

**Department of Botany**  
**Lakhimpur Girls' College**

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**Programmes Offered:**

**A. Bachelor of Science in Botany:-**

The Department of Botany is offering three year Bachelor of Science in Botany. The Programme comprises of total 6 (six) semesters viz. 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup>. For imparting the programme based learning experiences, the syllabus of Dibrugarh University is being adopted. In terms of end semester evaluation and grading Choice Based Credit System (CBCS) as prescribed by the Dibrugarh University is being followed.

**Under Choice Based Credit System (CBCS)**

**Programme Outcomes (Bachelor of Science in Botany)**

**Programme Outcomes (PO) :-**

**PO1. Knowledge and understanding:-**

1. Diversity of plants in terms of structure, function, reproduction and ecological roles.
2. The evaluation and assessment of plant diversity.
3. Plant systematics and classification including flora of India with special reference to Assam and major biomes of the world.
4. The role of plants in the functioning of the global ecosystem.
5. Application of Statistics in biological data.
6. Application of computer and bioinformatics- utilization of biological data in different branches of biological science.

**PO2. Intellectual skills – able to:-**

1. Logical interpretation of ideas and concepts into an organized form.
2. Accumulate and organize knowledge and ideas through reading and searching in internet
3. Transformation of knowledge based concepts from one area to another within the subject.
4. Plan, hypothesis and test.
5. Propose and carry out independent survey or research in various areas of the subject.

**PO3. Practical skills:-**

Giving opportunities to students to conduct experiments practically both in field and laboratory. Hands on practical helps the students to gain proficiency and skills in different topics of modules offered to them.

1. Study of plant morphology and anatomy.
2. Character correlation for Plant identification.
3. Study of structure and composition of vegetations.
4. Phyto-chemical analyses of plant materials to establish the presence of various biochemical's with reference to plant physiology and biochemistry.
5. Study of plant diseases and their control measures with reference to economic crops.
6. Accumulation and analysis of biological data using statistical methods.
7. Knowledge and use of computers.
8. To develop the knowledge of sustainable utilization of plant resources in different field.

**PO4. Transferable skills:-**

1. Use of information technology for accumulation and sharing of data.
2. Dissemination of scientific ideas in writing and orally.
3. Creation of team spirit.
4. Access of library resources.
5. Regularity, punctuality, devotion and Career planning.

**PO5. Scientific Knowledge:-**

Use of principles of basic science and fundamental process to study and analyze the plant forms.

**PO6. Problem analysis:-**

Recognize and solve the problems of the plant world, Extraction of research literature, Formulate independent research related to Botany.

**PO7. Design/development of solutions:-**

Formulate new concepts for a green world, sustainable development, betterment of human health specifically from medicinal plants, new formulation of phyto-chemical contents to meet specific need and ecofriendly environment. Application of indigenous knowledge in medicinal and pharmacognosical field .

**PO8. Modern tool usage:-**

Select and application of proper techniques and modern instruments for Biochemical experiments, Molecular Biology, Biotechnology, in vitro culture techniques, cytogenetical and physiological activities of plants.

**PO9. The Botanist and society:-**

Apply resource based knowledge to assess and access plant diversity, its importance for society and ecology, health and hazards, legal and environmental issues and conservation of biodiversity practice with responsibility

**PO10. Environment and sustainability:-**

Aware and understand the role of the plants in environmental issues, and propagate the knowledge for sustainable development.

**PO11. Ethics:-**

Application of moral and ethical principles to mitigate environmental issues and biodiversity conservation.

**PO12. Individual and team work:-**

Work with responsibilities as an individual, or as a member or leader in team works, or in multidisciplinary approaches.

**PO13. Communication:-**

Communicate effectively the scientific temperaments for the betterment of the society, propagate effective reports, proper documentation, effective presentations, and deliver clear instructions.

