

Topic & Paper No.	Sub-Topic	Syllabus allotted	No of Lectures require to complete the topic	Month
DSC/CORE PLANT DIVERSITY (THEORY) BOT-H-CC1	1. Introduction to plant kingdom. Originoflifeandevolutionofplantcells,1.2Importance of plant sassource of food, fuel and their role in ecosystem services (as carbon sink, sequestering etc.)	Prof. ANIRUDDHA GHOSH	9	Aug-Dec
	2. Algae 2.1. Salient features of Cyanophyceae, Chlorophyceae, Charophyceae, Phaeophyceae, Rhodophyceae and Bacillariophyceae 2.2 Criteria and system of classification (Fritsch, 1935) 2.3. Economic importance of algae in environment, agriculture, biotechnology and industry.			
	3. Fungi 3.1 Salient features of Myxomycota, Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina, Deuteromycotina. 3.2 SystemofclassificationuptoSub-division(Ainsworth,1973), 3.3Economicimportanceoffungi(food,medicineandagriculture),3.4Fungal symbioses:Mycorrhiza, Lichen and their importance.	Ms. DISHA DASGUPTA	6	Aug-Dec
	4. Bryophytes 4.1SalientfeaturesofHepaticopsida,AnthocerotopsidaandBryopsida ,4.2.Systemofclassificationup to Class (Proskauer 1957), 4.3 Amphibian nature of bryophytes, 4.4 Economic and ecological importance.	Dr. RASHI SUBBA	6	Aug-Dec
	5. Pteridophytes 5.1 Salient features of Psilophyta, Lycophyta, Sphenophyta and Filicophyta, 5.2System of classification up to Division (Gifford & Foster 1989), 5.3 Economic importance (food, medicine & agriculture).	Mrs. SRIYA CHAKRABAR TI	6	Aug-Dec
	6. Gymnosperms 6.1 Salient features of Cycadophyta, Coniferophyta and Gnetophyta, 6.2 Outline classification up to Division: Progymnospermophyta to Gnetophyta (Gifford & Foster 1989), 6.3 Economic importance (wood, resin, essential oil & drugs).	Dr. SANKAR BAKSHI	6	Aug-Dec
	7. Angiosperms 7.1 Types and morphology of leaf, stem and root, 7.2 Inflorescence types with examples, 7.3Flower: Differentpartsandformsofcalyx,corolla,androeciumandgynoecium;aesti vationandplacentation, 7.4Typeswithexamples-fruitsandseeds.	Mrs. SRIYA CHAKRABAR TI	12	Aug-Dec

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SEC-1-TH MUSHROOM CULTIVATION TECH. (THEORY)	1. 1.1 Introduction, History of mushroom cultivation, 1.2 Current overview of mushroom production in the world, 1.3 Mushroom biology-classification of mushrooms, edible mushrooms in India, poisonous mushrooms, mushroom poisoning.	Ms. DISHA DASGUPTA	6	Aug-Dec
	2. 2.1 Infrastructure-structural design and layout of mushroom farm, substrates (locally available), 2.2 Appliances- weighing balance, autoclave, laminar air flow, incubator, hot air oven, spirit lamp, bunsen burner, pH meter, laboratory heater, low-cost stoves, water bath, humidifier, water sprayer, vessels, inoculation hook and inoculation loop, sieves, culture racks, tray, polythene bags, 2.3 Methods of sterilization.		9	
	3. 3.1 Cultivation technology-overview of cultivation strategies, composting technology in mushroom production, mushroom bed preparation, culture media, pure culture, maintenance and preservation of pure culture, 3.2 Production of spawn-cultivation of oyster mushroom, paddy-straw mushroom, milky mushroom and white button mushroom, 3.3 Cultivation of medicinal mushroom (Cordyceps and Ganoderma).		12	
	4. 4.1 Mushroom diseases and management strategies, 4.2 Post-harvest technology-short-term storage (Refrigeration-upto 24 hours), long-term storage (canning, pickles, papad etc.), drying, storage in salt solutions, 4.3 Food preparations from mushrooms.		9	
	5. 5.1 Uses of spent mushroom substrate, 5.2 Strain improvements in cultivated mushroom; Nutritional and medicinal value of edible mushrooms, 5.3 Research centres-National level and regional level, 5.4 Cost-benefit ratio, 5.5 Mushroom based Industry, 5.6 Mushroom market in India and abroad.		9	

