

LESSON PLAN

Department Name: BOTANY

Name of Faculty: SHARMISTHA BASU (SB), ADITI DEY (AD)

Paper Name & Code: PLANT DIVERSITY (THEORY), BOT-H-CC1-1-Th

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
1. Introduction to plant kingdom: (SB)	1.1. Origin of life and evolution of plant cells.	1. Kenrick, P. & Crane, P. The Origin & early diversification of land plants (1997), Smithsonian Institute Press. 2. Bell, P.R. & Hensley, A.R. Green plants; their Origin & Diversity (2nd ed.), 2000, Cambridge University Press.	01	Face to face teaching, Chalk and talk method, content delivery through PPT, students' discussion in the classroom and posting of learning materials, educational videos and practice questions in google classroom for self-pace learning.	
	1.2. Importance of plants as source of food, fuel and their role in ecosystem services (as carbon sink, sequestering etc.).		02		
2. Algae: (AD)	2.1. Salient features of Cyanophyceae, Chlorophyceae, Charophyceae, Phaeophyceae, Rhodophyceae and Bacillariophyceae.	1. Sharma, O.P. Text Book of Algae, Tata McGraw Hill.	02		
	2.2. Criteria and system of classification (Fritsch, 1935).		02		
	2.3. Economic importance of algae in environment, agriculture, biotechnology and industry.		02		
3. Fungi: (AD)	3.1. Salient features of Myxomycota, Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina, Deuteromycotina.	1. Sharma, P.D. the Fungi, Rastogi Publication.	02	Chalk and talk, Power-Point Presentation and Google Classroom.	
	3.2. System of classification up to Sub-division (Ainsworth, 1973).		01		
	3.3. Economic importance of fungi (food, medicine and agriculture),		02		
	3.4. Fungal symbioses: Mycorrhiza, Lichen and their importance.		01		
4. Bryophytes:	4.1. Salient features of Hepaticopsida, Anthocerotopsida and Bryopsida.	1. Vashista, B.R. Bryophyta, Latest Ed., S. Chand & Company Pvt. Ltd.	03		

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
(AD)	4.2. System of classification up to Class (Proskauer 1957).		01		
	4.3. Amphibian nature of bryophytes.		01		
	4.4. Economic and ecological importance.		02		
5. Pteridophytes: (SB)	5.1. Salient features of Psilophyta, Lycophyta, Sphenophyta and Filicophyta.	1. Spore, K.R. The Morphology of Pteridophyte, Latest Ed., Huchinson & Co. Ltd. 2. Rashid, A. An Introduction to Pteridophyta, Latest Ed., Vani Educational Books. 3. Vashista, P.C. Pteridophyta, Latest Ed., S. Chand & Company Pvt. Ltd. 4. Gifford, E. M. & Foster, A. S. Morphology & Evolution of Vascular Plants (3rd ed.), 1998, Freeman and Co.	02	Face to face teaching, Chalk and talk method, content delivery through PPT, students' discussion in the classroom, explanation and elaboration of various groups of pteridophytes through charts, herbarium, wet preserved specimens kept at Botany Museum.	
	5.2. System of classification up to Division (Gifford & Foster 1989).		02		
	5.3. Economic importance (food, medicine & agriculture).		01		
6. Gymnosperms: (AD)	6.1. Salient features of Cycadophyta, Coniferophyta and Gnetophyta.	1. Vashishta, P.C. Gymnosperm, Latest Ed., S. Chand & Company Pvt. Ltd.	02	Chalk and talk, Power-Point Presentation and Google Classroom.	
	6.2. Outline classification up to Division: Progymnospermophyta to Gnetophyta (Gifford & Foster 1989).		02		
	6.3. Economic importance (wood, resin, essential oil & drugs).		02		
7. Angiosperms: (SB)	7.1. Types and morphology of leaf, stem and root.	1. Ganguli, H.C., Das, K.S.K. & Dutta, C.T. College Botany, Vol. I, latest Ed., New Central Book Agency. 2. Mitra, D., Guha, J. & Chowdhuri, S.K. Studies in Botany (Vols. I & II), Latest Ed., Das Printers.	03	Face to face teaching, Chalk and talk method, content delivery through PPT, students' discussion in the classroom, explanation and elaboration of various groups of pteridophytes through charts, herbarium, wet preserved specimens kept at Botany Museum.	
	7.2. Inflorescence types with examples.		03		
	7.3. Flower: Different parts and forms of calyx, corolla, androecium and gynoecium; aestivation and placentation.		04		
	7.4. Types with examples-fruits and seeds.		02		
		TOTAL	45 hr.		

