

**BankimSardar College**  
A College with Potential for Excellence

**Department of Botany**  
Under Graduate Programme  
Programme Specific Outcome (PSO) – Course Outcome (CO)

**Programme Specific Outcome (PSO) –**

- To provide fundamental knowledge about different groups of plant from primitive to newly evolved one.
- To make the students familiar with the plants and its utilization in the industrial sectors.
- To prepare the students with the knowledge related to field and laboratory based studies.
- To provide knowledge to the students about the potential of these studies to become an entrepreneur.
- To provide the knowledge about the sustainable uses and conservation of plant species.
- To shape the foundation for higher studies (M.Sc., M.Tech., M.Phil., Ph.D.) in Botany and its allied field.
- Help the students to build the successful career in Botany.
- To enable the graduate prepare for subject/ discipline specific national as well as international competitive examinations.

Sem	Core Courses	Content of CU Syllabus		Course Outcome (CO)
1	CCG1	<b>PLANT DIVERSITY I (PHYCOLOGY, MYCOLOGY, PHYTOPATHOLOGY, BRYOPHYTES AND ANATOMY)</b>		
		Introduction	<b>CO1</b>	Study about different plant groups.
		Phycology	<b>CO2</b>	Study of diagnostic characters and examples of Cyanophyceae, Rhodophyceae, Chlorophyceae, Charophyceae and Phaeophyceae. Classification: Criteria and system of Fritsch, Life histories of <i>Chlamydomonas</i> , <i>Chara</i> and <i>Ectocarpus</i> , Role of algae in the environment, agriculture, biotechnology and industry were mentioned.
		Mycology	<b>CO3</b>	Study of diagnostic characters and examples of Oomycotina, Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina, Deuteromycotina (Ainsworth, 1973). Life histories of <i>Rhizopus</i> and <i>Ascobolus</i> , Economic importance of fungi, Fungal symbioses: <i>Mycorrhiza</i> , Lichen and their importance were mentioned.
		Phytopathology	<b>CO4</b>	Understand the Symptoms - necrotic, hypoplastic and hyperplastic, Koch's postulates, Biotrophs and Necrotrophs, Disease triangle, Pathotoxins and phytoalexins (brief concept), Symptoms, causal organism, disease cycle and control measures of plant diseases (Late blight of potato, Brown spot of Rice, Stem rot of jute)
		Bryophytes	<b>CO5</b>	Understand the unifying features of archaegoniates and transition to land habit, Amphibian nature of bryophytes, Diagnostic characters and examples of Hepaticopsida, Anthocerotopsida and Bryopsida (Proskauer 1957), Life histories of <i>Marchantia</i> and <i>Funaria</i> , Ecological and economic importance.
		Anatomy	<b>CO6</b>	Study of Stomata - Types (Metcalfe & Chalk), Anatomy of root, stem and leaf of monocots and dicots, Stellar types and evolution, Secondary growth – normal in dicot stem and anomaly in stem of <i>Tecoma</i> & <i>Dracaena</i> .
2	CCG2	<b>PLANT DIVERSITY II (PTERIDOPHYTES, GYMNOSPERMS, PALAEOBOTANY,</b>		