Topic & Paper No.	Sub-Topic	Syllabus allotted	No of Lectures require to complete the topic	Month
DSC/CORE PLANT SYSTEMATICS (THEORY) CC-2	1. Introduction: Components of Systematics: Nomenclature, Identification, Classification; 1.2.Taxonomy and its phases - Pioneer, Consolidation, Biosystematic and Encyclopaedic; alpha- and omega- taxonomy, 1.3 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- Principles. 2. Systems of classification: 2.1 Broad outline of Bentham & Hooker (1862-1883) and Takhtajan (1997)- systems of classification with merits and demerits. Brief idea of angiosperm phylogeny group (APG IV classification), 2.2 Systematics in Practice: Herbaria and Botanic Gardens – their role in teaching and research; 2.3. Dichotomous keys – indented and bracketed	Dr. AJANTA SAHA MONDAL	20	Aug-Dec
	2.4 Brief idea on Phenetics and cladistics: Monophyletic, polyphyletic and paraphyletic groups; Plesiomorphy and apomorphy; 2.5 Numerical taxonomy- methods and significance; 2.6 Data sources in Taxonomy: Supportive evidences from Phytochemistry, Cytology, Palynology and Molecular biology data (Protein and Nucleic acid homology).	Prof. ANIRUDD HA GHOSH	10	Aug-Dec
	Systematic study of angiosperm taxa: Diagnostic features, systematic position (Bentham & Hooker) and economically important plants (parts used and uses) of the following families: Monocotyledons: Alismataceae, Gramineae (Poaceae), Cyperaceae, Palmae (Arecaceae), Liliaceae, Musaceae, Zingiberaceae, Cannaceae, Orchidaceae. Dicotyledons: Nymphaeaceae, Magnoliaceae, Ranunculaceae, Leguminosae (subfamilies), Euphorbiaceae, Malvaceae, Umbelliferae (Apiaceae), Labiatae (Lamiaceae), Cruciferae (Brassicaceae), Solanaceae, Scrophulariaceae, Acanthaceae, Rubiaceae, Cucurbitaceae, Compositae (Asteraceae).	Dr. AJANTA SAHA MONDAL and Mrs. SRIYA CHAKRABARTI	15	Aug-Dec

Topic & Paper No.	Sub-Topic	Syllabus allotted	No of Lectures require to complete the topic	Month
SEC BIOFERTILIZERS AND BIOPESTICIES (THEORY) SEC-2-TH	1. 1.1 General account and components of organic farming; microbes used as biofertilizers, general account on mass production of biofertilizers; 1.2 Manure- Green manuring and organic fertilizers; types and methods of composting; vermicompost and field applications; recycling of biodegradable municipal, agricultural and industrial wastes. 2. 3.1 Cyanobacteria (Blue green algae), Azolla and Anabaena azollae association, nitrogen fixation, factors affecting growth, blue green algae and Azolla in rice cultivation. 3.2 Actinorhizal symbiosis- Actinorhizal plants, infection process, isolation of Frankias 3. Mycorrhizal association- 4.1 Types of mycorrhizal association, phosphorus nutrition, growth and yield; 4.2 colonization of VAM – isolation and inoculum production of VAM and its influence on growth and yield of crop plants.	Prof. DISHA DASGUPTA	18	April to June
	4. Nitrogen fixing bacteria as biofertilizers: 2.1 Rhizobium- Isolation, identification, mass multiplication, carrier-based inoculant formulation, field application; 2.2 Azospirillum- Isolation, carrier-based inoculants, mass multiplication, associative effect of different microorganisms; 2.3 Azotobacter- Classification, characteristics, crop response to Azotobacter inoculants, maintenance and mass multiplication 5. 5.1 Phosphate, Potash and Zinc Solubilizing Microbes- Isolation, characterization, mass production, field application; 5.2 Plant Growth Promoting Rhizobacteria (PGPR) as biofertilizers, mode of action of PGPR	Dr. RASHI SUBBA	15	April to June
	Biopesticides – 6.1 Introduction; General features of potential biopesticides; Prospect and limitation; 6.2 Trichoderma: Isolation, mass production, formulation, quality control and field application; 6.3 Pseudomonas- Isolation, beneficial Pseudomonas strains in agriculture, mode of action; 6.4 Fungi as bioinsecticide- Metarhizium anisopliae, Beauveria bassiana and Verticillium lecanii- overview, mode of action and use in agriculture; 6.5 Nematophagous fungi- overview, mode of action; 6.6 Bacteria as bioinsecticide- Bacillus thuringiensis - Characterization, mass production and field application; 6.7 Virus as bioinsecticide- Baculovirus- characterization, bioformulation, mass production and field application	Dr. SANKAR BAKSHI	12	April to June

