                                                                                                                                                                                        | 13 | 2 |    | 15          |
| <b>Unit-IV<br/>Marks:15</b>    | <b>Modern tools and techniques of ecology:</b> Concept and application of Remote sensing, GIS, GPS. Environmental Impact Assessment, Environment protection Acts. Concept of geography of earth.                                                                                                                                                                                                                                                                                                                                             | 13 | 2 |    | 15          |
| <b>Practicals<br/>Marks:25</b> | 1. Estimation of frequency and compare with Raunkiaer's normal frequency class (Raunkiaer's law of frequency).<br>2. Estimation of Importance value index in herbaceous community.<br>3. Phenological study of any plant community.<br>4. Determination of life-form and biological spectrum of any plant community.<br>5. Determination of DO and BOD in any aquatic body.<br>6. Determination of N, P, K and S in soil by rapid test method.<br>7. Visit to any ecologically important area to observe topography, climate and vegetation. |    |   | 15 | 15          |

Total=60 classes

**Mode of Internal Assessment:** -1. Sessional examination-15 marks

2. Field trip, Excursion Tour, Seminar, quiz, Home assignment- 15 marks

## DETAILED SYLLABUS OF POST GRADUATE PROGRAMME

Common syllabus of 2<sup>nd</sup> Semester (For one-year PG) and 4<sup>th</sup> Semester (For 2 -years PG)

**Title of the Course: Applied Microbiology**

**Course code: BOT-DSC-554**

**Nature of the Course: MAJOR/ CORE-2.4/4.4**

**Total Credits: 04**

**Distribution of Marks: 100: Theory-45, Practical-25, Internal assessment-30**

**Course objectives:** Understand the diversity, physiology, and applications of microorganisms, Explain the principles of industrial microbiology and fermentation technology, Apply microbiological techniques for the isolation, cultivation, and identification of microorganisms, Evaluate the role of microorganisms in agriculture, environmental management, and bioremediation, Understand the applications of microorganisms in food, medical, and molecular microbiology, Develop practical and research skills in applied microbiology.

| UNITS                          | CONTENTS                                                                                                                                                                                                                                                                                                                                                                                    | L  | T | P  | Total Hours |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|---|----|-------------|
| <b>Unit-I<br/>Marks:15</b>     | <b>Microbial Diversity and Industrial Microbiology:</b> Microbial diversity; structure of bacteria, a brief account of viruses, viroids, prions, mycoplasma, rickettsia and chlamydia. microbial growth kinetics; microbial nutrition; microbial culture techniques; industrially important bacteria, fungi, algae and actinomycetes; microbial enzymes and metabolites; strain improvement | 11 | 1 |    | 12          |
| <b>Unit- II<br/>Marks:15</b>   | <b>Microbial Biotechnology and Fermentation Technology:</b> Principles of fermentation; fermenters and bioreactors; upstream and downstream processing; production of antibiotics, enzymes, vitamins, amino acids, organic acids, bioethanol and single-cell protein; quality control                                                                                                       | 10 | 1 |    | 11          |
| <b>Unit-III<br/>Marks:15</b>   | <b>Environmental and Agricultural Microbiology:</b> Soil microbiology; nitrogen fixation; phosphate solubilization; plant growth-promoting rhizobacteria (PGPR); biofertilizers; biopesticides; bioremediation; microbial degradation of pollutants; wastewater treatment; microbial biofilms, aeromicrobiology                                                                             | 9  | 2 |    | 11          |
| <b>Unit-IV<br/>Marks:15</b>    | <b>Medical, Food and Molecular Microbiology:</b> Food microbiology; food spoilage and preservation; probiotics; pathogenic microorganisms; biosafety; antimicrobial resistance; molecular diagnostic techniques (PCR, qPCR, ELISA); immunology, metagenomics; microbiome; recent advances in applied microbiology                                                                           | 10 | 1 |    | 11          |
| <b>Practicals<br/>Marks:25</b> | 1. Sterilization techniques and aseptic handling.<br>2. Preparation of microbiological media.<br>3. Isolation of microorganisms from soil, water and air.<br>4. Pure culture techniques and maintenance of cultures.                                                                                                                                                                        |    |   | 15 | 15          |