		<b>MORPHOLOGY AND TAXONOMY)</b>		
		Pteridophytes	<b>CO7</b>	Understand the diagnostic characters and examples of Psilophyta, Lycophyta, Sphenophyta&Filicophyta (Gifford & Foster 1989), Study of life cycle of <i>Selaginella</i> and <i>Pteris</i> , Understand the economic importance of pteridophytes.
		Gymnosperms	<b>CO8</b>	Study theProgymnosperms (brief idea), Understand the diagnostic characters and examples of Cycadophyta, Coniferophyta and Gnetophyta (Gifford & Foster 1989), Study the life histories of <i>Cycas</i> and <i>Pinus</i> , Study the <i>Williamsonia</i> (reconstructed), Understand the economic importance of Gymnosperms.
		Paleobotany& Palynology	<b>CO9</b>	Study the Fossil, fossilization process and factors of fossilization, Importance of fossil study, Geological time scale, Understand the Palynology - Definition, spore & pollen (brief idea), Applications.
		Angiosperm Morphology	<b>CO10</b>	Study and understand the Inflorescence types with examples, Flower, Fruits and seeds- type with examples.
		Taxonomy of Angiosperms	<b>CO11</b>	Understand the Artificial, Natural and Phylogenetic systems of classificaiton with one example each, Study the diagnostic features of following families- Malvaceae, Leguminosae (Fabaceae), Cucurbitaceae, Rubiaceae, Compositae (Asteraceae), Solanaceae, Acanthaceae, Labiatae (Lamiaceae),Orchidaceae, Gramineae (Poaceae).
<b>3</b>	<b>CCG3</b>	<b>CELL BIOLOGY, GENETICS AND MICROBIOLOGY</b> Cell Biology and Genetics		
			<b>CO12</b>	Study the ultrastructure of nuclear envelope, nucleolus and their functions, Understand the molecular organisation of metaphase chromosome (Nucleosome concept).
			<b>CO13</b>	Study the various types of chromosomal aberrations- deletion, duplication, inversion & translocation, Understand the Aneuploidy & Polyploidy-types, importance and role in evolution.
			<b>CO14</b>	Study the Central Dogma, Understand the process Transcription and Translation.
			<b>CO15</b>	Study the properties of Genetic Code
			<b>CO16</b>	Study the linkage group and Genetic map (three-point test cross).
			<b>CO17</b>	Study the various types of Mutation – Point mutation (tautomerisation; transition, transversion and frame shift), Understand the Mutagen-physical and chemical.
			<b>CO18</b>	Study the Brief concept of Split gene, Transposons
		Microbes	<b>CO19</b>	Study about Viruses- Discovery, general structure, replication (general account), DNA virus (T-phage); Lytic and lysogenic cycle, RNA virus (TMV); Economic importance; Study of Bacteria- discovery, general characteristics and cell structure; Understand the process of reproduction- vegetative, asexual and recombination (conjugation, transformation and transduction); Study of the Economic importance.
<b>4</b>	<b>CC4</b>	<b>PLANT PHYSIOLOGY AND METABOLISM</b>		
		Proteins	<b>CO20</b>	Study of the Primary, secondary and tertiary structure of protein, Study of Nucleic acid- DNA structure, RNA types, Study of the Classifications of Enzyme- with examples (IUBMB), Understand the mechanism of action.
		Transport in plants	<b>CO21</b>	Study of Ascent of sap and Xylem cavitation , Understand the Phloem transport and source-sink relation