LESSON PLAN

Department Name: BOTANY

Name of Faculty: SHARMISTHA BASU (SB)

Paper Name & Code: PLANT DIVERSITY (PRACTICAL), BOT-H-CC1-1-P

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
1. Flower- dissection, drawing and study: (SB)	a) Different parts, b) Adhesion and cohesion, c) Placentation, d) Aestivation.	1. Chatterjee, T., Santra, S.C. and Das, A. Practical College Botany, New Central Book Agency. 2. Focus on college practical Botany by Prof. P. Maji. Rita Book Agency.	2x6=12	Laboratory method. Demonstration using different flower specimens. Hands on activities.	
2. Study of ovules: (SB)	Types (Fresh specimens/ permanent slides/ photographs).	1. Chatterjee, T., Santra, S.C. and Das, A. Practical College Botany, New Central Book Agency. 2. Mitra, D., Guha, J. & Chowdhuri, S.K. Studies in Botany (Vols. I & II), Latest Ed., Das Printers. 3. Focus on college practical Botany by Prof. P. Maji. Rita Book Agency.	2	Laboratory method. Demonstration using permanent slides and photographs.	
3. Fruits: (SB)	Different types- study from fresh/ preserved specimens.		2	Laboratory method. Demonstration using fresh specimens, preserved specimens, charts and photographs. Hands on activities.	
4. Inflorescence types: (SB)	Study from fresh/ preserved specimens.		2	Laboratory method. Demonstration using fresh specimens, preserved specimens, charts and photographs. Hands on activities.	
5. Identification on the basis of reproductive and structural features from preserved specimens/ permanent slides: (SB)	Algae (<i>Nostoc</i> , <i>Oedogonium</i> and <i>Ectocarpus</i>), Fungi (<i>Rhizopus</i> , <i>Ascobolus</i> and <i>Agaricus</i>), Bryophytes (<i>Marchantia</i> , <i>Anthoceros</i> and <i>Funaria</i>), Pteridophytes (<i>Selaginella</i> , <i>Equisetum</i> and <i>Pteris</i>), Gymnosperms (male cone and female cone/ megasporophyll of <i>Cycas</i> , <i>Pinus</i> and <i>Gnetum</i>).		2x5=10	Laboratory method. Demonstration using preserved specimens and permanent slides. Hands on activities.	

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
3. Field work: (SB)	A field notebook supported with photographs taken during field study to be submitted giving comprehensive idea about different types of inflorescences, flowers and fruits.	-----	One day local excursion to study plants in their natural habitat. 2hr	Experiential learning through field visits, immersive field trips, hands on activities.	
		TOTAL	30 hr.		

LESSON PLAN

Department Name: BOTANY

Name of Faculty: RAJENDRA YONZONE (RY), ANJAN HAZRA (AH)

Paper Name & Code: MUSHROOM CULTIVATION TECHNOLOGY (THEORY), BOT-H-SEC-1-Th

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
1. Introduction: (RY)	1.1. Introduction, History of mushroom cultivation.	1. Acharya, K., Roy, A. & Sarkar, J. Mushroom Cultivation Technology, 2020, Techno World, Kolkata.. 2. Tewari, P. & Kapoor, S.C. Mushroom Cultivation, 1988, Mittal Publications, Delhi.	02	Chalk and talk.	
	1.2. Current overview of mushroom production in the world.		01		
	1.3. Mushroom biology-classification of mushrooms, edible mushrooms in India, poisonous mushrooms, mushroom poisoning.		03		
2. Infrastructure and instruments: (RY)	2.1. Infrastructure-structural design and layout of mushroom farm, substrates (locally available).		03		
	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.		04		
	2.3. Methods of sterilization.		02		
3. Cultivation procedure: (AH)	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.	1. Acharya,K., Roy, A. & Sarkar, J. Mushroom Cultivation Technology, 2020, Techno World, Kolkata.. 2. Tewari, P. & Kapoor, S.C. Mushroom Cultivation, 1988, Mittal Publications, Delhi.	05	Chalk and talk, Power-Point Presentation, class notes, e-resources	
	3.2. Production of spawn- cultivation of oyster mushroom, paddy-straw mushroom, milky mushroom and white button mushroom.		03		
	3.3. Cultivation of medicinal mushroom (<i>Cordyceps</i> and <i>Ganoderma</i>).		04		
	4.1. Mushroom diseases and management strategies.	1. Acharya, K., Roy, A. & Sarkar, J. Mushroom Cultivation	03	Chalk and talk	

