

**DEPARTMENT OF BOTANY**  
**B N COLLEGE (AUTONOMOUS), DHUBRI,**  
**ASSAM**

## Department of Botany

Semester: 1<sup>st</sup> Semester

Paper Name: Biodiversity (Algae, Fungi, Archegoniates and Angiosperms)

Paper Code: BOT-DSC-141

Theory Credit: 03

Lecture: 45

Hours: 45

Practical Credit: 01

Lecture: 15

Hours: 30

Full Marks: 100 (75T+ 25P)

### Course Outcome:

CO1: Understanding of general characters, structure, reproduction and economic importance of Algae, Fungi, Lichen, Bryophytes and Pteridophytes.

CO2: Understanding of general characters, structure, reproduction and economic importance of Gymnosperms and Angiosperms and their affinities.

CO3: Knowledge to recognise and analyze various groups of plants through morphological / anatomical analysis.

### Theory: Credit 03

Unit	Syllabus	Class Hour	Allotted Marks
1. Algae	General character ,cell structure, range of thallus structure ,reproduction , classification (with special reference of F.E. Fritsch) and economic importance of Algae, a brief account on <i>Nostoc</i> , <i>Chara</i> ,and <i>Ectocarpus</i>	7	12
2. Fungi & Lichen	General character, cell structure ,reproduction , classification and economic importance of Fungi , a brief account on <i>Mucor/ Rhizophus</i> ( Phycomycetes), <i>Puccinia</i> ( Basidiomycetes) <i>Alternaria</i> ( Deuteromycetes) A brief account on structure, types and economic importance of Lichen.	9	15
3. Bryophytes	General character, cell structure ,reproduction , classification and economic importance, Evolution of sporophyte of Bryophytes, a brief account on <i>Marchantia</i> , <i>Anthoceros</i> and <i>Polytrichum</i> with special reference to Sphagnum	7	12
4. Pteridophytes	General characters, cell structure, reproduction, classification and economic importance, heterospory and seed habit, stelar organization of Pteridophytes. A brief account on <i>Psilotum</i> , <i>Lycopodium/ Selaginella</i> and <i>Dryopteris</i> , ecological and economical importance.	7	12
5. Gymnosperms:	General characteristics, Classification. Morphology, anatomy and reproduction of <i>Cycas</i> , <i>Pinus</i> and <i>Gnetum</i> , ecological and economical importance.	7	11

<b>6. Angiosperms:</b>	General features, Artificial, Natural and Phylogenetic system of classification; Detail study of the following families: Magnoliaceae, Asteraceae, Orchidaceae.	8	13
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**Practical: (Credit: 01)**

Unit	Syllabus	Class Hours	Allotted Class
1.	Study of vegetative and reproductive structure of <i>Nostoc</i> , <i>Chara</i> and <i>Ectocarpus</i> with semi- permanent preparation of slides.	30	15
2.	Study of vegetative and reproductive structure of <i>Mucor</i> / <i>Rhizopus</i> and <i>Puccinia</i> with semi- permanent preparation of slides.		
3.	Study of morphology and reproductive structure of <i>Marchantia</i> and <i>Polytrichum</i> with semi-permanent preparation of slides.		
4.	Study of morphology and reproductive structure of <i>Lycopodium</i> / <i>Selaginella</i> and <i>Dryopteris</i> semi-permanent preparation of slides.		
5.	Study of morphology and reproductive structure of <i>Cycas</i> , <i>Pinus</i> and <i>Gnetum</i> . (Permanent slide preparation of <i>Cycas</i> leaflet and <i>Pinus</i> needle.		
6.	Herbarium preparation of locally available plants of family Asteraceae.		