		Transpiration	<b>C022</b>	Understand the Mechanism of stomatal movement and its significance.
		Photosynthesis	<b>C023</b>	Study of Pigments, Action spectra and Enhancement effect, Understand the Electron transport system and Photophosphorylation, Study of C <sub>3</sub> and C <sub>4</sub> photosynthesis, CAM- Reaction and its Significance.
		Respiration	<b>C024</b>	Study of Glycolysis & Krebs cycle and its Significance, Study of ETS and oxidative phosphorylation.
		Nitrogen metabolism	<b>C025</b>	Understand Biological nitrogen fixation process, Amino acid synthesis (reductive amination and transamination).
		Plant Growth regulators	<b>C026</b>	Study of Physiological roles of Auxin, Gibberellin, Cytokinin, Ethylene, ABA.
		Photoperiodism	<b>C027</b>	Study of Plant types, Role of phytochrome and GA in flowering and the process of Vernalization
		Senescence	<b>C028</b>	Study of Senescence (brief idea).
<b>5</b>	<b>SEC A</b>	<b>1. PLANT BREEDING AND BIOMETRY</b>		
		Plant breeding	<b>C029</b>	Understand the science of plant breeding including its Introduction and objective, Study of the Techniques of hybridization.
		Mass and Pure line selection	<b>C030</b>	To understand the Procedure, Advantages and limitations of mass and pure line selection
		Heterosis and hybrid seed production.	<b>C031</b>	To study the techniques of production of new superior crop varieties
		Role of mutation, polyploidy, distant hybridization and role of biotechnology in crop improvement	<b>C032</b>	Understand the Role of mutation, polyploidy, distant hybridization and study the role of biotechnology in crop Improvement.
		Biometry	<b>C033</b>	Understand the Measures of central tendency (Mean, Median and Mode), Standard error and standard deviation, Test of significance: Chi-square test for goodness of fit.
		<b>2. BIOFERTILIZERS</b>		
		Biofertilizers	<b>C034</b>	Study the General account of microbes used as biofertilisers; Study of <i>Rhizobium</i> identification, mass multiplication. Actinorrhizal symbiosis
		<i>Azospirillum</i>	<b>C035</b>	Learn the identification of <i>Azospirillum</i> , mass multiplication, associative effect of different microorganisms. Study of <i>Azotobacter</i> and understand the crop response to <i>Azotobacter</i> inoculum.
		Cyanobacteria,	<b>C036</b>	<i>Study of Azolla, Anabaena and Azolla</i> association, blue green algae and <i>Azolla</i> in rice cultivation.
		Mycorrhizal association	<b>C037</b>	Study of Types of Mycorrhizal association- Brief idea, understands of its influence on growth and yield of crop plants.
		Organic farming	<b>C038</b>	Study of Green manuring and organic fertilizers, Learn about Biocompost and vermicompost- making methods and field applications. Understand the Recycling of biodegradable municipal, industrial and agricultural wastes
	<b>DSE A</b>	<b>1. PHYTOCHEMISTRY AND MEDICINAL BOTANY</b>		
		Medicinal botany	<b>C039</b>	Study of History, scope and importance of medicinal plants, a brief idea about indigenous medicinal sciences- Ayurveda, Siddha and Unani. Polyherbal formulations.
		Pharmacognosy	<b>C040</b>	Understand the Scope and importance of Pharmacognosy, Study of Primary metabolites, Secondary metabolites- alkaloids, terpenoids, phenolics and their functions
		Organoleptic evaluation of crude drugs	<b>C041</b>	Study of Organoleptic evaluation of crude drugs