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
4. Disease and Management: (RY)	4.2. Post-harvest technology-short-term storage (Refrigeration- up to 24 hours), long-term storage (canning, pickles, papads etc.), drying, storage in salt solutions.	Technology, 2020, Techno World, Kolkata. 2. Tewari, P. & Kapoor, S.C. Mushroom Cultivation, 1988, Mittal Publications, Delhi.	04		
	4.3. Food preparations from mushrooms.		02		
5. Additional Topics: (RY)	5.1. Uses of spent mushroom substrate.		01		
	5.2. Strain improvements in cultivated mushroom; Nutritional and medicinal value of edible mushrooms.		02		
	5.3. Research centres- National level and regional level.		01		
	5.4. Cost-benefit ratio.		01		
	5.5. Mushroom based Industry.		02		
	5.6. Mushroom market in India and abroad.	02			
		TOTAL	45 hr.		

LESSON PLAN

Department Name: BOTANY

Name of Faculty: ANJAN HAZRA (AH)

Paper Name & Code: MUSHROOM CULTIVATION TECHNOLOGY (PRACTICAL), BOT-H-SEC-1-P

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
1. Section, staining, slide preparation, description, drawing: (AH)	Macro and microscopic identification of some common edible mushrooms (<i>Agaricus</i> , <i>Pleurotus</i>)	1. Som, D. 2021. A Practical Manual on Mushroom Cultivation. P.K. Publishers & Distributors. 2. Stamets, P. and Chilton, J.S. 1985. The Mushroom Cultivator: A Practical Guide to Growing Mushrooms at Home. Richmond Publishing Co Ltd. 3. Reyes, R.G., Kalaw, S.P., Cruz, D.G.V., Tokunaga, K., Sumi, R., Mori, N. and Eguchi F. 2018. A practical guide to mushroom pharming. SEAMEO BIOTROP.	4x2 = 8	Study of fresh Specimens.	
2. Media types and composition: (AH)	Media preparation.		2x2 = 4	Hands on experiment.	
3. Demonstration: (AH)	Fungal tissue culture.		2x2 = 4	Hands on experiment.	
4. Subculturing: (AH)	Sub-culturing for maintenance of culture.		2x2 = 4	Hands on experiment.	
5. Demonstration: (AH)	Spawn production.		1x2 = 2	Hands on experiment.	
6. Cultivation: (AH)	Cultivation of <i>Pleurotus/Calocybe</i> .		4x2 = 8	Hands on experiment.	
		TOTAL	30 hr.		

LESSON PLAN

Department Name: BOTANY

Name of Faculty: ADITI DEY (AD), SHARMISTHA BASU (SB)

Paper Name & Code: ECONOMIC BOTANY (THEORY), BOT-H-CC-3-3-TH

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
1. Origin of cultivated crops: (SB)	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.		04		
2. Cereals, pulses, oils and rubber: (SB)	2.1. Cereals: Rice, Wheat, Jowar and Bajra (cultivation, processing and uses), Millets as future cereals. Origin of Rice and Wheat.	1. Mukherjee, S. College Botany, Vol. III, latest Ed., New Central Book Agency 2. Mitra, D., Guha, J., Chowdhuri, S.K. Studies in Botany, Vol. II, latest Ed. D.N. Moulik for Moulik Library. 3. Kochhar, S.L. 2012. Economic Botany in Tropics, MacMillan & Co. New Delhi, India.	03	Group discussion during class hours about already taught contents to evaluate the intelligence and over all knowledge of the students on the specific topic. Regular attendance highly preferred (Classroom performance).	
	2.2. Pulses and Legumes: Cultivation and uses of Gram, Mung Bean and Soyabean. Importance to man and environment.		02		
	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.		03		
	2.4. Rubber yielding plants: Para-rubber (<i>Hevea brasiliensis</i>), Assam rubber (<i>Ficus elastica</i>)- tapping, processing and uses.		02		
	2.5. Other natural rubber: Sources (Ceara rubber, Castilla rubber, Lagos silk rubber, Landolphia rubber, Guayule rubber, Dandelion rubber).		02		
3. Sugar, starch, spices and beverages: (AD)/(SB)	3.1. Processing of sugarcane to products and byproducts. Extraction/ processing from Potato, Sugar beet and Palmyra palm.		02		
	3.2. Spices and condiments: Scientific names, family, economically important		05		