**Reference Books:**

1. Sharma, P.D. (2009). Microbiology, latest edition, Rastogi Publication, Meerut.
2. Vasistha B.R. (2017). Botany for Degree Students **Algae**, latest edition, S. Chand Publication, New Delhi.
3. Vasistha B.R. (2017). Botany for Degree Students **Fungi**, latest edition, S. Chand Publication, New Delhi.
4. Vasistha B.R. (2017). Botany for Degree Students **Bryophytes**, latest edition, S. Chand Publication, New Delhi.
5. Vasistha P.C. (2017). Botany for Degree Students **Pteridophytes**, latest edition, S. Chand Publication, New Delhi.
6. Vasistha P.C. (2017). Botany for Degree Students **Gymnosperms**, latest edition, S. Chand Publication, New Delhi.
7. Sharma O.P. ( 2016) , Plant Taxonomy, Mc Graw Hill Education ( India) Pvt. Ltd., New Delhi
8. Fritsch F.E .(2017), The structure and reproduction of Algae (Vol.i), latest edition, Cambridge University press
9. Alexopoulos ,C.J(1995) , Introduction to Mycology(4th edition), Wiley , New york
10. Lee, R.E (2018), Phycology, 5th edition, Cambridge University Press

**Department of Botany**

**Semester: 1<sup>st</sup> Semester**

**Paper Name: SEC 01 (Nursery and Gardening)**

**Paper Code: BOT- SEC-131**

**Credit: 02 (Theory)**

**Hours: 30**

**Lecture: 30**

**Credit: 01 (Practical)**

**Hours: 30**

**Lecture: 15**

**Full Marks: 75**

**Course outcome:**

CO1: Understanding the objectives, scopes and requirements of infrastructure of Nursery.

CO2: Knowledge on seed dormancy, seed storage and seed production technology.

CO3: Knowledge on various methods of vegetative propagation and maintenance of plants in green house.

CO4: Understanding the objective, scope, features and different types of Gardening.

**Theory: Credit 02**

Unit		Class Hours	Marks
<b>1. Nursery</b>	Definition, objectives, scope and infrastructure needed for nursery, planning and seasonal activities –Planting ( direct seeding and transplants ).	<b>5</b>	<b>8</b>
<b>2. Structure and types of seed</b>	Seed storage; seed bank, factors affecting seed viability, seed production technology-seed testing and certification.	<b>5</b>	<b>8</b>
<b>3. Vegetative propagation method</b>	Air-layering, cutting, collecting season, treatment of cutting, rooting medium and planting of cutting, hardening of plants.	<b>5</b>	<b>9</b>
<b>4. Gardening:</b>	Definition, objective and scope. Features of a garden (Garden wall, Fencing, Steps, Hedge, Lawn, Edging, Lawn, Flower beds, Shrubbery, Borders).	<b>7</b>	<b>12</b>
<b>5. Different types of gardening</b>	Landscape, home and park with special reference to – English garden, Mughal garden, French garden and Japanese garden.	<b>8</b>	<b>13</b>

**Practical: Credit 01 (25 marks)**

Unit	Syllabus	Class Hours	Allotted Class
1.	Study of morphology of different types of seed (Dicot and Monocot) at least three types each.	<b>30</b>	<b>15</b>
2.	Vegetative propagation methods- cutting and layering methods.		
3.	Different grafting techniques. ( Demonstration)		
4.	Institutional visit, Field/Nursery visit. (04)		
5.	Field Report. (06)		

**Reference Books:**

1. Agrawal, P.K. 1993, Hand Book of Seed Technology, Dept. of Agriculture and Cooperation, National Seed Corporation Ltd., New Delhi.
2. Bose T.K. & Mukherjee, D., 1972, Gardening in India, Oxford & IBH Publishing Co., New Delhi.
3. Edmond Musser & Andres, Fundamentals of Horticulture, McGraw Hill Book Co., New Delhi.
4. Janick Jules. 1979. Horticultural Science. (3rd Ed.), W.H. Freeman and Co., San Francisco, USA.
5. Kumar, N., 1997, Introduction to Horticulture, Rajalakshmi Publications, Nagercoil.
6. Sandhu, M.K., 1989, Plant Propagation, Wile Eastern Ltd., Bangalore, Madras.

**Name of the Department: Botany**  
**Semester: 1<sup>st</sup> Semester**  
**Paper Name: MDC 01 (Basics in Plant Sciences)**  
**Paper code: BOT-MDC-131**

**Theory Credit: 03**

**Hours: 45**

**Lecture: 45**

**Full Marks: 75**

**Course outcome:**

CO1: Detailed knowledge on microbes, virus and bacteria.

