



**Darrang College
(Autonomous),
Tezpur-784001**

Syllabus for FYUGP

Subject: BOTANY

Course Type: MINOR

Approved by:

Board of Studies meeting held on 24-12-2025

&

Academic Council vide Resolution no. 2, dated- 29-12-2025

FOUR-YEAR UNDERGRADUATE PROGRAMME (FYUGP) IN BOTANY, Darrang College (Autonomous)

INTRODUCTION :

Aim of FYUGP in Botany is designed with the following Objective

1. To build strong foundational knowledge in Plant Science through its various branches, like Morphology, Anatomy, Taxonomy, Pathology, Ecology, Cytology, Genetics, Molecular Biology and Biotechnology.
2. To emphasize regional Biodiversity, including Algae, Fungi, Bryophyta, Pteridophyta, Gymnosperm and Angiosperms.
3. To develop skills for sustainable plants' resources and uses.
4. To foster critical thinking on environmental issues and prepare graduates for research or biological entrepreneurship.
5. Equipping students with theoretical knowledge and practical skills, covering modern and traditional botany.
6. To enhance the skill of conservation, agriculture, research and careers in biotech, pharma and environmental sectors.

Program Outcome:

On successful completion of the FYUGP program, students will be able to obtain:

1. Knowledge with the concept of different plant groups, viz. Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms, Angiosperms including Viruses and Bacteria.
2. Knowledge of plant diversity, distribution, morphology and anatomy.
3. Knowledge of physiochemical properties of cells and their functions.
4. Fundamental knowledge for performing laboratory and field experiments and to prepare analysis of data and interpretation of results.
5. Knowledge of physiological processes, viz. metabolism, nutrition, plant-water relation, photosynthesis, respiration, growth and development, photoperiodism etc.
6. Knowledge of systematic and taxonomic study of plants.
7. Knowledge of plants' diseases and their controls.
8. Knowledge of microbial diversity, their ecology and economic importance.
9. Knowledge of different biomolecules, viz. carbohydrates, fats-lipids, proteins, nucleic acid; their chemical nature and applications.
10. Knowledge of plant tissue cultures, genetic engineering, plant breeding techniques and their applications.
11. Applications and economic importance of various plant groups in industries, agriculture and medicine for human welfare.

Teaching-Learning Process

The key components of teaching-learning process in Botany for the Four-Year- Under

-Graduate Program (FYUGP) in Botany are:

1. Traditional Lectures: Provide foundational knowledge and theoretical instructions.
2. Tutorials: Provide more clarification/ concept of difficult topic. More applicable for slow learners in small groups.
3. Practical and Laboratory Works: Essential for developing hands-on- skills such as microscopy, slide preparation, specimen identification, herbarium preparation and conservation and conducting experiments.
4. Field Studies/ Industrial Visits: Give opportunities to study plants in their natural habitats, explore local biodiversity and understand industrial processing of plant products.
5. Use of ICT Tools: Incorporates informations and communications Technology (ITC) tools, biological databases and software to solve biological problems.
6. Project Work/ Dissertations: Fostering independent research works.
7. Group discussions and Seminars/ Workshops: Enhancing communication, critical thinking and team work skills.

Teaching-Learning Tools:

1. White board/Green board/Black board
2. LCD Projectors and Monitors
3. Smart boards
4. Demonstration models
5. Laboratory Equipments, viz. microscopes, spectrophotometer, centrifuge, autoclaves, pH meters, laminar air-flow etc.
6. Specimens and Slides.
7. Herbarium Library.
8. Tissue Culture Laboratory
9. Shade house and Green house.
10. Mushroom cultivation room.
11. Botanical garden.

Assessment Methods:

Student progress is continuously evaluated through a combination of formative and summative assessment techniques, including:

1. Home assignments
2. Report based on projects, industry visits or field study
3. Seminar presentations.
4. In semester/sessional examinations (both theoretical and practical)
5. End semester examinations (both theory and practical)