**Programme Specific Outcomes: B.Sc. Botany :****Under Choice Based Credit System (CBCS)****Paper I: BOT-BC-101T Microbiology and Phycology (Semester - I Core)**

1. Understand the microbial diversity along with its mode of nutrition, reproduction and its economic importance.
2. Know the role of microbe in the maintenance of the ecological imbalance.
3. Know the importance of microbes in modern research and its application.
4. Knowledge on the systematics of viruses, algae, bacteria and their various metabolic processes.
5. Understand the difference between beneficial and harmful viruses or bacteria.
6. Understand the high industrial application of microbes based on the metabolite it develops which are useful for the human application in various fields of medicine and nutrient.
7. Role of beneficial or harmful viruses in research, medicine and diagnostics, as causal organisms of plant diseases.

### **Practical BC101 P- Microbiology and Phycology (Semester - I Core)**

1. Develop the practical knowledge on models of viruses and their life cycles by having a clear observation of the models.
2. Practical knowledge on the structure, reproduction of bacteria and its know the staining of the gram positive and gram negative bacteria, thus further help in the differentiation among them.
3. Practical understanding of soil micro flora and its isolation procedure

### **Paper-II: BOT-BC-102T Biomolecules and Cell Biology :-(Semester - II Core)**

1. Knowledge on the different bonding pattern among the chemical compounds and further understand the polar compounds.
2. Understand the significance of pH, buffers and their role in biological metabolism.
3. Understand the structure, types and importance of different biomolecules (Lipids, Carbohydrates, Nucleic Acids, Protein)
4. Develop the concept on various bioenergetics reactions and its mechanism under various conditions.
5. Understand the different redox reactions and the mechanism of ATP serving as the currency molecule.
6. The students will be able to understand the fundamental biochemical principles of enzymes, such as the structure and function of enzymatic process in living system.
7. Understand the structure and chemical composition of chromatin and concept of cell division.
8. Gain knowledge about "Cell Science"
9. Understand Cell wall Plasma membrane, Cell organelles and cell division.

### **Practical –BC102P: Biomolecules and Cell Biology :- (Semester - II Core)**

1. Gain practical knowledge to detect the presence of different biomolecules and differentiate among them through various qualitative tests based on their color variation.
2. Understand the different staining procedure of various cells and know the usage of different stains
3. Understand the types of cells and their structure.
4. Knowledge on the physiological phenomenon of cells in different osmotic conditions.
5. Practical observation of different stages of cell division and gain a clear concept on the cell cycle and its various steps.

### **Paper-III: BOT-BC-203T –Mycology and Phytopathology (Semester - II Core)**

- 1- Understand the world of microbes, fungi and Mycorrhiza.
- 2- Appreciate the adaptive strategies of the microbes and fungi .

3- To study the economic and pathological importance of microorganisms.

**Practical-BC-203P –Mycology and Phytopathology**

**(Semester – II Core)**

1. Develop the practical knowledge on different groups of fungi and their staining procedure.
2. Practical knowledge on the structure, reproduction of fungi and phaneroplasmodium..
3. Practical on different viral and bacterial plant diseases.

**Paper-IV: BOT-BC-204T – Archegoniate**

**(Semester - II Core)**

On completion of the course, students are able to:

1. Understand the morphological diversity of Bryophytes, Pteridophyteand Gymnosperms.
2. Understand the economic importance of the Bryophytes, Pteridophytes and Gymnosperms.
3. Learn about the process of fossilization and early land plants.

**Practical: BOT-BC-204P – Archegoniate**

**(Semester - II Core)**

- 1) Develop the practical knowledge on different groups of Bryophyte and Pteridophyte.
- 2) Develop the practical knowledge of the anatomical and morphological structure of Gymnospermic plants.
- 3) Field study offers an opportunity for a rich immersion experience and a tremendous way to facilitate learning.

**Paper-V: BOT-BC-305T – Anatomy of Angiosperms**

**(Semester – III Core)**

- 1) Understand plant communities and ecological adaptations in plants.
- 2) Know about the different tissue and tissue system.
- 3) Understand about relation between anatomy and taxonomy.

**Practical BOT-BC-305P – Anatomy of Angiosperms**

**(Semester – III Core)**

- 1) Develop the practical knowledge on adaptive anatomy of Xerophytes, Hydrophytes& epiphyte.
- 2) Practical knowledge about the distribution and types of stomata and trichomes.
- 3) Practical knowledge about different Secretory tissue and Kranz anatomy of C<sub>4</sub> plants.