CO2: Knowledge and understanding of the characteristics, distribution, classification, reproduction, and current status of various microbial and plant communities.

CO3: Knowledge and understanding of Gymnosperms and Angiosperms - their differences and affinities.

Unit No.	Syllabus	Class Hour	Allotted Marks
<b>1.Microbes</b>	General features, reproduction and economic importance of virus and bacteria.	9	15
<b>2. Algae</b>	General character ,cell structure, range of thallus structure ,reproduction , classification and economic importance of Algae,	6	10
<b>3. Fungi</b>	General character, reproduction, classification and economic importance of Fungi.	6	10
<b>4.Bryophytes</b>	General character, cell structure, reproduction, classification and economic importance.	6	10
<b>5.Pteridophytes</b>	General character, reproduction, classification and economic importance.	6	10
<b>6.Gymnosperms</b>	General characteristics, classification. morphology, anatomy, reproduction and economical importance.	6	10
<b>7. Angiosperms</b>	General features, Artificial, Natural and Phylogenetic system of classification.	6	10

**Reference Books:**

1. Sharma, P.D. (2009). Microbiology, latest edition, Rastogi Publication, Meerut.
2. Vasistha B.R. (2017). Botany for Degree Students **Algae**, latest edition, S. Chand Publication, New Delhi.
3. Vasistha B.R. (2017). Botany for Degree Students **Fungi**, latest edition, S. Chand Publication, New Delhi.
4. Vasistha B.R. (2017). Botany for Degree Students **Bryophytes**, latest edition, S. Chand Publication, New Delhi.
5. Vasistha P.C. (2017). Botany for Degree Students **Pteridophytes**, latest edition, S. Chand Publication, New Delhi.

6. Vasistha P.C. (2017). Botany for Degree Students **Gymnosperms**, latest edition, S. Chand Publication, New Delhi.
7. Sharma O.P. ( 2016) , Plant Taxonomy,Mc Graw Hill Education ( India) Pvt. Ltd., New Delhi

**Department of Botany**

**Semester: 2<sup>nd</sup> Semester**

**Paper Name: Microbes, Cell Biology & Biomolecules**

**Paper Code: BOT-DSC-142**

**Theory Credit: 03**

**Lecture: 45**

**Hours: 45**

**Practical Credit: 01**

**Lecture: 15**

**Hours : 30**

**Full Marks: 100 (75T+ 25P)**

**Course Outcome:**

CO1: Knowledge on microbes, virus and bacteria.

CO2: Detailed knowledge on the structure, properties, types and functioning of a cell and its components, cell organelles, cell division and cell cycles.

CO3: Basic knowledge and understanding the properties, classification, structure and biological importance of carbohydrate, protein, lipids and amino acids.

CO4: Basic knowledge on structure, function and types of DNA and RNA.

CO5: Basic practical knowledge on structure of bacteria, virus, cell and cell division.

Unit No.	Syllabus	Class Hour	Allotted Marks
1. Microbes	General characters, economic importance of virus, T phase and TMV virus, reproduction (Lytic and Lysogenic life cycle) General characters, economic importance, cell structure and reproduction conjugation, transformation and transduction of Bacteria.	6	10
2. Cell, Cell wall & Plasma membrane	Cell as a structure and functional unit; Characteristics of prokaryotic and eukaryotic cells; Cell theory (Endosymbiotic theory); Cytoskeleton, Cell division: Phases of cell cycle, mitosis and meiosis; Regulation of cell cycle.  Chemistry, structure and function of Plant cell wall. Overview of Chemical composition, membrane function of plasma membrane; fluid mosaic model; Membrane transport – Passive, active and facilitated transport.	10	17
3. Cell organelles:	Nucleus: Structure-nuclear envelope, Organization of chromatin, Nucleolus, Ribosome, Chloroplast, Mitochondria, Peroxisomes, Endoplasmic Reticulum, Golgi Apparatus, and Lysosomes.	8	13



<b>4. Carbohydrates and Lipids:</b>	Carbohydrates: Nomenclature and classification. Lipids: Definition and major classes of storage and structural lipids; Structure, properties and functions of Essential fatty acids.	7	11
<b>5.Amino acids and Proteins</b>	Structure and classification of amino acids; Levels of protein structure (primary, secondary, tertiary, and quaternary); Protein denaturation and biological roles of proteins.	7	12
<b>6. Nucleic acids</b>	Structure of nitrogenous bases; Structure and function of nucleotides; Types of nucleic acids; Structure of A, B, Z types of DNA; Types of RNA.	7	12

