

Bankim Sardar College
A College with Potential for Excellence

Department of Botany
Under Graduate Programme

Programme Outcome (PO) – Programme Specific Outcome (PSO) – Course Outcome (CO)

Programme Outcome (PO) –

Botany i.e. plant science originated in prehistory as herbalism with the efforts of early humans to identify – and later cultivate – edible, medicinal and poisonous plants, making it one of the oldest branches of science. Modern botany is a broad, multidisciplinary subject with inputs from most other areas of science and technology. The student graduating with the Degree B.Sc (Pass/ General) Botany should be able to acquire

1. **Core competency:**

- The student will be able to identify major groups of plants and compare the characteristics of lower (e.g. algae and fungi) and higher (angiosperms and gymnosperms) plants.
- Students will be able to use the evidence based comparative botany approach to explain the evolution of organism and understand the genetic diversity on the earth.
- The students will be able to explain various plant processes and functions, metabolism, concepts of gene, genome and how organism's function is influenced at the cell, tissue and organ level.

2. **Analytical ability:** The students will be able to demonstrate the knowledge in understanding research and addressing practical problems.

3. **Team Player:** Students will learn team workmanship in order to serve industry and society.

4. **Independent Learner:** Apart from the subject specific skills, generic skills, especially in botany, the program outcome would lead to gain knowledge and skills for further higher studies, competitive examinations and employment. Learning outcomes based curriculum would ensure equal academic standards across the country and broader picture of their competencies.

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	PLANT DIVERSITY I (PHYCOLOGY, MYCOLOGY, PHYTOPATHOLOGY, BRYOPHYTES AND ANATOMY)		
		Introduction	CO1	Study about different plant groups.
		Phycology	CO2	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	CO3	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	CO4	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	C05	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	C06	Study of Stomata - Types (Metcalfe & Chalk), Anatomy of root, stem and leaf of monocots and dicots, Stelar types and evolution, Secondary growth – normal in dicot stem and anomaly in stem of <i>Tecoma</i> & <i>Dracaena</i> .
2	CCG2	PLANT DIVERSITY II (PTERIDOPHYTES, GYMNOSPERMS, PALAEOBOTANY, MORPHOLOGY AND TAXONOMY)		
		Pteridophytes	C07	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	C08	Study the Progymnosperms (brief idea), Understand the diagnostic characters and examples of Cycadophyta, Coniferophyta and Gnetophyta (Gifford & Foster 1989), Study the life histories of Cycas and Pinus, Study the Williamsonia (reconstructed), Understand the economic importance of Gymnosperms.
		Paleobotany & Palynology	C09	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	C010	Study and understand the Inflorescence types with examples, Flower, Fruits and seeds- type with examples.
		Taxonomy of Angiosperms	C011	Understand the Artificial, Natural and Phylogenetic systems of classification 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).
3	CCG3	CELL BIOLOGY, GENETICS AND MICROBIOLOGY Cell Biology and Genetics		
			C012	Study the ultrastructure of nuclear envelope, nucleolus and their functions, Understand the molecular organisation of metaphase chromosome (Nucleosome concept).
			C013	Study the various types of chromosomal aberrations- deletion, duplication, inversion & translocation, Understand the Aneuploidy & Polyploidy-types, importance and role in evolution.
			C014	Study the Central Dogma, Understand the process Transcription and Translation.
			C015	Study the properties of Genetic Code
			C016	Study the linkage group and Genetic map (three-point test cross).

			C017	Study the various types of Mutation – Point mutation (tautomerisation; transition, transversion and frame shift), Understand the Mutagen-physical and chemical.
			C018	Study the Brief concept of Split gene, Transposons
		Microbes	C019	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.
4	CC4	PLANT PHYSIOLOGY AND METABOLISM		
		Proteins	C020	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	C021	Study of Ascent of sap and Xylem cavitation , Understand the Phloem transport and source-sink relation
		Transpiration	C022	Understand the Mechanism of stomatal movement and its significance.
		Photosynthesis	C023	Study of Pigments, Action spectra and Enhancement effect, Understand the Electron transport system and Photophosphorylation, Study of C3 and C4 photosynthesis, CAM- Reaction and its Significance.
		Respiration	C024	Study of Glycolysis & Krebs cycle and its Significance, Study of ETS and oxidative phosphorylation.
		Nitrogen metabolism	C025	Understand Biological dinitrogen fixation process, Amino acid synthesis (reductive amination and transamination).
		Plant Growth regulators	C026	Study of Physiological roles of Auxin, Gibberellin, Cytokinin, Ethylene, ABA.
		Photoperiodism	C027	Study of Plant types, Role of phytochrome and GA in flowering and the process of Vernalization
		Senescence	C028	Study of Senescence (brief idea).
5	SEC A	1. PLANT BREEDING AND BIOMETRY		
		Plant breeding	C029	Understand the science of plant breeding including its Introduction and objective, Study of the Techniques of hybridization.
		Mass and Pure line selection	C030	To understand the Procedure, Advantages and limitations of mass and pure line selection
		Heterosis and hybrid seed production.	C031	To study the techniques of production of new superior crop varieties
		Role of mutation, polyploidy, distant hybridization and role of biotechnology in crop improvement	C032	Understand the Role of mutation, polyploidy, distant hybridization and study the role of biotechnology in crop Improvement.
		Biometry	C033	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.
		2. BIOFERTILIZERS		
		Biofertilizers	C034	Study the General account of microbes used as biofertilisers; Study of <i>Rhizobium</i> identification, mass multiplication. Actinorrhizal symbiosis
		<i>Azospirillum</i>	C035	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> inoculums.