FYUGP STRUCTURE

SEMESTER	TYPE	COURSE	COURSE CODE	CREDIT
1	Major	Major-1 (Plant and Microbial Diversity)	BOT-MJ-01014	4
	*Minor	Minor-1 (Plant and Microbial Diversity)	BOT-MN-01014	4
	SEC	SEC-1 (Mushroom cultivation technique)	BOT-SEC-01013	3
2	Major	Major-2 (Cell Biology and Biomolecules)	BOT-MJ-02014	4
	Minor	Minor-2 (Cell Biology and Biomolecules)	BOT-MN-02014	4
	SEC	SEC-2 Biofertilizer	BOT-SEC-02013	3
*Here, the minor paper indicates the minor paper offered by the Department of Botany for the students other than Botany Major.				
3	Major	Major-3 (Laboratory and Field Techniques in Plant Science)	BOT-MJ-03014	4
		Major-4 (Plant Physiology)	BOT-MJ-03024	4
	*Minor	Minor-3 (Laboratory and Field Techniques in Plant Science)	BOT-MN-03014	4
	SEC	SEC-3 (Environmental Ethics)	BOT-SEC-03013	3
*Here, the minor paper indicates the minor paper offered by the Department of Botany for the students other than Botany Major.				
4	Major	Major-5 (Morphology and Anatomy of Angiosperms)	BOT-MJ-04014	4
		Major-6 (Mycology and Phytopathology)	BOT-MJ-04024	4
		Major-7 (Microbiology)	BOT-MJ-04034	4
		Major-8 (Plant Resources and Economic Botany)	BOT-MJ-04044	4
	*Minor	Minor-4 (Plant Resources and Economic Botany)	BOT-MN-04014	4
*Here, the minor paper indicates the minor paper offered by the Department of Botany for the students other than Botany Major.				
5	Major	Major-9 (Genetics)	BOT-MJ-05014	4
		Major-10 (Plant Ecology, Phytogeography and Climate Change)	BOT-MJ-05024	4
		Major-11 (Plant Systematics)	BOT-MJ-05034	4
	*Minor	Minor-5 (Plant Systematics)	BOT-MN-05014	4
	Internship	Internship		4
*Here, the minor paper indicates the minor paper offered by the Department of Botany for the students other than Botany Major.				
6	Major	Major-12 (Reproductive Biology of Angiosperm)	BOT-MJ-06014	4
		Major-13 (Plant Metabolism and Biochemistry)	BOT-MJ-06024	4
		Major-14 (Molecular Biology)	BOT-MJ-06034	4
		Major-15 (Applied Plant Biology)	BOT-MJ-06044	4
	Minor	Minor-6 (Applied Plant Biology)	BOT-MN-06014	4

*Here, the minor paper indicates the minor paper offered by the Department of Botany for the students other than Botany Major.

B.Sc. Botany with Honours

7	Major	Major-16 (Plant Breeding, Genomics and Bioinformatics)	BOT-MJ-07014	4
		Major-17 (Conservation Ecology and Biodiversity Assessment)	BOT-MJ-07024	4
		Major-18 (Plant diseases, diagnostic and management)	BOT-MJ-07034	4
		Major-19 (Environmental Microbiology)	BOT-MJ-07044	4
		Research Component (RC1) Research Methodology	BOT-RC-07014	4
8	Major	Major-20 (Molecular Genetics and Cell Signalling)	BOT-MJ-08014	4
		Major-21 (Fungal Diversity, Genetics, and Applications)	BOT-MJ-08024	4
		Major-22 (Exploring Cryptogams and Gymnosperms)	BOT-MJ-08034	4
		Major-23 (Plant Growth and Morphogenesis)	BOT-MJ-08044	4
		One Mocs course related to advance techniques		4
		Or		
		One Seminar/Project based course and presentation.		4

OR

B.Sc. Botany Honors with Research

7	Major	Major-16 (Plant Breeding, Genomics and Bioinformatics)	BOT-MJ-07014	4
		Major-17 (Conservation Ecology and Biodiversity Assessment)	BOT-MJ-07024	4
		Major-18 (Plant diseases, diagnostic and management)	BOT-MJ-07034	4
		Major-19 (Environmental Microbiology)	BOT-MJ-07044	4
		Research Component (RC1) Research Methodology	BOT-RC-07014	4
8	Major	Dissertation-8		16
		One Mocs course related to advance techniques		4
		Or		
		One Seminar/Project based course and presentation.		4

