DEPARTMENT OF BOTANY

PROGRAMME OUTCOME

(BOTANY HONOURS UNDER CBCS SYSTEM)

(**Model Reference**: University of Calcutta, Syllabus for Botany Honours under CBCS system)

Programme Outcomes Nos	**Programme Outcomes (PO)**
PO A	To motivate the students for higher education and to take research as a career as well as to prepare them for a successful career in others jobs.
PO B	To provide strong knowledge in basic Plant science.
PO C	To provide hands on training on different experiments of Plant Sciences.
PO D	To develop individual and team work by functioning effectively as an individual or as a member in a group in laboratory classes
PO E	Ability to use modern techniques and to handle different types of sophisticated instruments.
PO F	To develop computational acumen in solving different statistical problems of Botany
PO G	To develop communicating ability such as being able to comprehend and write effective laboratory notebooks and design documentation
PO H	To develop an opportunity to work in interdisciplinary groups
PO I	To develop the ability to engage in independent and life-long learning in the current context of biotechnological research work.
PO J	To inculcate scientific temperament in the young minds and outside the scientific community
PO K	To develop knowledge on Biodiversity and Environmental awareness.
PO L	To explore the treasure of medicinal plants.

Programme Specific Outcomes Nos	**Programme Specific Outcomes (PSO)**
PSO 1	To apply knowledge in emerging and varied areas of Botany for higher studies
PSO 2	To develop leadership and managerial skills and understanding the need for lifelong learning to be a competent professional
PSO 3	To develop knowledge in community study and study on changing environment in our planet.
PSO 4	To be acquainted with good laboratory practices and safety measures

Mapping of PO & PSO for Botany (Honours) Syllabus of University of Calcutta

Programme Specific Outcomes (PSO) Nos	Programme Outcomes (PO)											
	A	B	C	D	E	F	G	H	I	J	K	L
PSO 1	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
PSO 2	✓			✓	✓		✓	✓	✓			
PSO 3	✓	✓			✓			✓	✓	✓	✓	✓
PSO 4	✓	✓	✓	✓	✓		✓					

PROGRAMME OUTCOME MAPPING FOR SEMESTER WISE COURSE

TABLE I (For Semester- I and II)

COURSE DURATION	COURSE DETAIL	PROGRAMME OUTCOME (PO)											
		A	B	C	D	E	F	G	H	I	J	K	L
Semester I	CC –1 (Phycology & Microbiology- Theory and Practical)	✓	✓	✓			✓						
	CC –2 (Mycology & Plant Pathology- Theory and Practical)	✓	✓	✓		✓							
Semester II	CC-3 (Plant anatomy- Theory and Practical)	✓			✓	✓		✓	✓				
	CC-4 (Archaegoniate- Theory and Practical)	✓	✓	✓		✓			✓				

TABLE II (For Semester- III and IV)

COURSE DURATION	COURSE DETAIL	PROGRAMME OUTCOME (PO)											
		A	B	C	D	E	F	G	H	I	J	K	L
Semester III	CC-5 (Paleobotany and palynology- Theory and Practical	✓	✓	✓		✓			✓				

	CC-6 (Reproductive biology of angiosperms- Theory and Practical)	✓	✓	✓		✓	✓		✓			✓	✓
	CC-7 (Plant systematic- Theory and Practical)	✓	✓	✓			✓		✓			✓	✓
	SEC-A (Biofertilizers- Theory)	✓	✓										
Semester IV	CC- 8 (Plant Geography, Ecology and Evolution- Theory and Practical)	✓	✓	✓					✓			✓	
	CC-9 (Economic Botany- Theory and Practical)	✓	✓	✓							✓	✓	✓
	CC-10 (Genetics- Theory and Practical)	✓	✓	✓					✓	✓			
	SEC- B (Mushroom Culture Technology- Theory)	✓	✓						✓	✓			

TABLE III (For Semester- V and VI)

