



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

Syllabus for FYUGP

Subject: BOTANY

Course Type: MINOR

Approved by:

Board of Studies meeting held on 24-12-2025

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

BOTANY
SYLLABUS OFR
MINOR COURSE

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			

<p>5. Determination of cell/spore size using micrometer.</p> <p>6. Preparation of PDA/NA medium for growth and maintenance of fungal/bacterial cultures.</p> <p>7. Calculation of mean, mode, median, standard deviation using data set. (Primary data set)</p> <p>8. Drawing of tables, graphs and to carry out statistical calculation using Microsoft Excel using primary data set.</p> <p>9. Preparation of herbarium specimen: Collection, processing, mounting, and labelling of plant specimen.</p>					
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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 : <ol style="list-style-type: none"> 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		<p>On successful completion of the course, students will :</p> <ol style="list-style-type: none"> 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; Clusteranalysis; 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]					
	<ol style="list-style-type: none"> 1. 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. 2. Field visits to familiarise students with vegetation of an area and identification of plant species / Visit to Academic or Research Institutions. 3. 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	<ol style="list-style-type: none"> 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	Tutorial (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]						
	<ol style="list-style-type: none"> 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