BOTANY
SYLLABUS FOR
MINOR COURSE

DETAIL SYLLABUS OF 1ST SEMESTER

Title of the course		Minor-1 (Plant and Microbial Diversity)				
Course code		BOT-MN-01014				
Total Credit (theory-practical)		04 (03+01)				
Contact hours		75 (Theory = 45 + Practical = 30)				
Distribution of Marks		Theory =60 + Practical = 40				
Course outcomes		1. This paper will explain the origin of life, the diversity of Bacteria, Viruses, Algae, Fungi & Lichen, Bryophytes, Pteridophytes, Gymnosperms, and Angiosperms on the planet, and how they may be related to each other. The emphasis will also be on the hands- on approach and laboratory techniques for identification of the plant and microbial groups using various morphological features.				
Theory [Total Marks : 60] Credit :03 : Total No. of Classes : 45						
Unit	Content	Lecture (L)	Marks	Tuotorial (T)	Practical (P)	Total Hours
Unit-1	Origin of Life: Theories of Origin of Life, Concept of Kingdom	2	4	1		3
Unit-2	Bacteria & Viruses: Bacteria: General Features, Bacterial Cell Structure , Types of Bacteria, Reproduction (Conjugation, Transformation & Transduction). Introduction to Archaeobacteria; Economic Importance of Bacteria Virus: General features, Reproduction, Life Cycle (Lytic & Lysogenic); RNA Viruses (TMV), DNA Virus (CMV)	8	10	4		12
Unit-3	Algae: General Features, Cell Structure, Range of Thallus Structure and Photosynthetic Pigmentation in Algae. Reproduction, Classification (F.E. Fritch, 1945). A brief account of : <i>Nostoc</i> , <i>Chlamydomonas</i> , <i>Volvox</i> , <i>Spirogyra</i> , <i>Chara</i> . Economic importance of Algae	6	10	3		9
Unit-4	Fungi: General Features (Distribution, Morphology, Nutrition) Reproduction & Classification (Einsworth, 1973). A brief account of: <i>Mucor</i> , <i>Penicillium</i> , <i>Agaricus</i> . <i>A</i> brief idea of Fungi <i>imperfecti</i> . Economic importance of Fungi Lichen: General account of Lichen (Distribution, Morphology & Types) Reproduction & Economic Importance	7	12	3		11
Unit-5	Bryophytes:	10	12	5		15

	General features (Distribution & Morphology, Alternation of Generation) Adaptation to land habit, Classification and Evolutionary Trends. A Brief Account of : <i>Marchantia & Funaria</i> Pteridophytes: General features (Distribution & Morphology, Alternation of Generation); <i>Reproduction, Classification, Stellar Diversity & Evolution, Heterospory & Seed habit.</i> A brief account of : <i>Lycopodium, Selaginella & Pteris</i>					
Unit-6	Biostatistics, computing and field skills:Data types- primary and secondary, methods of data collection,sample and sampling methods - merits and demerits; technical and biological replicates; Tabulation and presentation of data, Descriptive statistics - Mean,Median, Mode, Variance, Standard Deviation, Standard error, Coefficient of Variation, MS-Word, PowerPoint, Excel, concept on biological databases, Basics at SPSS Collection, Identification, Preparation and Preservation of Herbarium and Museum specimens.	12	12	6		16
PRACTICAL [Credit : 01]						
- Study of structure of TMV and Bacteriophage (electron micrographs/ models). - Study of morphology of <i>Nostoc</i>, <i>Chalydomonas</i>, <i>Volvox</i>, <i>Spirogyra</i>, <i>Chara</i> (Temporary preparation of slides). - Study of <i>Mucor</i>, <i>Penicillium</i>, <i>Agaricus</i>. - Study of vegetative and reproductive parts of <i>Marchantia</i> and <i>Funaria</i> (preparation of slides). - Study of <i>Lycopodium</i>/ <i>Selaginella</i> (morphology, strobilus, and spores), <i>Adiantum</i>/ <i>Pteris</i> (morphology). - Study of <i>Cycas</i>/ <i>Pinus</i> and <i>Gnetum</i> (morphology, leaf/ needle, megasporophyll and microsporophyll) - Study of leaf venations in dicots and monocots (at least two specimens each)	30	40				
8. Study of different types of inflorescences and fruits.						