**Paper-VI( BOT-BC-306T – Economic Botany.**

**(Semester – III Core)**

- 1) Understand the role plants in human welfare.
- 2) Gain knowledge about various plants of economic use.
- 3) Know importance of plants & plant products.
- 4)Understand the chemical contents of the plant products

**Practical BOT-BC-306P – Economic Botany.**

**(Semester – III Core)**

- 1) Micro-chemical test of different plant seeds.
- 2) Know practically about rubber tapping.
- 3) Understand about the habit and morphology of Drug-yielding and fiber yielding plants.

**Paper-VII: BOT-BC-307T – Genetics**

**(Semester – III Core)**

1. Understand the Mendelian genetics and its extension.
2. Understand the process of synthesis of proteins and role of genetic code in polypeptide formation.
- 3) Understand the variation in chromosome number and structure.
- 4) Learn about the process of Gene mutation and evolutionary Genetics.

**Practical BOT-BC-307P – Genetics**

**(Semester – III Core)**

- 1) Practical knowledge about Mitosis and Meiosis cell division.
- 2) Understand about the human genetic traits.
- 3) Practical knowledge about Mendel's laws.

**Paper-VIII: BOT-BC-408T – Molecular Biology**

**(Semester – IV Core)**

- 1) Learn the scope and importance of molecular biology.
- 2) Understand the biochemical nature of nucleic acids, their role in living systems, experimental evidences to prove DNA as a genetic material.
- 3) Learn about the processing and modification of RNA.
- 4) Learn about the central dogma and genetic code.

**Practical BOT-BC-408P – Molecular Biology**

**(Semester - IV Core)**

- 1) DNA estimation by UV Spectrophotometry.
- 2) Study of structure of prokaryotic RNA polymerase and eukaryotic RNA polymerase.
- 3) Preparation of LB medium and raising *E.Coli*.

**Paper-IX: BOT-BC-409T – Plant Ecology and Phytogeography. (Semester - IV Core)**

- 1). Know the different ecological factors such as abiotic and biotic factors
- 3) Understand the adaptations of the plants to various conditions or stress
- 4) Understand the concept of ecosystem and its functioning
- 5) Know the flow of energy in the nature through food chain, trophic level or food web
- 6) Know the phyto-geographical regions of India and North-East.

**Practical BOT-BC-409P – Plant Ecology and Phytogeography.****(Semester - IVCORE)**

- 1) Practically they are able to understand the anatomical modifications of the plants for various stress created by the nature itself
- 2) Understand the methods of determination plant vegetation richness
- 3) Quantitative analysis of herbaceous vegetation of Lakhimpur Girl's College.
- 4) Determination of pH of soil of the college campus and its surrounding areas.

**Paper-X: BOT-BC-410T – Plant Systematics****(Semester - IVCORE)**

1. Understand the plant morphology and basic taxonomy
2. Know the vegetative characteristics of the plant.
3. Know the concept of methodology in taxonomy.
4. Know the conceptual development of taxonomy and systematic.
5. Understand the Phylogeny of angiosperms -A general account of the origin of Angiosperms

**Practical: BOT-BC-410P – Plant Systematics****(Semester – IVCORE)**

1. Gain knowledge about various plants of economic use.
2. Understand the chemical contents of the plant products.
3. Know the technique of herbarium preparation and its importance.

**Paper-XI: BOT-BC-511T – Reproductive Biology of Angiosperms****(Semester - VCore)**

- 1) Know the different Indian embryologists contributions to the field of plant science
- 2) Understand the development of male and female gametophyte, double fertilization and triple fusion among the angiosperms.
- 3) Understand the different agents involved in the pollination and its significance
- 4) Know apomixis and polyembryony and their significance in the plant developmental biology
- 5) Understand the pollen morphology of the angiosperms.

**Practical-BOT-BC-511P – Reproductive Biology of Angiosperms****(Semester - VCore)**

- 1) Practical knowledge about Intra-ovarian pollination.
- 2) Practical knowledge about types of ovule.
- 3) Know about the calculation of percentage of pollen germination in different media using Hanging drop method.

**Paper-XII: BOT-BC-512T – Plant Physiology****(Semester - VCore)**

- 1) Learn and understand about mineral nutrition in plants.