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	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.	1. Kochhar, S.L. 2012. Economic Botany in Tropics, MacMillan & Co. New Delhi, India. 2. Simpson, B.B. and Conner-Ogorzaly, M. 1986. Economic botany: plants in our world. 3. Pandey, B.P. 1978. Economic botany for degree honours and postgraduate students.		Chalk and Talk, PowerPoint presentation, Demonstrative Videos, Google Classroom.	
	3.3. Beverages: Tea and coffee (plant habit, processing and uses).		02		
4. Narcotics, timbers and fibres: (AD)	4.1. Habit forming drugs with special reference to Poppy, Cannabis and Tobacco (processing, uses and health hazards).		04		
	4.2. Timber: General account with special reference to Sal, Teak, Mahogany and Sissoo.		06		
	4.3. Fibers: Classification on the basis of origin of fibres, Cotton, Flax and Jute (extraction and uses).		06		
5. Vegetables and fruits: (AD)	5.1. 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.		02		
	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.	02			
		Total	45 hr.		

LESSON PLAN

Department Name: BOTANY

Name of Faculty: SUDIP KUMAR SINHA (SKS)

Paper Name & Code: ECONOMIC BOTANY (PRACTICAL), BOT-H-CC-3-3-P

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
1. Identification: (SKS)	Identification of economically important plants (as listed below) from fresh/herbarium sheets/ preserved specimens: Cereals: Rice and Wheat.	1. Pandey, B.P. 2017. Modern Practical Botany Vol 1. S Chand & Company Pvt.	03	Laboratory method. Practical demonstration. Write up provided in printed form.	
	Legume: Gram, Mung bean and Soybean (habit, fruit and seed structure).		03		
	Spices and condiments: Coriander, Cumin, Bay leaf, Black pepper, Cinnamon.		03		
	Tea and coffee (plant habit and parts used).		03		
	Common vegetables: Potato, Cucumber, Brinjal, Lady's finger, Carrot, Sweet potato.		03		
	Fruits (only identify the type of fruit) as listed in theoretical syllabus (Mango, Papaya, Custard apple, Pineapple, Tamarind, Jackfruit, Banana, Guava, Pomegranate, Apple, Strawberry, Wood apple, Litchi and Grapes).		06		
	Fibres: jute and cotton (plant and parts used).		03		
2. Field visit: (SKS)	One field visit to give an idea about cultivation of Rice/Jute/Tea/Potato.		06	One day local excursion.	
		Total	30 hr. including field work		

LESSON PLAN

Department Name: BOTANY

Name of Faculty: PAYEL CHATTERJEE (PC), SUDIP KUMAR SINHA (SKS)

Paper Name & Code: PLANT ANATOMY & EMBRYOLOGY (THEORY), BOT-H-CC-4-3-TH

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
PLANT ANATOMY (50 marks)					
1. Cell and Tissues: (PC)	1.1. Cell wall: ultrastructure, chemical constituents; thickening of cell wall.	1. Fahn, A. Plant Anatomy (4th ed.), 1990, Wiley Eastern. 2. Roy, P. Plant Anatomy, Latest Ed., New Central Book Agency	04	Powerpoint presentation, Chalk and Talk	
	1.2. Tissues: meristems, simple and complex tissues, cambium- Structure and function.		03		
	1.3. Mechanical tissues and the principles governing their distribution in plants.		02		
	1.4. Stele: stelar types; leaf-trace and leaf-gap.		03		
	1.5. Stomata: origin and types (Metcalf and Chalk, 1950; Stebbins and Khush, 1961).		02		
2. Primary and secondary growth: (PC)	2.1. Primary structure of stem and root- monocot and dicot. Leaf- dorsiventral and Isobilateral.	1. Pandey, B.P. Plant Anatomy, Latest Ed., S. Chand & Company. 2. Roy, P. Plant Anatomy, Latest Ed., New Central Book Agency. 3. Tayal, M.S. Plant Anatomy, Latest Ed., Rastogi Publications.	03		
	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>).		05		
3. Developmental and Ecological Anatomy: (PC)	3.1. Organisation of shoot apex (Tunica- Corpus) and root apex (Körper-Kappe), plastochron.	1. Esau, K. Anatomy of Seed Plants (2nd ed.), 1977, John Wiley & Sons.	04		
	3.2. Adaptive anatomical features of hydrophytes, xerophytes, halophytes.		02		
4. Scope of plant anatomy: (PC)	Application in systematics, forensics and pharmacognosy, brief idea on dendrochronology.	1. Roy, P. Plant Anatomy, Latest Ed., New Central Book Agency.	02		