Topic & Paper No.	Sub-Topic	Syllabus allotted	No of Lectures require to complete the	Month
DSC/CORE ECONOMIC BOTANY CC-3-TH	1. Origin of cultivated crops: Concepts of centre of origin, their importance with reference to Vavilov's work. Examples of major plant introductions; crop domestication and loss of genetic diversity; evolution of new crops/ varieties, importance of germplasm diversity. 4 Lecture 2. Cereals, pulses, oils and rubber: Cereals: Rice, Wheat, Jowar and Bajra (cultivation, processing and uses), Millets as future cereals. Origin of Rice and Wheat. 2.2 Pulses and Legumes: Cultivation and uses of Gram, Mung Bean and Soyabean. Importance to man and environment, 2.3 Oil and fats: General description, Classification, Extraction, uses and health implications of Mustard, Groundnut, Sunflower, Coconut (Botanical name, family and uses). Essential oils- general account, extraction methods, comparison with fatty oils and their uses, 2.4 Rubber yielding plants: Para-rubber (<i>Hevea brasiliensis</i>), Assam rubber (<i>Ficus elastica</i>)- tapping, processing and uses, 2.5 Other natural rubber: Sources (Ceara rubber, Castilla rubber, Lagos silk rubber, Landolphia rubber, Guayule rubber, Dandelion rubber). 3. Sugar, starch, spices and beverages: Processing of sugarcane to products and byproducts. Extraction/ processing from Potato, Sugar beet and Palmyra palm. 3.2 Spices and condiments: Scientific names, family, economically important parts and uses of Ajwain, Cumin, Black Cumin, Mustard, Fenugreek, Coriander, Chillies, Bay leaf, Black Pepper, Cardamom (small and big), Clove, Cinnamon, Onion, Garlic and Ginger, 3.3 Beverages: Tea and coffee (plant habit, processing and uses).	Dr. RASHI SUBBA	25	November to February
	1. Narcotics, timbers and fibres: Habit forming drugs with special reference to Poppy, <i>Cannabis</i> and Tobacco (processing, uses and health hazards), 4.2 Timber: General account with special reference to Sal, Teak, Mahogany and Sissoo, 4.3 Fibers: Classification on the basis of origin of fibres, Cotton, Flax and Jute (extraction and uses). 16 Lecture 2. Vegetables and fruits: Vegetables: Scientific names, family and edible parts- Potato, Pointed gourd, Brinjal, Tomato, Cauliflower, Cabbage, Lady's finger, Ridge gourd, Cucumber, Spinach, Carrot, Pea, Beans, Drumstick, Radish and Sweet potato, 5.2 Fruits: Scientific names, family, types of fruits and edible parts: Mango, Papaya, Custard apple, Pineapple, Tamarind, Jackfruit, Banana, Guava, Pomegranate, Apple, Strawberry, Wood apple, Litchi and Grapes.	Mrs. SRIYA CHAKRABARTI	20	November to February

Topic & Paper No.	Sub-Topic	Syllabus allotted	No of Lectures require to complete	Month
DSC/CORE PLANT ANATOMY & EMBRYOLOGY CC-4-TH	PLANT ANATOMY 1. Cell and Tissues: 14 lectures 1.1 Cell wall: ultrastructure, chemical constituents; thickening of cell wall. 1.2 Tissues: meristems, simple and complex tissues, cambium- Structure and function 1.3 Mechanical tissues and the principles governing their distribution in plants. 1.4 Stele: stelar types; leaf-trace and leaf-gap, 1.5 Stomata: origin and types (Metcalfe and Chalk, 1950; Stebbins and Khush, 1961).	Prof. ANIRUDDHA GHOSH & Ms. DISHA DASGUPTA	14	November to February
	1. Primary and secondary growth: 8 lectures 2.1 Primary structure of stem and root- monocot and dicot. Leaf- dorsiventral and isobilateral, 2.2 Secondary growth: normal (intra- & extra-stelar), anomalous (stem of <i>Bignonia</i> , <i>Boerhavia</i> , <i>Tecoma</i> , <i>Dracaena</i> and root of <i>Tinospora</i>).	Ms. SIMA BISWAS & Ms. DISHA DASGUPTA	8	November to February
	2. Developmental and Ecological Anatomy: 6 lectures Organisation of shoot apex (Tunica–Corpus) and root apex (Körper-Kappe), plastochron, Adaptive anatomical features of hydrophytes, xerophytes, halophytes.	Ms. SIMA BISWAS	6	November to February
	3. Scope of Plant Anatomy: Application in systematics, forensics and pharmacognosy, brief idea on dendrochronology	Prof. ANIRUDDHA GHOSH	2	November to February
	EMBRYOLOGY 1. Pre-fertilisation and post- fertilization changes 10 lectures 1.1. Microsporogenesis and Microgametogenesis, 1.2. Megasporogenesis and Megagametogenesis (monosporic, bisporic and tetrasporic), 1.3 Pollen germination, 1.4 Pollen tube- growth, entry into ovule and discharge, 1.5 Double fertilization, post- fertilization changes. 2. Embryo development and apomixis: 5 lectures 2.1 Embryogenesis in <i>Capsella</i> , 2.2 Development of endosperm (3 types), 2.3 Apomixis-Apospory and Apogamy, 2.4 Polyembryony- different types.	Dr. RASHI SUBBA	15	November to February