- 2) Understand the growth and developmental processes in plants.
- 3) Understand the plants and plant cells in relation to water.
- 4) Understand the rate of transpiration and its significance in plants
- 5) Learn about the movement of sap and absorption of water in plant body
- 6) Understand the process of translocation of solutes in plants
- 7) Understand the plant movements.

**Practical: BOT-BC-512P – Plant Physiology.**

**(Semester – V Core)**

- 1) Know about the osmotic potential of plant cell sap.
- 2) To study the effect of different concentration of IAA on *Avena* coleoptiles elongation.
- 3) To study the induction of amylase activity in germinating Barley grains.
- 4) To study the effect of wind velocity and light on the rate of transpiration.

**Paper-XIII: BOT-BC-613T – Plant Metabolism.**

**(Semester – VI Core)**

- 1) Understand the process of photosynthesis in higher plants with particular emphasis on light and dark reactions, C<sub>3</sub> and C<sub>4</sub> pathways.
- 2) Understand the respiration in higher plants with particular emphasis on aerobic and anaerobic respiration.
- 3) Understand the mechanism of ATP synthesis.
- 4) Know about the concept of metabolism.
- 5) Understand the mechanism of signal transduction.

**Practical: BOT-BC-613P – Plant Metabolism.**

**(Semester – VI Core)**

- 1) Chemical separation of photosynthetic pigments.
- 2) To study the activity of lipases in germinating oil seeds.
- 3) To study the absorption spectrum of photosynthetic pigments.
- 4) To compare the rate of respiration in different parts of plants.

**Paper-XIV: BOT-BC-614T – Plant Biotechnology.**

**(Semester – VI Core)**

- 1) Understand the fundamentals of Recombinant DNA Technology.
- 2). Know about the Genetic Engineering.
- 3) Understand the principle and basic protocols for Plant Tissue Culture.
- 4) Understand the applications of biotechnology for human welfare



- 5) Know the gene mapping, DNA finger printing, and production of monoclonal antibodies.
- 6) Understand the importance of Transgenic plants.

**Practical: BOT-BC-614P – Plant Biotechnology.**

**(Semester – VI Core)**

- 1) Study of anther, embryo and endosperm culture.
- 2) Study of gene transfer through photograph.
- 3) Study of steps of genetic engineering for production of Bt Cotton, Golden rice.
- 4) Isolation of plasmid DNA.

**ELECTIVES (Discipline Specific)**

**Under Choice Based Credit System (CBCS)**

**Paper-DSE : BOT-BD-501T – Analytical Technique in Plant Science.(Semester – V Core)**

- 1) Know the details of Microscopy- Principles of light microscopy, electron microscopy (TEM and SEM).
- 2) Understand the methods used in Micrometry, Microtomy and Microphotography.
- 3) Know about Radioisotopes & Spectrophotometry.
- 4) Know about TLC, GLC, HPLC and ion-exchange chromatography.
- 5) know about Bio-statistical analysis such as mean, median mode etc.

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**Practical-DSE : BOT-BD-501P – Analytical Technique in Plant Science.(Semester – V Core)**

- 1) Separation of Nitrogenous base by paper Chromatography.
- 2) To separate proteins using PAGE.
- 3) To separation DNA using AGE.
- 4) Demonstration of ELISA.

**Paper-DSE : BOT-BD-504T – Industrial and Environmental Microbiology (Semester – V Core)**

- 1) Understand the Scope of microorganism in different industrial production and their role in our environment.
- 2) Know the importance of microbes in agriculture.
- 3) Know the role of microbes in sewage and domestic waste water treatment.
- 4) know about the microbial enzymes of industrial interest and enzyme immobilization.

**Practical -DSE : BOT-BD-504P – Industrial and Environmental Microbiology (Semester – V Core)**

- 1) Sterilization techniques of culture media.
- 2) Role of instruments in Microbiological laboratory.

**Paper-DSE : BOT-BD-605T – Plant Breeding (Semester – VI Core)**

- 1) Know about the plant breeding for improvement of crop plants.
- 2) know about the concept and mechanism of quantitative inheritance and polygenic inheritance.
- 3) Understand about inbreeding depression and heterosis.
- 4) Role of biotechnology in crop improvement

**Practical-DSE : BOT-BD-605P -- Plant Breeding (Semester – VI Core)**

- 1) Study of hybridization technique.
- 2) Study of pollen morphology and viability.
- 3) Breeding importance of some common crop plants.