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
EMBRYOLOGY (25 marks)					
1. Pre-fertilisation and post-fertilization changes: (SKS)	1.1. Microsporogenesis and Microgametogenesis.	1. Bhojwani, S.S. & Bhatnagar, S.D. The Embryology of Angiosperms (4th ed.), 1989, Publishing House. 2. Roy, P. Plant Embryology, 1 st Ed., Soudagar.	02	Chalk and talk, PowerPoint presentation, online tests, Class notes.	
	1.2. Megasporogenesis and Megagametogenesis (monosporic, bisporic and tetrasporic).		03		
	1.3. Pollen germination.		01		
	1.4. Pollen tube- growth, entry into ovule and discharge.		02		
	1.5. Double fertilization, post-fertilization changes.		02		
2. Embryo development and apomixis: (SKS)	2.1. Embryogenesis in <i>Capsella</i> .	1. Maheswari, P. An Introduction to Embryology of Angiosperm, Latest Ed., Tata McGraw Hill. 2. Roy, P. Plant Embryology, 1 st Ed., Soudagar.	01		
	2.2. Development of endosperm (3 types).		01		
	2.3. Apomixis- Apospory and Apogamy.		01		
	2.4. Polyembryony- different types.		02		
		TOTAL	45 hr.		

LESSON PLAN

Department Name: BOTANY

Name of Faculty: PAYEL CHATTERJEE (PC)

Paper Name & Code: PLANT ANATOMY & EMBRYOLOGY (PRACTICAL), BOT-H-CC-4-3-P

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
1. Microscopic studies on: (PC)	Types of stomata, sclerenchyma and parenchyma cells, sclereids, raphides (<i>Colocasia</i>), cystolith (<i>Ficus</i> leaf) starch grains, aleurone grains, laticiferous ducts, oil glands.	1. Pandey, B.P. 2017. Modern Practical Botany Vol 1. S Chand & Company Pvt. 2. Maji, S. 2005. Focus on college practical botany. Calcutta Rita Book Agency.	06	Laboratory method. Practical demonstration. Hands on training.	
2. Basic anatomical study: (PC)	Study of anatomical details through permanent slides/ temporary stained mounts- a) Root-Monocot and dicot, b) Stem-Monocot and dicot, c) Leaf- Isobilateral and Dorsiventral, d) Stelar types.		06		
3. Anomalous secondary structure: (PC)	Study of anomalous secondary structure in stem of <i>Bignonia</i> , <i>Boerhaavia</i> , <i>Tecoma</i> , <i>Dracaena</i> and root of <i>Tinospora</i>		12		
4. Study of adaptive anatomical features: (PC)	Hydrophytes (<i>Nymphaea</i> – petiole), Xerophytes (<i>Nerium</i> – leaf) and Halophytes (<i>Aegiceros corniculatum</i> - salt gland), Epiphytic root (Orchid velamen).		06		
		Total	30 hr.		

LESSON PLAN

Department Name: BOTANY

Name of Faculty: ANJAN HAZRA (AH), RAJENDRA YONZONE (RY)