Total=60 classes

**Mode of Internal Assessment:** -1. Sessional examination-15 marks

2. Field trip, Excursion Tour, Seminar, quiz, Home assignment- 15 mark

## DETAILED SYLLABUS OF POST GRADUATE PROGRAMME

Common syllabus of 2<sup>nd</sup>Semester (For one-year PG) and 4<sup>th</sup>Semester (For 2-years PG)

**Title of the Course: Advanced Plant Taxonomy**

**Course code: BOT-DSC-555**

**Nature of the Course: MAJOR/ CORE-2.5/4.5**

**Total Credits: 04**

**Distribution of Marks : 100 (Theory-45, Practical-25, Internal assessment-30)**

**Course objectives:** The objective of this course is to develop knowledge of understanding taxonomic concept, can solve various aspect taxonomic problems and research, develop the skill of identification taxa by using modern tools in this field.

| UNITS                          | CONTENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | L  | T | P  | Total Hours |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|---|----|-------------|
| <b>Unit-I<br/>Marks:7</b>      | Basics of Taxonomy, Recent development of classificatory system in Angiosperms - APG System; Phenetic and Cladistic taxonomy.                                                                                                                                                                                                                                                                                                                                                                                                                    | 4  |   |    | 4           |
| <b>Unit- II<br/>Marks:17</b>   | <b>Modern Approach to Taxonomy:</b> Molecular Approach in taxonomy, Diagnostic tools, Polymerase Chain Reaction (PCR) analysis, applications of molecular markers in plant taxonomy. Computers and taxonomy- Documentation and data processing. Molecular plant taxonomy scope, tools and techniques.                                                                                                                                                                                                                                            | 10 | 1 |    | 10          |
| <b>Unit-III<br/>Marks:18</b>   | <b>Botanical Nomenclature:</b> Principles and major rules, Typification, Effective and Valid Publication, Authors' Citation, Principles of Priority and Limitations, synonym, basionym, tautonym, homonym; nominaconservanda, rejection of names, illegitimate names.<br><b>Plant Conservation:</b> Endemism; IUCN; Endemic, Exotics and RET Plants of North-East India and their conservation.<br><b>Plant Identification:</b> Identification and Documentation; Construction of Botanical keys; Preparation of a flora.                        | 13 | 2 |    | 13          |
| <b>Unit-IV<br/>Marks:18</b>    | <b>Taxonomic Literatures:</b> Flora, Manuals, Monograph, Revision, Icon, Periodicals.<br><b>Herbaria and Botanical Gardens:</b> Herbarium techniques; Roles of herbaria and botanical gardens, important herbaria and botanical gardens, Botanical Survey of India.<br><b>Biosystematics:</b> Methods, categories and importance; Role of computers in taxonomic studies, commonly available software.<br><b>Phylogeny and Evolution of Angiospermic Taxa:</b> Magnoliales, Euphorbiales, Lamiales, Asterales, Orchidales, Poales, Zingiberales. | 13 | 2 |    | 13          |
| <b>Practicals<br/>Marks:25</b> | 1. Herbarium Preparation of locally available Angiosperm plants (20 nos).<br>2. Practices on Nomenclatural problems<br>3. Practices on identification of live/herbarium specimens/ molecular identification.<br>4. Online validation of nomenclature of collected plants.                                                                                                                                                                                                                                                                        | 20 |   | 15 | 20          |

Total=60 classes

**Mode of Internal Assessment:** -1. Sessional examination-15 marks

2. Field trip/Excursion Tour, Seminar, quiz, Home assignment- 15 marks

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