COURSE DURATION	COURSE DETAIL	PROGRAMME OUTCOME (PO)											
		A	B	C	D	E	F	G	H	I	J	K	L
Semester V	CC- 11 (Cell and molecular biology- Theory and Practical)	✓	✓	✓					✓	✓			
	CC-12 (Biochemistry- Theory and Practical)	✓	✓	✓					✓		✓		✓
	DSE-A (Biostatistics-Theory and Practical)	✓	✓	✓					✓	✓			
	DSE-B (Plant Biotechnology- Theory and Practical)	✓	✓	✓					✓	✓			

Semester VI	CC- 13 (Plant Physiology- Theory and Practical)	✓	✓	✓					✓				
	CC-14 (Plant Metabolism- Theory and Practical)	✓	✓	✓					✓				
	DSE-A (Medicinal and ethnobotany-Theory and Practical)	✓	✓	✓					✓		✓		✓
	DSE-B (Natural Resource Management- Theory and Practical)	✓		✓								✓	

DEPARTMENT OF BOTANY

COURSE OUTCOME

(BOTANY HONOURS UNDER CBCS SYSTEM)
SEMESTER- I
CC-1 (Phycology & Microbiology- Theory)

After successfully completing this course, students will be able to:

CO1	Have an idea of cell structure, origin and evolution of algae and important contributions of phycologists, classification of algae
CO2	Have a concept of structural and ecological aspects of Cyanobacteria; structural features, cell division and auxospore formation in Bacillariophyta
CO3	Understand the life cycle of *Chlamydomonas, Oedogonium, Chara, Ectocarpus, Polysiphonia* and evolutionary system of Procholron
CO4	Have knowledge on Discovery of Plant virus, types, Transmission and translocation of Plant virus, Physicochemical characteristics and Multiplication of TMV, One step growth curve, Lytic cycle and Lysogenic cycle, Significance of lysogeny, Viroids and Prions
CO5	Know the discovery, distinguishing features of Archaea and Bacteria, characteristics of some major groups of bacteria, Bacterial growth curve and generation time, Flagella & Pilli, Cell wall of Gram +ve & Gram – ve bacteria, Bacterial genome and plasmid, Endospore and Genetic Recombination in bacteria

CC-1 (Phycology & Microbiology- Practical)

After successfully completing this course, students will be able to:

CO1	Study of the microscopic features of *Oedogonium, Chara, Ectocarpus*
CO2	Know microscopic features of *Gloeotrichia, Volvox, Vaucheria, Coleochaete, Polysiphonia,* Centric and Pennate diatom *and* macroscopic features of *Laminaria,*

	Sargassum
CO3	Prepare bacterial culture media
CO4	Have a concept of sub-culturing of bacterial culture
CO5	Have knowledge on Gram staining from bacterial culture, microscopic examination of bacteria from natural habitat by simple staining
CO6	Prepare a report on plant diversity and algal diversity

CC-2 (Mycology & Plant Pathology- Theory)

After successfully completing this course, students will be able to:

CO1	Have an idea of fungal hyphal forms, fungal spore forms and mode of liberation, sexual reproduction and degeneration of sex, parasexuality and sexual compatibility, life cycle pattern
CO2	Know the Classification of fungi, understand life history of *Synchytrium*, *Rhizopus*, *Ascobolus*, *Agaricus*
CO3	Have thorough knowledge of the different types of Mycorrhiza and their role in Agriculture & Forestry, different types of lichen and their economic and ecological importance
CO4	Have a concept of different types of plant diseases, host – parasite Interaction, pathotoxin, defense mechanism, Resistance
CO5	Have knowledge on plant disease management, symptoms , causal organism, disease cycle and control measures of different plant diseases.

CC-2 (Mycology & Plant Pathology- Practical)

After successfully completing this course, students will be able to:

CO1	Study the microscopic features of *Rhizopus*, *Ascobolus* , *Agaricus*
CO2	Know microscopic features of Zygospore of *Rhizopus*, Conidia of *Fusarium*, Conidiophore of *Penicillium* and morphological study of Fungi, Lichens
CO3	Know how to prepare fungal media and sterilization process
CO4	Have a concept of Isolation of pathogen from diseased leaf, Inoculation of fruit and subculturing, to identify different Pathological specimens
CO5	Have knowledge on to prepare a report on macro-fungal diversity

SEMESTER II

CC-3 (Plant anatomy- Theory)

After successfully completing this course, students will be able to:

CO1	Understand the Ultrastructure, Chemical constituents of cell wall, Plasmodesmata, Concept of Apoplast and Symplast, Growth and Thickening of cell wall.
CO2	Know types of stomata, Stelar types & evolution
CO3	Describe the primary structure of stem and root, Leaf, Normal and Anomalous Secondary growth, Mechanical tissues and the Principles governing their distribution in plants
CO4	Understand the organisation of shoot apex and Root apex, Plastochrone, adaptive

	anatomical features of Hydrophytes, Xerophytes.
CO5	Know the scope of plant anatomy in systematics, forensics and pharmacognosy

CC-3 (Plant anatomy- Practical)

After successfully completing this course, students will be able to:

CO1	Have knowledge on microscopic studies on types of stomata, sclereids, raphides, cystolith, starch grains, aleurone grains, laticiferous ducts, oil glands
CO2	Know the anatomical details of Monocot and dicot Root, Monocot and dicot Stem, Monocot and dicot Leaf.
CO3	Describe the anomalous secondary structure in different plants
CO4	Understand the adaptive anatomical features of hydrophytes and xerophytes.

CC-4 (Archaegoniate- Theory)

After successfully completing this course, students will be able to:

CO1	Have knowledge on General characteristics and adaptations to land habit, Classification of bryophytes, Gametophyte structure and Reproduction, Development and Structure of sporophyte, Spore dispersal in *Marchantia, Anthoceros, Funaria*
CO2	Know Unifying features of archaegoniates; transition to land habit, Origin of Alternation of Generations, Evolution of Sporophytes, Origin of Bryophytes, Role of bryophytes in Plant succession, Pollution Monitoring, Economic importance of bryophytes with special reference to *Sphagnum*
CO3	Have a concept of Colonisation and rise of early land plants, Classification of vascular plants (Rhyniophyta to Filicophyta), Sporophyte structure, Reproduction and Structure of gametophyte in *Psilotum, Selaginella, Equisetum, Pteris*
CO4	Understand the Telome concept and its significance in the origin of different groups of Pteridophytes, Heterospory and Origin of Seed habit, Economic importance of pteridophytes.
CO5	Know the Classification of vascular plants (Progymnospermophyta to Gnetophyta), Progymnosperms
CO6	Understand the distribution, vegetative and reproductive structure of sporophyte, development of gametophyte in *Cycas* , *Pinus* and *Gnetum*, Economic importance of gymnosperms

CC-4 (Archaegoniate- Practical)

After successfully completing this course, students will be able to:

CO1	Identify *Riccia, Porella, Marchantia, Anthoceros, Funaria*
CO2	Know the details of *Lycopodium, Ophioglossum, Marsilea, Selaginella, Equisetum, Pteris, Dryopteris*
CO3	Understand the morphological features of *Cycas, Pinus, Gnetum* and microscopic study of *Cycas, Pinus, Ginkgo, Gnetum*
CO4	Have knowledge on to prepare a report on diversity of bryophytes, pteridophytes and gymnosperms

SEMESTER III

CC-5 (PALAEOBOTANY AND PALYNOLOGY- Theory)

After successfully completing this course, students will be able to:

CO1	Understand the Geological time scale with dominant plant groups through ages and different types of Plant Fossil
CO2	Know Structural features, Geological distribution and Evolutionary significance of Fossil Pteridophytes and Fossil gymnosperms
CO3	Have an idea about Indian Gondwana System
CO4	Understand the different types of Spore and Pollen, Pollen aperture types, NPC classification, Pollen wall- Sporopollenin, Stratification and Ornamentation
CO5	Basic concepts of. Palaeopalynology, Aeropalynology, Forensic palynology, Melissopalynology

CC-5 (PALAEOBOTANY AND PALYNOLOGY- Practical)

After successfully completing this course, students will be able to:

CO1	Identify *Ptilophyllum* and *Glossopteris* leaf fossils
CO2	Understand the stem anatomy of *Rhynia*, *Lepidodendron*, *Calamites*, *Lyginopteris*, *Cordaites*
CO3	Have knowledge on Study of Pollen types

CC-6 (REPRODUCTIVE BIOLOGY OF ANGIOSPERMS- Theory)