DETAIL SYLLABUS OF 2ND SEMESTER

Title of the course		Minor-2 (Cell Biology & Biomolecules)				
Course code		BOT-MN-02014				
Total Credit (theory-practical)		04 (03+01)				
Contact hours		75 (Theory = 45 + Practical = 30)				
Distribution of Marks		Theory =60 + Practical = 40				
Course outcomes		1. The core aim of cell biology is to understand the structure, function and behaviour of cells, the fundamental units of life. Simultaneously, the study of biomolecules explores the molecules that make up cells and carry out essential biological processes. By understanding both, it is an aim to unravel the complexities of life, from individual cellular mechanisms to the overall workings of organisms.				
Theory [Total Marks : 60] Credit :03 : Total No. of Classes : 45						
Unit	Content	Lecture (L)	Marks	Tuotorial (T)	Practical (P)	Total Hours
Unit-1	Introduction to cell: Cell theory, Cell as a unit of structure and function; Characteristics of prokaryotic and eukaryotic cells; Origin of eukaryotic cell (Endosymbiotic theory); Cytoskeleton, Cell division: Phases of eukaryotic cell cycle, mitosis and meiosis; Regulation of cell cycle.	8	12	4		12
Unit-2	Cell wall and plasma membrane: Chemistry, structure and function of Plant cell wall. Overview of membrane function; fluid mosaic model; Chemical composition of cell membranes; Membrane transport – Passive, active and facilitated transport.	6	12	3		9
Unit-3	Cell organelles: Nucleus: Structure-nuclear envelope, Organization of chromatin, Nucleolus, Ribosome, Chloroplast, Mitochondria, Peroxisomes, Endoplasmic Reticulum, Golgi Apparatus, and Lysosomes.	9	8	4		13
Unit-4	Carbohydrates and Lipids: Carbohydrates: Nomenclature and classification. Polymers of carbohydrate, Lipids: Definition and major classes of storage and structural lipids; Structure, properties and functions of Essential fatty acids.	9	8	4		13
Unit-5	Aminoacids and Proteins: Structure and classification of amino	8	10	4		12

	acids; Levels of protein structure (primary, secondary, tertiary, and quaternary); Protein denaturation and biological roles of proteins.					
Unit-6	Nucleic acids: Chemistry of Nucleic Acids; Structure and function of nucleotides & nucleosides; Types of nucleic acids; Structure of A, B, Z types of DNA	5	10	3		8
PRACTICAL [Credit : 01]						
1. Qualitative tests for carbohydrates, reducing sugars, non-reducing sugars, lipids and proteins. 2. Study of plant cell structure with the help of epidermal peel mount of Onion/ Rhoeo/ Crinum. 3. Demonstration of the phenomenon of protoplasmic streaming in <i>Hydrilla</i> and <i>Vallisneria</i> leaf. 4. Counting the cells per unit volume with the help of haemocytometer. (Yeast/ pollen grains). 5. Cytochemical staining of: DNA- Feulgen and cell wall in the epidermal peel of onion using Periodic Schiff's (PAS) staining technique. 6. Study different stages of mitosis and meiosis.		30	40			

DETAIL SYLLABUS OF 3RD SEMESTER **(MINOR)**

Title of the course	Minor-3 (Laboratory and Field Techniques in Plant Science)
Course code	BOT-MN-03014
Total Credit (theory-practical)	04 (03+01)
Contact hours	75 (Theory = 45 + Practical = 30)
Distribution of Marks	Theory =60 + Practical = 40
Course outcomes	On successful completion of the course, students will : 1. Able to learn fundamental skills important for performing laboratory and field experiments. 2. Able to prepare, analysis of data and interpretation of results.

Theory [Total Marks : 60] Credit :03 : Total No. of Classes : 45

Unit	Content	Lecture (L)	Marks	Tutorial (T)	Practical (P)	Total Hours
Unit-1	Laboratory safety and good practices: General laboratory safety : dos and don'ts, lab safety measures, code of conduct in laboratory, safe handling of chemicals, glass apparatus, instruments, electrical appliances; First aid practices (acid spills, burns and other injuries), safety symbols, classes/grades of chemicals, Laboratory waste management: radioactive, hazardous chemicals and biological wastes, ecological aspects	7	8	1		8
Unit-2	Handling and maintenance of instruments: Weighing balance, pipettes and micropipettes, magnetic stirrer, autoclave, laminar airflow, pH and conductivity meter (calibration and use), Incubator (static and shaker), Lux meter, hemocytometer, micrometer, spectrophotometer, Agarose gelelectrophoresis unit, SDS PAGE unit, centrifuge, distillation unit, fractional distillation	7	12	1		8
Unit-3	Measurements and calculations: Units of measurements, conversion from one unit to another, Weighing, calculations: scientific notations, powers, logarithm and fractions;	4	8			4