		Cyanobacteria,	C036	<i>Study of Azolla, Anabaena and Azolla association, blue green algae and Azolla in rice cultivation.</i>
		Mycorrhizal association	C037	Study of Types of Mycorrhizal association- Brief idea, understands of its influence on growth and yield of crop plants.
		Organic farming	C038	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
	DSE A	1. PHYTOCHEMISTRY AND MEDICINAL BOTANY		
		Medicinal botany	C039	Study of History, scope and importance of medicinal plants, a broef idea about indigenous medicinal sciences- Ayurveda, Siddha and Unani. Polyherbal formulations.
		Pharmacognosy	C040	Understand the Scope and importance of Pharmacognosy, Study of Primary metabolites, Secondary metabolites- alkaloids, terpenoids, phenolics and their functions
		Organoleptic evaluation of crude drugs	C041	Study of Organoleptic evaluation of crude drugs
		Pharmacologically active constituents	C042	Study of Source plants (one example), parts used and uses of: Steroids (Diosgenin, Digitoxin), Tannin (Catechin), Resins (Gingerol, Curcumnoids), Alkaloids (Strychnine, Reserpine, Vinblastine), Phenols (Capsaicin).
		Ethnobotany and folk medicine	C043	Understand the Brief idea on the Applications of ethnobotany, Application of natural product to certain diseases- Jaundice, Cardiac and Diabetics.
		2. NATURAL RESOURCE MANagements		
		Natural resources	C044	Study of the definition and types of natural resource
		Sustainable utilization	C045	Understand the concept, approaches (economic, ecological and socio-cultural) of Sustainable utilization
		Land utilization	C046	Understand the concept of Land utilization, Soil degradation and management
		Water	C047	Understand the concept of Water, fresh water marine, estuarine. Study of Wetlands- threats and management.
		Biological resources	C048	Study on biodiversity- definition and types. Significance, threats and management strategies
		Forests	C049	Understand the definition of Forests, cover and its significance (with special reference to India). Study on the Major and minor forest products.
		Energy	C050	Know the renewable and non-renewable source of energy.
		EIA and waste management	C051	Understand the fundamentals of EIA and waste management
6	SEC B	1. PLANT BIOTECHNOLOGY		
		Plant tissue culture	C052	Understand the fundamentals of plant tissue culture, learn about the Cellular potency, study of Callus culture and plant regeneration.
		Micropropagation	C053	Study of Somatic embryogenesis and artificial seed
		Protoplast culture and its application	C054	Understand the various types Protoplast culture and its application
		Recombinant DNA technology	C055	Study of Recombinant DNA, Restriction enzymes, Plasmids as vectors.
		Gene cloning (basic steps	C056	Understand the fundamentals of basic steps of gene cloning
		Achievements in crop biotechnology	C057	Study of Pest resistant plant (Bt cotton), understand about the Transgenic crops with improved quality (flavr tomato and golden rice).

	2. MUSHROOM CULTURE TECHNOLOGY		
	Mushroom	C058	Understand the fundamentals of nutritional and medicinal value of mushrooms. Study of Poisonous mushrooms
	Cultivation techniques/ technology of edible mushrooms in India:	C059	Understand the fundamentals of Cultivation techniques/ technology of edible mushrooms - <i>Volvarealla volvacea</i> , <i>Pleuretus citrinopyrineatus</i> , <i>Agaricus bisporus</i> .
	Storage	C060	Understand the fundamentals of short term and long term of storage and drying.
	Food preparation	C061	Study of different types of foods prepared from mushroom. Understand the Cost and benefit ratio.
	Research centres	C062	Learn about the national and regional Research centres of Mushroom.
DSE B	1. ECONOMIC BOTANY		
	Origin of cultivated plants	C063	Understand the Concepts of centres of origin and their importance with reference to Vavilov's work.
	Rice	C064	Study on origin, morphology and uses of rice
	Legumes	C065	Study on General account of legumes with special reference to <i>Vigna</i> .
	Beverages	C066	Study on the Tea- morphology, processing and uses.
	Study of the following economically important plants (Scientific names, families, parts used and importance):	C067	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, raddish, bottle groud, cabbage; Fibre yielding plants- Cotton, jute; Timber yielding plants- Teak, Sal; Fruits- Mango, apple; Sugar yielding plant- Sugarcane.
	2. HORTICULTURAL PRACTICES AND POST HARVEST		
	Horticulture	C068	Understand the role of horticulture in rural economy and employment generation. Study on Urban horticulture- its scope and importance.
	Ornamental plants	C069	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	C070	Identification of Citrus, Banana, Papaya, Mango, Jackfruit, Chillies and cucurbits. Understand the Fruit processing- scope and benefits.
	Horticultural techniques	C071	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	C072	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	C073	Understand the field and post-harvest diseases of common crops. Study on Crop sanitation, quarantine practices. Study on the Identification of common diseases and pest of fruits and vegetable crops.