Paper Name & Code: PLANT TISSUE CULTURE AND HORTICULTURE PRACTICES (THEORY), BOT-H-SEC-3-TH

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
PLANT TISSUE CULTURE (50 marks)					
1. Plant Tissue Culture: (AH)	1.1. Land mark contributions.	1. Bhojwani, S.S. & Razdan, M.I. Plant Tissue Culture: Theory and Practise, Elsevier.	01		
	1.2. Importance of plant tissue culture as tools for fundamental and applied plant sciences.		01		
	1.3. Future prospects in improving cash crops, medicinal plants and forest trees.		01		
2. Requisites of Plant Tissue Culture and Plant regeneration: (AH)	2.1. Requirement of plant tissue culture laboratory- Equipment, instruments, glassware and plastic wares.	1. Jha, T.B. & Ghosh, B. Plant Tissue Culture, 2003, Universities Press. 2. Dey, K.K. Plant Tissue Culture, 1992, New Central Book Agency.	01	Powerpoint presentation, class notes, e-resources	
	2.2. Aseptic technique- contaminants and sterilization.		01		
	2.3. Plant tissue culture medium: media preparation (basal medium), gelling agents and their uses, Use of plant growth regulators in plant tissue culture.		02		
	2.4. Cellular totipotency.		01		
	2.5. Organogenesis (direct and indirect).		01		
	2.6. Somatic embryogenesis and its significance.		01		
	2.7. Artificial seed (encapsulation and its potential uses).		01		
3. Types of culture techniques: (AH)	3.1. Plant micropropagation: Methods and advantages of micropropagation, Steps of general micropropagation, Important considerations and precautions.	1. Bhojwani, S.S. & Razdan, M.I. Plant Tissue Culture: Theory and Practise, Elsevier.	03	Chalk and talk, Powerpoint presentation, class notes, e-resources.	
	3.2. Somaclonal variation: Types, applications of tissue culture-derived variation and crop improvement.		02		

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	3.3. Callus and haploid culture: Callus culture- Induction, maintenance and application, Suspension culture (introductory idea).	2. Jha, T.B. & Ghosh, B. Plant Tissue Culture, 2003, Universities Press. 3. Dey, K.K. Plant Tissue Culture, 1992, New Central Book Agency.	02		
	3.4. Haploid culture- Anther, pollen and ovary culture methods, application and utilization of haploids in agriculture.		02		
	3.5. Protoplast culture- isolation and culture, protoplast fusion (somatic hybridization), cybrid production, application.		02		
	3.6. Embryo and endosperm culture- procedure and application.		02		
4. Production of useful metabolites by tissue culture techniques: (AH)	4.1. Secondary metabolites: Techniques of production of secondary metabolites; terpenes, phenolics and alkaloids- definitions and functions.	1. Chawla, H.S. An Introduction to Plant Biotechnology (2nd ed.), 2002, Oxford & IBH.	04		
	4.2. Valuable natural compounds from plant cell and tissue culture and their uses as drugs- brief idea.		02		
HORTICULTURE PRACTICES (25 marks)					
1. Horticulture: (RY)	1.1. Scope, importance and branches.	1. Singh, D. & Manivannan, S. 2009. Genetic Resources of Horticultural Crops. Ridhi International, Delhi, India.	01	Chalk and talk.	
	1.2. Role in rural economy and employment generation,		01		
	1.3. Harvesting and handling of fruits, vegetables and cut flower; methods of preservation and processing.		01		
	1.4. Urban horticulture and ecotourism.		01		
	2.1. Application of manures, fertilizers, nutrients and PGRs.	2. Swaminathan, M.S. and Kochhar, S.L. 2007. Groves of Beauty and Plenty: An Atlas of Major	01		

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
2. Horticultural techniques: (RY)	2.2. Weed controls, biofertilizers, biopesticides, irrigation methods.	Flowering Trees in India. Macmillan Publishers, India.	01		
	2.3. Hydroponics, propagation methods: vegetative (grafting, cutting, layering, budding), sexual (seed production), scope and limitations.		01		
3. Ornamental plants: (RY)	3.1. Types, classifications (annuals, perennials, climbers and trees).		01		
	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).		01		
	3.2.2. Ornamental flowering trees (Indian laburnum, gulmohar, jacaranda, jarul, fishtail palm, simul, coral tree).		01		
	3.2.3. Bonsai and their commercial use.		01		
	3.2.4. Importance of flower shows and exhibitions.	01			
4. Fruit and vegetable crops: (RY)	4.1. Some common fruits and vegetables- description of plants and their economically important parts (orange, banana, mango, papaya, guava, litchi, bael, potato, cauliflower, carrot, onion, peas, brinjal, ridged gourd).	1. NIIR Board 2005. Cultivation of Fruits, Vegetables and Floriculture. National Institute of Industrial Research Board, Delhi.	02		
	4.2. Fruit processing- scope and benefit.		01		
		TOTAL	45 hr.		