After successfully completing this course, students will be able to:

CO1	Understand the types of Inflorescence, Flower, induction of flowering, flower development- genetic and molecular aspects and types of fruits and seeds
CO2	Know the different Pre-fertilisation changes in plant; different stages involved in Fertilisation, Double fertilization
CO3	Have an idea about Embryogenesis in *Capsella*, Development of Endosperm, Apomixis & Polyembryony

CC-6 (REPRODUCTIVE BIOLOGY OF ANGIOSPERMS- Practical)

After successful completing this course, students will be able to:

CO1	Understand the different types of Inflorescence types, Flower, and Fruits
CO2	Know the different types of Study of ovules
CO3	Have knowledge on to prepare a report on different types of inflorescence, flowers and fruits

CC-7 (PLANT SYSTEMATICS- Theory)

After successfully completing this course, students will be able to:

CO1	Gain knowledge on Components of Systematic, Taxonomy and it's phases
CO2	Understand Nomenclature, Type method, Publication, Rank of taxa, Rules of priority, Retention and rejection of names, Author Citation, Effective and valid publication, Elementary knowledge of ICN
CO3	Have an idea about Systems of classification and angiosperm phylogeny group (APG III) classification, Herbaria and Botanical Gardens and their role in teaching and

	research; Dichotomous keys
CO4	Have idea about Phenetics and Cladistics
CO5	Explain different Data sources in Taxonomy
CO6	Understand the diagnostic features, Systematic position, Economically important plants of different Monocotyledons and Dicotyledons families

CC-7 (PLANT SYSTEMATICS - Practical)

After successfully completing this course, students will be able to:

CO1	Provide a sound knowledge and understanding of Work out, description, preparation of floral formula and floral diagram, identification of wild plants, Spot identification of common wild plants
CO2	Know how to prepare Herbarium specimen
CO3	Have knowledge on to prepare a report on diversity of angiospermic plants

SEC-A (BIOFERTILIZERS Theory)

After successfully completing this course, students will be able to:

CO1	Gain knowledge on different microbes used as biofertilizers- *Rhizobium*- isolation, identification, mass multiplication, carrier based inoculants, actinorrhizal symbiosis, *Azospirillum*, *Azotobacter*
CO2	Understand Cyanobacteria, *Azolla* and *Anabaena azollae* association, nitrogen fixation, blue green algae and *Azolla* in rice cultivation
CO3	Have an idea about Mycorrhizal association, types of mycorrhizal association, phosphorus nutrition, growth and yield- colonisation of VAM and its influence on growth and yield of crop plants.
CO4	Know about Organic farming- green manuring and organic fertilizers, recycling of biodegradable municipal, agricultural and industrial wastes- biocompost making methods, types and methods of vermicomposting- field application

SEMESTER IV

CC-8 (PLANT GEOGRAPHY, ECOLOGY AND EVOLUTION- Theory)

After successfully completing this course, students will be able to:

CO1	Have a knowledge on Phytogeographical regions of India, Dominant flora of Eastern Himalaya, Western Himalaya and Sunderban
CO2	Understand Endemic types and Factors; theories; Endemism in Indian flora.
CO3	Have an idea about Habitat and Niche, Ecotone and edge–effect, Microclimate, Ecads, ecotype and ecoclines, Carrying capacity
CO4	Have a concept of Community, Ecological succession, Plant indicators; Phytoremediation, Conservation of Biodiversity
CO5	Know about Natural selection, Group selection, Neutral theory of molecular evolution, Phyletic gradualism, Punctuated equilibrium and Stasis, Stabilizing directional, disruptive and sexual selection; Speciation: Sympatric and allopatric speciation; Coevolution, Adaptive radiation, Reproductive isolation

CO6	Understand phylogeny of bacteria, algae, fungi, bryophyte, pteridophyte and gymnosperm, have concept on Phylogenetic tree.