		Pharmacologically active constituents	<b>C042</b>	Study of Source plants (one example), parts used and uses of: Steroids (Diosgenin, Digitoxin), Tannin (Catechin), Resins (Gingerol, Curcuminoids), Alkaloids (Strychnine, Reserpine, Vinblastine), Phenols (Capsaicin).
		Ethnobotany and folk medicine	<b>C043</b>	Understand the Brief idea on the Applications of ethnobotany, Application of natural product to certain diseases- Jaundice, Cardiac and Diabetics.
		<b>2. NATURAL RESOURCE MANagements</b>		
		Natural resources	<b>C044</b>	Study of the definition and types of natural resource
		Sustainable utilization	<b>C045</b>	Understand the concept, approaches (economic, ecological and socio-cultural) of Sustainable utilization
		Land utilization	<b>C046</b>	Understand the concept of Land utilization, Soil degradation and management
		Water	<b>C047</b>	Understand the concept of Water, fresh water marine, estuarine. Study of Wetlands- threats and management.
		Biological resources	<b>C048</b>	Study on biodiversity- definition and types. Significance, threats and management strategies
		Forests	<b>C049</b>	Understand the definition of Forests, cover and its significance (with special reference to India). Study on the Major and minor forest products.
		Energy	<b>C050</b>	Know the renewable and non-renewable source of energy.
		EIA and waste management	<b>C051</b>	Understand the fundamentals of EIA and waste management
<b>6</b>	<b>SEC B</b>	<b>1. PLANT BIOTECHNOLOGY</b>		
		Plant tissue culture	<b>C052</b>	Understand the fundamentals of plant tissue culture, learn about the Cellular potency, study of Callus culture and plant regeneration.
		Micropropagation	<b>C053</b>	Study of Somatic embryogenesis and artificial seed
		Protoplast culture and its application	<b>C054</b>	Understand the various types Protoplast culture and its application
		Recombinant DNA technology	<b>C055</b>	Study of Recombinant DNA, Restriction enzymes, Plasmids as vectors.
		Gene cloning (basic steps)	<b>C056</b>	Understand the fundamentals of basic steps of gene cloning
		Achievements in crop biotechnology	<b>C057</b>	Study of Pest resistant plant (Bt cotton), understand about the Transgenic crops with improved quality (flavr tomato and golden rice).
		<b>2. MUSHROOM CULTURE TECHNOLOGY</b>		
		Mushroom	<b>C058</b>	Understand the fundamentals of nutritional and medicinal value of mushrooms. Study of Poisonous mushrooms
		Cultivation techniques/ technology of edible mushrooms in India:	<b>C059</b>	Understand the fundamentals of Cultivation techniques/ technology of edible mushrooms- <i>Volvareallavolvacea</i> , <i>Pleuretuscitrinopyrineatus</i> , <i>Agaricusbisporus</i> .
		Storage	<b>C060</b>	Understand the fundamentals of short term and long term of storage and drying.
		Food preparation	<b>C061</b>	Study of different types of foods prepared from mushroom. Understand the Cost and benefit ratio.
		Research centres	<b>C062</b>	Learn about the national and regional Research centres of Mushroom.
	<b>DSE B</b>	<b>1. ECONOMIC BOTANY</b>		
		Origin of cultivated plants	<b>C063</b>	Understand the Concepts of centres of origin and their importance with reference to Vavilov's work.
		Rice	<b>C064</b>	Study on origin, morphology and uses of rice
		Legumes	<b>C065</b>	Study on General account of legumes with special reference to <i>Vigna</i> .

	Beverages	<b>C066</b>	Study on the Tea- morphology, processing and uses.
	Study of the following economically important plants (Scientific names, families, parts used and importance):	<b>C067</b>	Cereals- Rice, wheat; Pulses- Mong, gram; Spices- Ginger, cumin; Beverages- Tea, coffee; Medicinal plants- Cinchona, neem, Ipecac, Vasaka; Oil yielding plants- Mustard, groundnut, coconut; Vegetables- Potato, radish, bottle gourd, cabbage; Fibre yielding plants- Cotton, jute; Timber yielding plants- Teak, Sal; Fruits- Mango, apple; Sugar yielding plant- Sugarcane.
	<b>2. HORTICULTURAL PRACTICES AND POST HARVEST</b>		
	Horticulture	<b>C068</b>	Understand the role of horticulture in rural economy and employment generation. Study on Urban horticulture- its scope and importance.
	Ornamental plants	<b>C069</b>	Study on the identification and salient features of some ornamental plants (rose, marigold, gladiolus, gerberas, tube rose, carnations, cacti and succulents) & Ornamental flowering trees (Gulmohor, Lagerstromia, Shimul, Coral tree and jacaranda).
	Identification of some fruits and vegetable plants	<b>C070</b>	Identification of Citrus, Banana, Papaya, Mango, Jackfruit, Chillies and cucurbits. Understand the Fruit processing- scope and benefits.
	Horticultural techniques	<b>C071</b>	Study on propagation methods, application of manure, fertilizers, nutrients and PGR. Study on Weed control technology. Understand the basic concept of Biofertilizers and biopesticides
	Post-harvest technology	<b>C072</b>	Understand the importance of post-harvest technology in horticultural practices. Study on Harvesting and handling of fruits, vegetables and cut flower. Study on the Methods of preservation and processing.
	Disease control and management	<b>C073</b>	Understand the field and post-harvest diseases of common crops. Study on Cropsanitation, quarantine practices. Study on the Identification of common diseases and pest of fruits and vegetable crops.