LESSON PLAN

Department Name: BOTANY

Name of Faculty: RAJENDRA YONZONE (RY)

Paper Name & Code: PLANT TISSUE CULTURE AND HORTICULTURE PRACTICES (PRACTICAL), BOT-H-SEC-3-P

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
1. Horticultural field visit: (RY)	Field trip (any two with report submission) - Visit to plant tissue culture laboratory, gardens, standing crop sites, nurseries, vegetable plantations, horticultural fields at IARI/AHSI and cold storage.	-----	06	Laboratory method. Practical demonstration. Hans on training.	
2. Plant Tissue culture: (RY)	Media preparation, sterilization and aseptic inoculation of explant for seed culture.		03		
3. Plant Propagation: (RY)	Propagation of two horticulturally important plants (each student needs to propagate plants following two separate vegetative methods; records and photographs to be authenticated by respective teacher and presented in a form of field diary during examination)		15		
4. Identification: (RY)	Identification of ornamental flowers as per theoretical syllabus.		06		
		Total	30 hr. including field trip		

LESSON PLAN

Department Name: BOTANY

Name of Faculty: ANJAN HAZRA (AH), ADITI DEY (AD), SUDIP KUMAR SINHA (SKS) & PAYEL CHATTERJEE (PC)

Paper Name & Code: PLANT DIVERSITY (THEORY), BOT-MD-CC1-1-Th

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
1. Introduction to plant kingdom: (AH)	1.1. Origin of life and evolution of plant cells.	1. Ganguli, H.C., Das, K.S.K. & Dutta, C.T. College Botany, Vol. I, latest Ed., New Central Book Agency. 2. Ganguli, H.C. and Kar, A.K. College Botany, Vol. II, latest Ed., New Central Book Agency. 3. Mukherjee, S. College Botany, Vol. III, latest Ed., New Central Book Agency. 4. Hait, G., Ghosh, A. and Bhattacharya, K. A Text Book of Botany (Vols. I & II), 2007, New Central Book Agency. 5. Mitra, D., Guha, J. & Chowdhuri, S.K. Studies in Botany (Vols. I & II), Latest Ed., Das Printers.	01	Chalk and talk method.	
	1.2. Importance of plants as source of food, fuel and their role in ecosystem services (as carbon sink, sequestering etc.).		02		
2. Algae: (AD)	2.1. Salient features of Cyanophyceae, Chlorophyceae, Charophyceae, Phaeophyceae, Rhodophyceae and Bacillariophyceae.		02	Chalk and talk.	
	2.2. Criteria and system of classification (Fritsch, 1935).		02		
	2.3. Economic importance of algae in environment, agriculture, biotechnology and industry.		02		
3. Fungi: (AD)	3.1. Salient features of Myxomycota, Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina, Deuteromycotina.		02		
	3.2. System of classification up to Sub-division (Ainsworth, 1973).		01		
	3.3. Economic importance of fungi (food, medicine and agriculture).		02		
	3.4. Fungal symbioses: Mycorrhiza, Lichen and their importance.	01			
4. Bryophytes: (SKS)	4.1. Salient features of Hepaticopsida, Anthocerotopsida and Bryopsida.	03	Chalk and talk.		

Planned						
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments	
	4.2. System of classification up to Class (Proskauer 1957).		01			
	4.3. Amphibian nature of bryophytes.		01			
	4.4. Economic and ecological importance.		02			
5. Pteridophytes: (AH)	5.1. Salient features of Psilophyta, Lycophyta, Sphenophyta and Filicophyta.		02	Chalk and talk.		
	5.2. System of classification up to Division (Gifford & Foster 1989).		02			
	5.3. Economic importance (food, medicine & agriculture).		01			
6. Gymnosperms: (PC)	6.1. Salient features of Cycadophyta, Coniferophyta and Gnetophyta.	1. Mitra, D., Guha, J. & Chowdhuri, S.K. Studies in Botany (Vols. I & II), Latest Ed., Das Printers	02	Chalk and talk.		
	6.2. Outline classification up to Division: Progymnospermophyta to Gnetophyta (Gifford & Foster 1989).		02			
	6.3. Economic importance (wood, resin, essential oil & drugs).		02			
7. Angiosperms: (PC)	7.1. Types and morphology of leaf, stem and root.			03	Chalk and talk.	
	7.2. Inflorescence types with examples.			03		
	7.3. Flower: Different parts and forms of calyx, corolla, androecium and gynoecium; aestivation and placentation.			04		
	7.4. Types with examples-fruits and seeds.			02		
		TOTAL	45 hr.			