### **PRACTICAL: Credit 01**

<b>Unit</b>	<b>Syllabus</b>	<b>Class Hours</b>	<b>Allotted Class</b>
<b>1.</b>	Study of structure of TMV and Bacteriophages (Photograph)	<b>30</b>	<b>15</b>
<b>2.</b>	Gram Staining (Curd/ Root nodule)		
<b>3.</b>	Study of plant cell structure with the help of epidermal peel mount Onion, Rheo/ <i>Tradescantia</i> leaf		
<b>4.</b>	Study of different stages of mitosis and meiosis (using root tip and flower bud of onion)		
<b>5.</b>	Counting the cells per unit volume with the help of haemocytometer (yeast/pollen grain)		
<b>6.</b>	Qualitative tests for carbohydrates, lipids and proteins		
<b>7.</b>	Ultra structure of mitochondria, chloroplast, nucleus, endoplasmic reticulum, DNA and RNA.		

### **Reference Books:**

1. Berg JM, Tymoczko JL and Stryer L (2011) Biochemistry, W.H. Freeman and Company.
2. Campbell MK (2012) Biochemistry, 7th Edition. Published by Cengage Learning
3. Campbell PN, Smith AD (2011) Biochemistry Illustrated, 4th Edition, Published by Churchill Livingstone.
4. Cooper GM, Hausman RE (2009) The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
5. Hardin J, Becker G, Skliensmith LJ (2012) Becker's World of the Cell, Pearson Education Inc. U.S.A. 8th Edition.
6. Karp G (2010) Cell Biology, John Wiley & Sons, U.S.A. 6th Edition.
7. Nelson DL, Cox MM (2008) Lehninger Principles of Biochemistry, 5th Edition, W.H. Freeman and Company.
8. Tymoczko JL, Berg JM and Stryer L (2012) Biochemistry: A short course, 2nd Edition, W.H. Freeman.
9. Pelczar MJ (2001) Microbiology, 5th edition. New Delhi, Delhi: Tata McGraw-Hill Co.
10. Tortora GJ, Funke BR, Case CL (2007) Microbiology. San Francisco, U.S.A: Pearson Benjamin Cummings.

**Department of Botany**

**Semester: 2<sup>nd</sup> Semester**  
**Paper Name: SEC 2 (Biofertilizers)**  
**Paper Code: BOT-SEC-132**

**Theory Credit: 02**  
**Hours: 30**  
**Lecture: 30**

**Practical Credit: 01**  
**Practical Hours: 30**  
**Lecture: 15**

**Full Marks: 75 (50T+ 25P)**

**Course Outcome:**

1. Basic knowledge about various types of biofertilizers, their identification and classification.
2. Understanding the process of isolation and multiplication of *Azospirillum* and *Azotobacter*.
3. Knowledge to analyze Mycorrhizal association and their role in plant growth.
4. Understanding the importance of organic farming, green manuring, biocomposting and recycling of biodegradable waste material.

**Theory: Credit 02**

Unit no	Syllabus	Class hour	Marks
<b>1.Biofertilizer:</b>	Definition, types of Biofertilizer ; uses, methods of applying Biofertilizers , advantages and disadvantages of Biofertilizers.	<b>5</b>	<b>8</b>
<b>2.Azospirillum:</b>	Isolation and mass multiplication – carrier based inoculant, associative effect of different microorganisms. <i>Azotobacter</i> : classification, characteristics – crop response to <i>Azotobacter</i> inoculum, maintenance and mass multiplication.	<b>6</b>	<b>10</b>
<b>3.Cyanobacteria (BGA),</b>	<i>Azolla</i> and <i>Anabaena azollae</i> association, process of nitrogen fixation, blue green algae and <i>Azolla</i> in rice cultivation.	<b>5</b>	<b>8</b>
<b>4. Mycorrhizal association</b>	Types of mycorrhizal association, taxonomy, occurrence and distribution, phosphorus nutrition, growth and yield – colonization of VAM – isolation and inoculum production of VAM, and its influence on growth and yield of crop plants.	<b>7</b>	<b>12</b>
<b>5.Organic farming</b>	Green manuring and organic fertilizers, recycling of bio-degradable municipal, agricultural and Industrial wastes – biocompost making methods, types and method of vermicomposting – field Application.	<b>7</b>	<b>12</b>