	measurement of volumes of liquids, basics and titration					
Unit-4	Solutions and Buffers: Preparation of solutions: stock solution, standard solution. Types of solutions: Normal, Molar, Molal, Percentage, ppm, ppb. Dilution and dilution factors, Acids, Bases, adjustment of pH, Buffers - phosphate, Tris- HCl and Citrate buffer. Standardization and Buffers.	5	8	1		6
Unit-5	Microscopy and Culture Techniques: Microscopes: working principles and types (Light and Electron microscopes), sample and slide preparation: fixation, staining, mounting, preservation (for light and electron microscopy), scanning stain Microscope Basic culture media (NA, NB, P D A , MS), selective and differential media, Culture techniques: plating (streak, spread & pour), serial dilution.	7	12	1		6
Unit-6	Biostatistics, computing and field skills: Data types- primary and secondary, methods of data collection, sample and sampling methods - merits and demerits; technical and biological replicates; Tabulation and presentation of data, Descriptive statistics - Mean, Median, Mode, Variance, Standard Deviation, Standard error, Coefficient of Variation, MS-Word, PowerPoint, Excel, concept on biological databases, Basics at SPSS Collection, Identification, Preparation and Preservation of Herbarium and Museum specimens.	10	12	2		11
PRACTICAL [Credit : 01]						
1. Preparation of solutions- molar, molal, normal, percentage, stock solution and dilution 2. Measurement of pH of solutions using pH meter/ pH strip and preparation of buffers (Phosphate /citrate buffer) 3. Working with instruments - Centrifuge, autoclave, laminar air flow, hot air oven, incubator, light microscope, spectrophotometer/colorimeter, 4. Slide preparation and staining of plant materials.		30	40			

5. Determination of cell/spore size using micrometer.					
6. Preparation of PDA/NA medium for growth and maintenance of fungal/bacterial cultures.					
7. Calculation of mean, mode, median, standard deviation using data set. (Primary data set)					
8. Drawing of tables, graphs and to carry out statistical calculation using Microsoft Excel using primary data set.					
9. Preparation of herbarium specimen: Collection, processing, mounting, and labelling of plant specimen.					

DETAIL SYLLABUS OF 4TH SEMESTER **(MINOR)**

Title of the course	Minor-4 (Plant Resources and Economic Botany)
Course code	BOT-MN-04014
Total Credit (theory-practical)	04 (03+01)
Contact hours	75 (Theory = 45 + Practical = 30)
Distribution of Marks	Theory =60 + Practical = 40
Course outcomes	On successful completion of the course, students will : 1. Know the centre of origin, domestication, and loss of genetic diversity 2. Understand the evolution of new crops /varieties 3. Know about the germplasm diversity 4. Understand the economic values of various plant species. 5. Understand the importance of ethnobotany in the present context.

Theory [Total Marks : 60] Credit :03 : Total No. of Classes : 45

Unit	Content	Lecture (L)	Marks	Tutorial (T)	Practical (P)	Total Hours
Unit-1	Origin of Cultivated Plants: Centres of Origin, their importance with reference to Vavilov's work. Introductions, domestication, and loss of crop genetic diversity; evolution of new crops/varieties, importance of germplasm diversity and conservation. Classification of plant resources on the basis of their uses.	6	8			6
Unit-2	Food and Food Adjuncts: Cereals and millets: Rice and wheat (origin, morphology, processing, post-harvest management & uses); Brief account of millets and their climatic and nutritional importance. Legumes: Origin, morphology, cultivation, uses and commercial importance of Chick pea, Pigeon pea, Soybean and Lentil. Importance of legumes to man and ecosystem. Spices: Listing of important spices, their family and part used. Economic importance with special reference to Assam. Study of fennel, saffron, clove and black pepper.	11	14	1		12