**Paper-DSE : BOT-BD-606T – Natural Resource Management (Semester – VI Core)**

- 1) Understand about land and water management strategies.
- 2) Know about different forest products and their management.
- 3) Describe about Renewable and Non-Renewable source of energy and their management and conservation.
- 4) Biodiversity threats and management.

**Practical-DSE : BOT-BD-606P – Natural Resource Management (Semester – VI Core)**

- 1) Ecological modeling.
- 2) Collection of data on forest cover of a reserve forest of Lakhimpur.
- 3) Calculation and analysis of ecological footprint.

**ELECTIVES(For students opting other than Botany as honours subject)**

**Under Choice Based Credit System (CBCS)**

**Paper- BOT-GE-101T – Biodiversity (Microbes,Algae,Fungi,Lichen& Archegoniate)( Sem-I G)**

- 1)Understand the diversity among Algae.

- 2) Know the systematic, morphology and structure, of Algae, Understand the life cycle pattern of Algae.
- 3) Understand the Biodiversity of Fungi
- 4) Know the Economic Importance of Fungi
- 5) Understand the morphological diversity of Bryophytes, Pteridophytes and Gymnosperms
- 6) Understand the economic importance of the Bryophytes, Pteridophytes and Gymnosperms
- 7) Know the taxonomic position, occurrence, thallus structure, reproduction of Bryophytes, Pteridophytes and Gymnosperms

**Practical- BOT-GE-101P – Biodiversity (Microbes,Algae,Fungi,Lichen& Archegoniate) )( Sem-I G)**

- 1) Practical knowledge about vegetative and reproductive structure of Algae,Fungi,Lichen& Archegoniate.
- 2) Photographic study of T-Phage and TMV.
- 3) Photographic study of Mycorrhiza.

**Paper- BOT-GE-202T – Plant Ecology and Taxonomy. ( Sem-II G)**

- 1) Acquire knowledge on classification of plant families, their characteristics and its economic importance.
- 2) Students learned about the interaction between biotic and abiotic components of the environment.
- 3) Know about the concept of energy flow in the ecosystem.
- 4) Acquire knowledge about Biometrics and Numerical taxonomy.
- 5) Know about the principles of Botanical nomenclature

**Practical- BOT-GE-202P – Plant Ecology and Taxonomy. ( Sem-II G)**

- 1) Practically they are able to understand the anatomical modifications of the plants for various stress created by the nature itself
- 2) Understand the methods of determination plant vegetation richness
- 3) Quantitative analysis of herbaceous vegetation of Lakhimpur Girl's College.
- 4) Determination of pH of soil of the college campus and its surrounding areas.
- 5) Technique of herbarium preparation.

**Paper- BOT-GE-303T – Plant Anatomy and Embryology. ( Sem-III G)**

- 1) Understand the development of male and female gametophyte, double fertilization and triple fusion among the angiosperms.
- 2) Understand the different agents involved in the pollination and its significance
- 3) Know apomixis and polyembryony and their significance in the plant developmental biology
- 4) Understand plant communities and ecological adaptations in plants.
- 5) Know about the different tissue and tissue system.

**Practical- BOT-GE-303P – Plant Anatomy and Embryology. ( Sem-III G)**

- 1) Develop the practical knowledge on adaptive anatomy of Xerophyte, Hydrophyte & epiphyte.
- 2) Practical knowledge about the distribution and types of stomata and trichomes.
- 3) Practical knowledge about types of ovule.
- 4) Know about the calculation of percentage of pollen germination in different media using Hanging drop method.

**Paper- BOT-GE-404T – Plant Physiology and Metabolism ( Sem-IV G)**

- 1) Learn about mineral nutrition in plants.
- 2) Understand the growth regulators and their function in developmental processes in plants.
- 3) Know about Photosynthesis and Respiration in plants.
- 4) Understand process of plant-water relation & the process of translocation of solutes in plants
- 5) Know the physiology of flowering plants.
- 6) Know the process of Nitrogen metabolism in plants.