Topic & Paper No.	Sub-Topic	Syllabus allotted	No of Lectures require to complete the topic	Month
SEC PLANT TISSUE CULTURE AND HORTICULTURAL PRACTICES SEC-3-TH	A. PLANT TISSUE CULTURE 1. Plant Tissue Culture: 3 Lectures Land mark contributions, 1.2 Importance of plant tissue culture as tools for fundamental and applied plant sciences, 1.3 Future prospects in improving cash crops, medicinal plants and forest trees. 2. Requisites of Plant Tissue Culture and Plant regeneration: 8 Lectures Requirement of plant tissue culture laboratory- Equipment, instruments, glassware and plastic wares, 2.2 Aseptic technique- contaminants and sterilization, 2.3 Plant tissue culture medium: media preparation (basal medium), gelling agents and their uses, Use of plant growth regulators in plant tissue culture, 2.4 Cellular totipotency, 2.5 Organogenesis (direct and indirect), 2.6 Somatic embryogenesis and its significance, 2.7 Artificial seed (encapsulation and its potential uses). 3. Types of culture techniques: 13 Lectures Plant micropropagation: Methods and advantages of micropropagation, Steps of general micropropagation, Important considerations and precautions, 3.2 Somaclonal variation: Types, applications of tissue culture-derived variation and crop improvement, 3.3 Callus and haploid culture: Callus culture- Induction, maintenance and application, Suspension culture (introductory idea), 3.4 Haploid culture- Anther, pollen and ovary culture methods, application and utilization of haploids in agriculture 3.5 Protoplast culture- isolation and culture, protoplast fusion (somatic hybridization), cybrid production, application, 3.6 Embryo and endosperm culture- procedure and application. 4. Production of useful metabolites by tissue culture techniques: Secondary metabolites: Techniques of production of secondary metabolites; terpenes, phenolics and alkaloids- definitions and functions, 4.2 Valuable natural compounds from plant cell and tissue culture and their uses as drugs- brief idea.	Dr. RANJU TAMANG	30	November to February

SEC PLANT TISSUE CULTURE AND HORTICULTURAL PRACTICES SEC-3-TH	B. Horticulture Practices 1 Horticulture: 4 Lectures 1.1 Scope, importance and branches, 1.2 Role in rural economy and employment generation, 1.3 Harvesting and handling of fruits, vegetables and cut flower; methods of preservation and processing, 1.4 Urban horticulture and ecotourism. 2. Horticultural techniques: 3 Lectures Application of manures, fertilizers, nutrients and PGRs, 2.2 Weed controls, biofertilizers, biopesticides, irrigation methods, 2.3 Hydroponics, propagation methods: vegetative (grafting, cutting, layering, budding), sexual (seed production), scope and limitations 3. Ornamental plants: 5 Lectures Types, classifications (annuals, perennials, climbers and trees), 3.2 Identification and salient features of 3.2.1 Some ornamental flowers (rose, marigold, gladiolus, carnations, rasna orchid, gerberas, tuberose, birds of paradise, pin cushion cactus and desert rose), 3.2.2 Ornamental flowering trees (Indian laburnum, gulmohar, jacaranda, jarul, fishtail palm, simul, coral tree), 3.2.3 Bonsai and their commercial use, 3.2.4 Importance of flower shows and exhibitions 4. Fruit and vegetable crops: 3 Lectures Some common fruits and vegetables- description of plants and their economically important	Dr. RANJU TAMANG	15	November to February
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BOTANY CO /PO MAPPING Program Specific Outcomes, B.Sc. Botany (General)