	Beverages: Tea, Coffee (morphology, processing, cultivation, Types & uses).					
Unit-3	Plants and Plant Products of Industrial Value: Oils and Fats: General description, classification, extraction, their uses and health implications groundnut, coconut, soybean, and mustard. Essential Oils: General account, extraction methods, comparison with fatty oils. Essential oil yielding plants of NE India, their botanical identity and uses. Sugar and starches: Morphology, new varieties and processing of sugarcane, products and by-products of sugarcane industry. Potato: morphology, propagation, post-harvest management, uses of potato and starches. Natural Rubber: Para-rubber: tapping, processing and uses. Fibres: Classification based on the origin of fibres; Cotton, Coir and Jute (morphology, extraction and uses).	11	14	1		12
Unit-4	Drug-yielding plants: Therapeutic and habit-forming drugs with special reference to Ravolfia, Digitalis, Aloe vera and Cannabis; Tobacco (Morphology, processing, uses and health hazards).	5	8			5
Unit-5	Forest Products: Forest and forest products. Timber and Non-Timber Forest Products (NTFP), Forest types of Assam and their conservation strategies; Community forestry.	5	8			5
Unit-6	Ethnobotany Hours: Definition, concept and scope; relevance of ethnobotany in present context; IPR Traditional knowledge with reference to NE India.	5	8			5
PRACTICAL [Credit : 01]						
1. Cereals: Study of useful parts: Rice/Bean (habit sketch, study of paddy and grain, starch grain, micro-chemical test). 2. Legumes: Bean, (habit, fruit, seed structure, micro-chemical tests). 3. Beverages: Tea (plant specimen, tea leaves). 4. Oils and fats: Coconut and Mustard, Groundnut, 5. Rubber: Specimen, photograph/model of tapping, samples of rubber products. 6. Test for alkaloids: Neem, Vinca rosea.		30	40			30

7. Fibre-yielding plants: Cotton (specimen, whole mount of seed to show lint and fuzz; whole mount of fibre and test for cellulose), Jute (specimen, transverse section of stem, test for lignin).					
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DETAIL SYLLABUS OF 5TH SEMESTER **(MINOR)**

Title of the course		Minor-5 (Plant Systematics)				
Course code		BOT-MN-05014				
Total Credit (theory-practical)		04 (03+01)				
Contact hours		75 (Theory = 45 + Practical = 30)				
Distribution of Marks		Theory =60 + Practical = 40				
Course outcomes		On successful completion of the course, students will : 1. Able to obtain knowledge on plant identification and classification systems, plant nomenclature. 2. Detailed knowledge of the phylogenetic and evolutionary relationships of angiosperms. 3. Able to obtain knowledge on various herbaria and botanical gardens in India and abroad, their role in plant systematics. 4. Acquainted with practical knowledge on vegetative and reproductive structures of angiosperms. 5. Acquainted students with practical knowledge on vegetation of an area				
Theory [Total Marks : 60] Credit :03 : Total No. of Classes : 45						
Unit	Content	Lecture (L)	Marks	Tutorial (T)	Practical (P)	Total Hours
Unit-1	Significance of Plant systematics: Introduction to systematics; Plant identification, Classification, Nomenclature. Evidences from palynology, cytology, phytochemistry and molecular data. Functions and importance of Herbarium and botanical garden; Important herbaria and botanical gardens of the world and India; Taxonomic literatures; Categories and taxonomic hierarchy; Concept of taxa (family, genus, species).	7	8	1		8
Unit-2	Botanical nomenclature: History, Principles and Rules (ICN); Ranks and names; Typification, Author citation, Effective and Valid publication, Rejection of names, Principle of priority and its limitations.	5	8			5
Unit-3	Systems of classification: Major contributions of Theophrastus, Bauhin, Linnaeus, Adanson, de Candolle, Hutchinson, Takhtajan and Cronquist; Classification systems of Bentham and Hooker, Engler and Prantl, Takhtajan;	8	12	1		9