CC-8 (PLANT GEOGRAPHY, ECOLOGY AND EVOLUTION- Practical)

After successfully completing this course, students will be able to:

CO1	Provide a sound knowledge and understanding of Study of community structure by quadrat method
CO2	Have an idea on comparative anatomical studies of leaves form polluted and less polluted areas
CO3	Measure dissolved O_2 and free CO_2 from different sources
CO4	Have knowledge on to prepare a report on flora of a particular area highlighting phytogeographical characteristics of the region

CC-9 (ECONOMIC BOTANY- Theory)

After successfully completing this course, students will be able to:

CO1	Have a Concepts of centre of cultivated crops, origin, their importance, crop domestication and loss of genetic diversity; evolution of new crops/ varieties, importance of germplasm diversity
CO2	Understand origin, morphology, processing and uses of Rice and wheat, Origin, morphology and uses of gram and mung bean. Importance of legumes to man and environment, Morphology and processing of sugarcane, products and byproducts of sugarcane industry, Potato- morphology, propagation and uses.
CO3	Have an idea about Spices and Beverages (Tea)
CO4	Have a concept on General description, classification, extraction, their uses and health implications of Oil and fats, Essential oils, Drug-yielding plants
CO5	Know about general account with special reference to Sal and Teak, Morphology, extraction and uses of Cotton and Jute

CC-9 (ECONOMIC BOTANY- Practical)

After successfully completing this course, students will be able to:

CO1	Know L.S./T.S. of grain, starch grains, T.S. of potato tuber to show localization of starch grains, W.M. of starch grains
CO2	Provide a knowledge on morphological features of Soybean, ground nut, potato, *Digitalis*, *Papaver* and *Cannabis*
CO3	Do qualitative tests for carbohydrates, proteins, fat and tannin
CO4	Have a knowledge on anatomical features of Sal and Teak

CC-10 (GENETICS- Theory)

After successfully completing this course, students will be able to:

CO1	Have a Concepts on Mendelian genetics and its extension, Linkage, Crossing over and Gene Mapping
CO2	Understand Epistasis and Polygenic inheritance in plants
CO3	Have an idea about Aneuploidy and Polyploidy, Speciation and evolution through polyploidy
CO4	Have a concept on different types of Chromosomal aberration and their meiotic behaviour

CO5	Know about different types of Mutation and Molecular mechanisms, DNA repair
CO6	Explain structural organisation of Gene

CC-10 (GENETICS- Practical)

After successfully completing this course, students will be able to:

CO1	Know methods of Pre-treatment, Fixation, Staining, Squash and Smear preparation, Preparation of permanent slides
CO2	Determine of mitotic index and frequency of different mitotic stages in pre-fixed root tips
CO3	Do study meiotic chromosome
CO4	Have a knowledge on Study of chromosomal aberrations developed due to exposure to any two pollutants/ pesticides etc
CO5	Give an idea about Identifying features of different stages of mitosis and meiosis

SEC-B (MUSHROOM CULTURE TECHNOLOGY- Theory)

After successfully completing this course, students will be able to:

CO1	Gain knowledge on General account of mushroom, nutritional and medicinal value of edible mushrooms; poisonous mushrooms, types of edible mushrooms
CO2	Understand Cultivation technology of different mushrooms
CO3	Have an idea about short term and long term storage of mushroom
CO4	Have a thorough knowledge on type of foods prepared from mushroom. Research centres, Cost benefit ratio, Export value of mushroom

SEMESTER V

CC-11 (CELL AND MOLECULAR BIOLOGY- Theory)

After successfully completing this course, students will be able to:

CO1	Describe evolution of nucleic acid, Concept of RNA world, Ribozymes, First cell, Origin of eukaryotic cell, Small RNA- riboswitch, RNA interference, si-RNA, mi RNA, Organellar DNA
CO2	Have knowledge on Nucleus and Chromosome, DNA packaging in eukaryotic chromosome, Centromere
CO3	Have a thorough knowledge on Cell cycle and its regulation, Apoptosis
CO4	Know the molecular basis of DNA Replication, Transcription and Translation in Prokaryotes & Eukaryotes, RNA processing
CO5	Have concept on Gene Regulation, genetic code properties and decipherence of codon
CO6	Have a concept of Recombinant DNA Technology, Development and causes of Cancer, tumor suppressor gene and oncogene

CC-11 (CELL AND MOLECULAR BIOLOGY- Practical)

After successfully completing this course, students will be able to:

CO1	Know how to Study of plant cell structure, Measurement of cell size by the technique of micrometry
CO2	Do Counting cells per unit volume with the help of haemocytometer, Cytochemical

	staining of DNA
CO3	Estimate DNA and RNA content
CO4	Have a knowledge to Study of nucleolus and determination of nucleolar frequency

CC-12 (BIOCHEMISTRY- Theory)

After successfully completing this course, students will be able to:

CO1	Know about Biochemical Foundations, Molecules of life
CO2	Have knowledge on Energy flow and enzymology
CO3	Have a thorough knowledge on Membrane chemistry, Membrane transport, mechanism of ion uptake.
CO4	Have concept on ATP Synthesis- Chemiosmotic model, Oxidative and Photophosphorylation

CC-12 (BIOCHEMISTRY- Practical)

After successfully completing this course, students will be able to:

CO1	Detect organic acids qualitatively
CO2	Detect nature of carbohydrate and protein from plant samples
CO3	Detect Ca, Mg, Fe, S from plant ash sample
CO4	Prepare different solutions and buffers
CO5	Have an idea to estimate amino-nitrogen, glucose, titratable acidity from lemon, catalase activity and urease activity in plant samples quantitatively
CO6	Use of Colorimeter for quantitative estimation of protein

DSE-A (BIOSTATISTICS- Theory)

After successfully completing this course, students will be able to:

CO1	Know about the concept of Biostatistics, statistical methods, basic principles, variables- measurements, functions, limitations and uses of statistics
CO2	Have knowledge on Data, Sample, Population, Random sampling, Frequency distribution, Arithmetic Mean, Mode and Median; Measurement of dispersion, Coefficient of variation, Standard Deviation, Standard error of Mean
CO3	Have a thorough knowledge on chi- square test for goodness of fit and Probability
CO4	Have concept on Measurement of gene frequency

DSE-A (BIOSTATISTICS- Practical)

After successfully completing this course, students will be able to:

CO1	Analyze of statistical data, Calculation of correlation coefficient values and finding out the probability
CO2	Determine of goodness of fit in Mendellian and modified mono-and dihybrid ratios by Chi-square analysis and comment on the nature of inheritance from any sample
CO3	Have a thorough knowledge Calculate‘F’ value and finding out the probability value for the F value
CO4	Have concept on basic idea of computer programme for statistical analysis of correlation coefficient, ‘t’ test, standard error, standard deviation

DSE-B (PLANT BIOTECHNOLOGY- Theory)

After successfully completing this course, students will be able to:

CO1	Get an overview of Plant tissue culture, Cellular totipotency, Tissue culture media, Aseptic manipulation, Cyto-differentiation and dedifferentiation
CO2	Have knowledge on Plant regeneration through organogenesis and somatic embryogenesis
CO3	Have a thorough knowledge on Haploid Culture, Protoplast isolation and culture, Protoplast fusion
CO4	Gain knowledge on different gene transfer methods, Achievements of Plant Genetic Engineering in crop biotechnology

DSE-B (PLANT BIOTECHNOLOGY- Practical)

After successfully completing this course, students will be able to:

CO1	Familiarize with basic equipments in plant tissue culture
CO2	Prepare basal media.
CO3	Have a thorough knowledge on Sterilization techniques

SEMESTER VI

CC-13 (PLANT PHYSIOLOGY- Theory)

After successfully completing this course, students will be able to:

CO1	Know about the Plant-water relations
CO2	Have knowledge on Mineral nutrition and mineral deficiency symptoms in plants
CO3	Have concept on Organic Translocation in plants
CO4	Have an idea about Physiological roles of different Plant Growth Regulators
CO5	Have a Concept of photomorphogenesis, Photoperiodism and plant types, Critical day length, Phytochrome, cryptochrome and phototropins, Vernalisation, biological clock and biorhythm.
CO6	Get an idea about Types, Causes and Methods of breaking seed dormancy, Biochemistry of seed germination.
CO7	Know about the Physiology of Senescence and Ageing

CC-13 (PLANT PHYSIOLOGY- Practical)

After successfully completing this course, students will be able to:

CO1	Determine of loss of water per stoma per hour
CO2	Understand the Relationship between transpiration and evaporation
CO3	Have concept on Measurement of osmotic pressure
CO4	Have a Concept of Effect of temperature on absorption of water by storage tissue and determination of Q_{10}
CO5	Get an idea about Rate of imbibition of water by starchy, proteinaceous and fatty seeds and effect of seed coat
CO6	Study the phenomenon of seed germination
CO7	To study the induction of amylase activity in germinating grains
CO8	Study the effect of different concentrations of IAA on *Avena* coleopotile elongation

CC-14 (PLANT METABOLISM- Theory)

After successfully completing this course, students will be able to:

CO1	Know about the Concept of metabolism
CO2	Have knowledge on Photosynthesis and it's process in different plants, Photosynthetic efficiency of C3 and C4 plants and crop productivity, Photorespiration, Crassulacean Acid Metabolism and it's ecological significance.
CO3	Have concept on process of Respiration in plant, Mitochondrial electron transport system, uncouplers, Oxidation of cytosolic $NADH^{+}H^{+}$, Stoichiometry of glucose oxidation
CO4	Have an idea about assimilation of nitrate by plants, Biochemistry of dinitrogen fixation in *Rhizobium*, amino acid biosynthesis
CO5	Have a Concept of Lipid metabolism
CO6	Get an idea about Mechanism of signal transduction

CC-14 (PLANT METABOLISM- Practical)

After successfully completing this course, students will be able to:

CO1	Have a basic idea of different types chromatography
CO2	Understand the Separation of plastidial pigments by solvent and paper chromatography
CO3	Have concept on Estimation of total chlorophyll
CO4	Get an idea about Effect of HCO3 concentration on oxygen evolution during photosynthesis
CO5	Measure oxygen uptake by respiring tissue
CO6	Determine of the RQ of germinating seeds
CO7	Study the seed viability

DSE-A (MEDICINAL AND ETHNOBOTANY- Theory)

After successfully completing this course, students will be able to:

CO1	Know about the History, scope and importance of medicinal plant and Polyherbal formulations
CO2	Have knowledge on Pharmacognosy and its importance, Crude drugs, Classification of drugs,
CO3	Have a thorough knowledge on Secondary metabolites, Interrelationship of basic metabolic pathways with secondary metabolite biosynthesis, Major types of secondary metabolites
CO4	Have concept on Source plants parts used and uses of Pharmacologically active constituents
CO5	Have an idea about Ethnobotany and folk medicine, Palaeo-ethnobotany, ethnomedicine, ethnoecology, application of natural products to certain diseases

DSE-A (MEDICINAL AND ETHNOBOTANY- Practical)

After successfully completing this course, students will be able to:

CO1	Detect Tannin and Alkaloid by different chemical tests
CO2	Know the Powder microscopic features of *Zingiber* and *Holarrhena*

CO3	Do the Histochemical tests of Curcumin, Starch, Alkaloid

DSE-B (Natural resource management- Theory)

After successfully completing this course, students will be able to:

CO1	Get an overview of Natural resources and Sustainable utilization of resources
CO2	Have knowledge on Land Utilization, Soil degradation and management, Fresh water; Marine; Estuarine; Wetlands; Threats and management strategies
CO3	Have a thorough knowledge on Biodiversity and it's types; Significance; Threats; Management strategies; Bioprospecting; IPR; CBD; National Biodiversity Action Plan
CO4	Gain knowledge on Forests, Forest products; Depletion; Management
CO5	Have a concept on Renewable and non-renewable sources of energy
CO6	Familiarize with EIA, GIS, Participatory Resource Appraisal, Ecological Footprint with emphasis on carbon footprint, Resource Accounting; Waste management.
CO7	Have concept on National and international efforts in resource management and conservation

DSE-B (Natural resource management- Practical)

After successfully completing this course, students will be able to:

CO1	Estimate of solid waste generated by a domestic system
CO2	Estimate of foliar dust deposition
CO3	Determine of total solid in water
CO4	Have concept on to determine chemical properties of soil by rapid spot test
CO5	Estimate organic carbon percentage present in soil sample
CO6	Prepare a report on collection of data on forest cover of specific area