- **Govt. Department:** After completion of the courses, a bioscience student can avail job opportunities in government departments (like planning and developmental commissions, forestry, environmental, agricultural, stress management organization, botanic garden and disaster management departments etc.
- **Laboratory Technician/ Laboratory Instructor/Field Assistant:** Knowledge about the various types of microscopy, preparing solutions, stains, pre-treatment techniques, basic understanding of different plant families and identification of plant taxa will help a student in achieving jobs as laboratory technician or laboratory instructor.
- **Private Agencies:** There are opportunities in private agencies also such as travel agencies requiring data of flora of an area. Prior knowledge of Industrial and Environmental Microbiology helps in the research related fields and in the Pharmaceutical Industries, Private Hospitals, Environmental agencies, Food Industry, Beverage Industry, Chemical Industry and also in Agriculture Department. With further knowledge, students can become a Biochemist in public as well as private sector. They can engage in research related works, quality control and safety section in the companies like food, pharmaceuticals, health and beauty care.
- **Medical Field:** Due to the bio-science background, they can go for various private or governmental agencies where they can work as surveyor, instrument handler, collector of samples for medical testing and also may work as technician in departments like X-Ray, data collector etc.
- **Entrepreneur:** There are opportunities to get engaged into mushroom farming and agribased industry and to start up a business.
- **Surveyor:** Many others with a degree in Botany can also opt to work as a surveyor in disaster management, forest, environment agencies, NGOs etc.
- **Tourism:** There is some scope for the students of Botany (After further study in the relevant field i.e., taxonomy, palaeobotany) in the field of Tourism.
- **Researcher:** In several research institutes there may be job openings for a Bio-Science graduate as Laboratory Assistant, Project Fellow and Field Assistants etc.
- **Teacher/Professor:** After completing higher studies in Botany, there are scopes to opt for teaching positions in school after completing teachers' training and by clearing SSC (School Service Commission).
- **Govt. Job:** After completing graduation degree a student can appear in different competitive examinations such as Bank, Railway, Public Service Commission, Staff Selection Commission, Union Public Service Commission, West Bengal Civil Service etc.

BOTANY PO / CO MAPPING Program Specific Outcomes, B.Sc. Botany (Honours)

- **Govt. Department:** After completion of the courses, a botanist can avail job opportunities in government departments (like planning and developmental commissions, forestry, environmental, agricultural, stress management organization, botanic garden and disaster management departments etc.
- **Laboratory Technician/ Laboratory Instructor:** Knowledge about the various types of microscopy, preparing solutions, stains, pre-treatment techniques, basic understanding of different plant families and identification of plant taxa will help a student in achieving jobs as laboratory technician or laboratory instructor.
- **Private Agencies:** There are opportunities in private agencies also such as travel agencies requiring data of flora of an area. Prior knowledge of Industrial and Environmental Microbiology helps in the research related fields and in the Pharmaceutical Industries, Private Hospitals, Environmental agencies, Food Industry, Beverage Industry, Chemical Industry and also in Agriculture Department. With further knowledge, students can become a Biochemist in public as well as private sector. They can engage in research related works, quality control and safety section in the companies like food, pharmaceuticals, health and beauty care.
- **Entrepreneur:** There are opportunities to get engaged into mushroom farming and agribased industry and to start up a business.
- **Medical Field:** Due to the bio-science background, they can go for various private or governmental agencies where they can work as surveyor, instrument handler, collector of samples for medical testing and also may work as technician in departments like X-Ray, data collector etc.
- **Surveyor:** Many others with a degree in Botany can also opt to work as a surveyor in disaster management, forest, environment agencies, NGOs etc.
- **Tourism:** There is some scope for the students of Botany (After further study in the relevant field i.e., taxonomy, palaeobotany) in the field of Tourism.
- **Researcher:** In several research institutes there are enormous job openings as Research Assistant, Research Associate, Research Consultant, Project Fellow etc. With further knowledge student can become Food, Industrial or Environmental Microbiologists, Biomedical Scientists or Clinical Research Associate.
- **Teacher/Professor:** After completing higher studies in Botany, there are scopes to opt for state or national level college teacher position (CSC, PSC, and UGC), school teachers (SSC, MSC, PSC, KVS, Army Public School etc.) and university teacher.
- **Govt. Job:** After completing graduation degree a student can appear in different competitive examinations such as Bank, Railway, Public Service Commission, Staff Selection Commission, Union Public Service Commission, West Bengal Civil Service etc.
- During this Covid-19 pandemic situation in absence of any specific drug in hand, the knowledge of pharmacognosy and ethnobotany can act as an armour to boost up our body immunity, the primary weapon to fight against the virus.