	Brief account of Angiosperm Phylogeny Group (APG) classification.					
Unit-4	Numerical taxonomy and cladistics: OTUs, characters, character weighting and coding; Cluster analysis; Phenograms & Cladograms (definitions and differences).	6	8			6
Unit-5	Phylogeny of Angiosperms: Terms and concepts (primitive and advanced, homology and analogy, parallelism and convergence, monophyly, Paraphyly, polyphyly and clades). Origin and evolution of angiosperms; Co-evolution of angiosperms and animals; Methods of illustrating evolutionary relationship (phylogenetic tree, cladogram).	6	10			
Unit-6	Angiospermic Families: Detail study of the following families: Magnoliaceae, Fabaceae, Asteraceae, Solanaceae, Acanthaceae, Lamiaceae, Euphorbiaceae, Orchidaceae, Musaceae, Zingiberaceae, Poaceae	9	14	2		11
PRACTICAL [Credit : 01]						
	- Study of vegetative and floral characters of locally available angiospermic plants belonging to the following families (Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification): Fabaceae, Solanaceae, Asteraceae, Lamiaceae, Euphorbiaceae, Musaceae, Orchidaceae. - Field visits to familiarise students with vegetation of an area and identification of plant species / Visit to Academic or Research Institutions. - Mounting of properly dried and pressed specimens of at least 10 (ten) wild plant species with herbarium labels (to be submitted with the record book).	30	40			30

DETAIL SYLLABUS OF 6TH SEMESTER **(MINOR)**

Title of the course		Minor-6 (Applied Plant Biology)				
Course code		BOT-MN-06044				
Total Credit (theory-practical)		04 (03+01)				
Contact hours		75 (Theory = 45 + Practical = 30)				
Distribution of Marks		Theory =60 + Practical = 40				
Course outcomes		1. Knowledge of various methods of Plant tissue culture and their application 2. Knowledge of gene cloning, recombinant DNA technology and various methods of gene transfer in plants 3. Knowledge of the application of genetic engineering techniques for agriculture. 4. Ability to demonstrate tissue culture technique; isolate plasmid DNA and to carry out DNA manipulation using restriction enzymes				
Theory [Total Marks : 60] Credit :03 : Total No. of Classes : 45						
Unit	Content	Lecture (L)	Marks	Tuotorial (T)	Practical (P)	Total Hours
Unit-1	Plant Tissue Culture: Historical perspective; Composition of media; Nutrient and hormone requirements (role of vitamins and hormones); Totipotency; Organogenesis; Embryogenesis (somatic and zygotic); Protoplast isolation, culture and fusion.	7	10	1		8
Unit-2	Application of tissue culture: Micropropagation, androgenesis, secondary metabolite production, Culture of haploids, triploids and hybrids plants; Cryopreservation; Germplasm conservation.	4	6			
Unit-3	Recombinant DNA technology: Restriction Endonucleases (History, Types I-IV, biological role and application); Restriction Mapping (Linear and Circular); Cloning Vectors: Prokaryotic (pUC 18 and pUC19, pBR322, Ti plasmid, BAC); Lambda phage, M13 phagemid, Cosmid, Shuttle vector; Eukaryotic Vectors (YAC).	7	10	1		8
Unit-4	Gene Cloning: Recombinant DNA, Bacterial Transformation and selection of recombinant clones, PCR- mediated gene cloning; Gene Construct; construction of genomic and cDNA	8	12	1		9

	libraries, screening DNA libraries to obtain gene of interest by genetic selection; complementation, colony hybridization; PCR					
Unit-5	Methods of gene transfer: Agrobacterium-mediated, Direct gene transfer by Electroporation, Microinjection, Microprojectile bombardment; Selection of transgenics - selectable marker and reporter genes (Luciferase, GUS, GFP).	6	10			6
Unit-6	Applications of genetic engineering: Pest resistant (Bt-cotton); herbicide resistant plants (Round Up Ready soybean); Transgenic crops with improved quality traits (FlavrSavr tomato, Golden rice); Improved horticultural varieties (Moondust carnations); Role of transgenics in bioremediation (Superbug).	9	12	1		10
PRACTICAL [Credit : 01]						
1. (a) Preparation of MS medium. (b) Demonstration of in vitro sterilization and inoculation methods using leaf and nodal explants of any plant species. 2. Study of anther, embryo and endosperm culture, micropropagation, somatic embryogenesis & artificial seeds through photographs. 3. Isolation of protoplasts. 4. Construction of restriction map of circular and linear DNA from the data provided. 5. Study of methods of gene transfer through photographs: Agrobacterium-mediated, direct gene transfer by electroporation, microinjection, microprojectile bombardment. 6. Study of steps of genetic engineering for production of Bt cotton, Golden rice, FlavrSavr tomato through photographs. 7. Isolation of plasmid DNA. 8. Restriction digestion and gel electrophoresis of plasmid DNA.		30	40			30