**Practical- BOT-GE-404P – Plant Physiology and Metabolism ( Sem-IV G)**

1. Know the various physiological processes of plants through practicals
2. Determination of OP,RQ and stomatal index
3. Separation of plant pigments through chromatography
4. Chemical tests for determination of tannin and alkaloid

**Course Outcomes (HONOURS)**

**CO1.** Critically evaluation of ideas and arguments by collection relevant information about the plants, so as recognize the position of plant in the broad classification and phylogenetic level.

**CO2.** Identify problems and independently propose solutions using creative approaches, acquired through interdisciplinary experiences, and a depth and breadth of knowledge/expertise in the field of Plant Identification.

**CO3.** Accurately interpretation of collected information and use taxonomical information to evaluate and formulate a position of plant in taxonomy.

**CO4.** Students will be able to apply the scientific method to questions in botany by formulating testable hypotheses, collecting data that address these hypotheses, and analyzing those data to assess the degree to which their scientific work supports their hypotheses.

**CO5.** Students will be able to present scientific hypotheses and data both orally and in writing in the formats that are used by practicing scientists.

**CO6.** Students will be able to access the primary literature, identify relevant works for a particular topic, and evaluate the scientific content of these works.

**CO7.** Students will be able to apply fundamental mathematical tools (statistics, calculus) and physical principles (physics, chemistry) to the analysis of relevant biological situations.

**CO8.** Students will be able to identify the major groups of organisms with an emphasis on plants and be able to classify them within a phylogenetic framework. Students will be able to compare and contrast the characteristics of plants, algae, and fungi that differentiate them from each other and from other forms of life.

**CO9.** Students will be able to use the evidence of comparative biology to explain how the theory of evolution offers the only scientific explanation for the unity and diversity of life on earth. They will be able to use specific examples to explicate how descent with modification has shaped plant morphology, physiology, and life history.

**CO10.** Students will be able to explain how Plants function at the level of the gene, genome, cell, tissue, Flower development. Drawing upon this knowledge, they will be able to give specific examples of the physiological adaptations, development, reproduction and mode of life cycle followed by different forms of plants.

**CO11.** Students will be able to explain the ecological interconnectedness of life on earth by tracing energy and nutrient flow through the environment. They will be able to relate the physical features of the environment to the structure of populations, communities, and ecosystems.

**CO12.** Students will be able to demonstrate proficiency in the experimental techniques and methods of analysis appropriate for their area of specialization within biology. Programme Specific Outcomes: B.Sc. Botany

### **ELECTIVES (Discipline Specific)**

**DSE- CO-1** Students will be able to explain different analytical techniques which can be used to study different Biological processes.

**DSE- CO-2** Students will be able to explain the principle and application of Spectrophotometry.

**DSE- CO-3** Students will be able to apply fundamental mathematical tools (statistics, calculus) and physical principles (physics, chemistry) to the analysis of relevant biological situations.

**DSE- CO-4** Expose the students to application of different microbes for industrial purposes and also their role in the environment.

**DSE- CO-5** Expose the students to different methods of plant improvement and breeding technique.

**DSE- CO-6** Expose the students to different natural resources and their management practices.

### **ELECTIVES (For students opting other than Botany as an honours subject)**

**GE- CO-1-** Exposed the undergraduate students with the basic knowledge of the structure, forms and reproduction of thallophytes.

**GE- CO-2-** Exposed the students to interaction of plant life with the surroundings and also to identification, classification and nomenclature of plants.

**GE- CO-3-** Exposed the students to basic knowledge of plant tissue and tissue systems, development of primary and secondary plant bodies and development of male and female reproductive components and their functions.

**GE- CO-4-** The main objective of the course is to introduce the undergraduate students with the basic knowledge of physiological activities of plants through the mechanisms of absorption of inorganic components and production and function of organic components and the role of external factors upon them.

**GE- CO-5-** The main aim of this course is to introduce the students with the basic knowledge of Biotechnology in the light of recent developments and provide comprehensive knowledge of usefulness of plant resources for human welfare.

**GE- CO-5-** The objective of the course is to expose the students to application of modern tools and techniques in biology.