**Practical: Credit 01**

Unit	Syllabus	Class Hour	Allotted Class
1	Study of <i>Rhizobium</i> from the root nodules of leguminous plants by Gram Staining method.	30	15
2	Photograph/ live-specimen/ preserved specimen : <i>Azospirillum</i> , Cyanobacteria, mycorrhiza (VAM)		
3	Demonstration on Bio-composting		
4	Field visit to Biofertilizer producing unit and submission of Field Report. ( 04+06)		

**Reference Books:**

1. Dubey, R.C., 2005 A Text book of Biotechnology S.Chand & Co, New Delhi.
2. John Jothi Prakash, E. 2004. Outlines of Plant Biotechnology. Emkay Publication, New Delhi.
3. Kumaresan, V. 2005, Biotechnology, Saras Publications, New Delhi.
4. Sathe, T.V. 2004 Vermiculture and Organic Farming. Daya publishers.
5. Subha Rao, N.S. 2000, Soil Microbiology, Oxford & IBH Publishers, New Delhi.
6. Vayas,S.C, Vayas, S. and Modi, H.A. 1998 Bio-fertilizers and organic Farming Akta Prakashan, Nadiad

**Department of Botany**

**Semester: 2<sup>nd</sup> Semester**

**Paper Name: MDC 2 (Plant Biodiversity and Conservation)**

**Paper Code: BOT-MDC-132**

**Theory Credit: 03**

**Hours: 45**

**Lecture: 45**

**Full Marks: 75**

**Course Outcome:**

CO1: Knowledge of plant diversity at genetic, species and ecosystems level.

CO2: Understanding the importance of biodiversity, causes of biodiversity loss and conservation strategies.

CO3: Knowledge on various associations/organizations associated with biodiversity conservation.

CO4: Understanding Phytogeographical regions of India, importance of sustainable development in the present context.

Unit No.	Syllabus	Class hour	Marks
<b>1.Biodiversity</b>	Definition, genetic, species and ecosystem diversities; Biodiversity Hotspot: concept and Hotspot areas of Indian Biodiversity.	<b>8</b>	<b>13</b>
<b>2.Phytogeography</b>	Definition, concept, Phytogeographical region of India.	<b>8</b>	<b>13</b>
<b>3. Threat to Biodiversity</b>	Habitat loss, Loss of genetic diversity, loss of species diversity, loss of ecosystem. Threat to biodiversity with special reference to NE-India.	<b>9</b>	<b>15</b>
<b>4. Conservation of Biodiversity</b>	Conservation of genetic biodiversity, species diversity and ecosystem, <i>In-situ</i> (Sanctuaries, National Parks, Biosphere Reserves) and <i>Ex-situ</i> (Gene bank, seed bank and cryopreservation) conservation, Social approaches to conservation, organizations associated with biodiversity management – methodology for execution, IUCN, UNEP, UNESCO, WWF, NBPGR .	<b>12</b>	<b>20</b>
<b>5. Sustainable development</b>	Definition and concept of sustainable development, Tragedy of Commons.	<b>8</b>	<b>14</b>

### **Reference Books:**

1. Sharma, P.D., (12<sup>th</sup> edition, 2015). Ecology and Environment, Rastogi Publications, Meerut.
2. Singh, J. S., Singh, S.P. and Gupta, S. (2006). Ecology, Environment and Resource Conservation. Anamaya Publications, New Delhi.
3. Rogers, P.P., Jalal, K.F. and Boyd, J.A. (2008). An Introduction to Sustainable Development. Prentice Hall of India Private Limited, New Delhi.
4. Environmental Protection and Laws by Jadhav and Bhosale, V.M.Himalaya publ. House 13. Biodiversity Assessment and Conservation by PC Trivedi, Agrobios publ.