LESSON PLAN

Department Name: BOTANY

Name of Faculty: ADITI DEY (AD)

Paper Name & Code: PLANT DIVERSITY (PRACTICAL), BOT-MD-CC1-1-P

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
1. Flower- dissection, drawing and study: (AD)	a) Different parts, b) Adhesion and cohesion, c) Placentation, d) Aestivation.	1. Chatterjee, T., Santra, S.C. and Das, A. Practical College Botany, New Central Book Agency. 2. Focus on college practical Botany by Prof. P. Maji. Rita Book Agency.	2x6=12	Laboratory method. Demonstration using different flower specimens. Hands on activities.	
2. Study of ovules: (AD)	Types (Fresh specimens/ permanent slides/ photographs).		2	Laboratory method. Demonstration using permanent slides and photographs.	
3. Fruits: (AD)	Different types- study from fresh/ preserved specimens.	1. Chatterjee, T., Santra, S.C. and Das, A. Practical College Botany, New Central Book Agency. 2. Mitra, D., Guha, J. & Chowdhuri, S.K. Studies in Botany (Vols. I & II), Latest Ed., Das Printers.	2	Laboratory method. Demonstration using fresh specimens, preserved specimens, charts and photographs. Hands on activities.	
4. Inflorescence types: (AD)	Study from fresh/ preserved specimens.	3. Focus on college practical Botany by Prof. P. Maji. Rita Book Agency.	2	Laboratory method. Demonstration using fresh specimens, preserved specimens, charts and photographs. Hands on activities.	
5. Identification on the basis of reproductive and structural features from preserved specimens/ permanent slides: (AD)	Algae (<i>Nostoc</i> , <i>Oedogonium</i> and <i>Ectocarpus</i>), Fungi (<i>Rhizopus</i> , <i>Ascobolus</i> and <i>Agaricus</i>), Bryophytes (<i>Marchantia</i> , <i>Anthoceros</i> and <i>Funaria</i>), Pteridophytes (<i>Selaginella</i> , <i>Equisetum</i> and <i>Pteris</i>),		5x2=10	Laboratory method. Demonstration using preserved specimens and permanent slides. Hands on activities.	

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	Gymnosperms (male cone and female cone/ megasporophyll of <i>Cycas</i> , <i>Pinus</i> and <i>Gnetum</i>).				
3. Field work: (AD)	A field notebook supported with photographs taken during field study to be submitted giving comprehensive idea about different types of inflorescences, flowers and fruits.	-----	One day local excursion to study plants in their natural habitat. 2hr	Experiential learning through field visits, immersive field trips, hands on activities.	
			TOTAL	30 hr.	

LESSON PLAN

Department Name: BOTANY

Name of Faculty: RAJENDRA YONZONE (RY), ANJAN HAZRA (AH)

Paper Name & Code: MUSHROOM CULTIVATION TECHNOLOGY (THEORY), BOT-MD-SEC-1-Th

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
1. Introduction: (RY)	1.1. Introduction, History of mushroom cultivation.	1. Acharya, K., Roy, A. & Sarkar, J. Mushroom Cultivation Technology, 2020, Techno World, Kolkata.. 2. Tewari, P. & Kapoor, S.C. Mushroom Cultivation, 1988, Mittal Publications, Delhi.	02	Chalk and talk.	
	1.2. Current overview of mushroom production in the world.		01		
	1.3. Mushroom biology-classification of mushrooms, edible mushrooms in India, poisonous mushrooms, mushroom poisoning.		03		
2. Infrastructure and instruments: (RY)	2.1. Infrastructure-structural design and layout of mushroom farm, substrates (locally available).		03		
	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.		04		
	2.3. Methods of sterilization.		02		
3. Cultivation procedure: (AH)	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.	1. Acharya, K., Roy, A. & Sarkar, J. Mushroom Cultivation Technology, 2020, Techno World, Kolkata.. 2. Tewari, P. & Kapoor, S.C. Mushroom Cultivation, 1988, Mittal Publications, Delhi.	05	Chalk and talk, Power-Point Presentation, class notes, e-resources	
	3.2. Production of spawn- cultivation of oyster mushroom, paddy-straw mushroom, milky mushroom and white button mushroom.		03		
	3.3. Cultivation of medicinal mushroom (<i>Cordyceps</i> and <i>Ganoderma</i>).		04		
	4.1. Mushroom diseases and management strategies.	1. Acharya, K., Roy, A. & Sarkar, J. Mushroom Cultivation	03	Chalk and talk	

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
4. Disease and Management: (RY)	4.2. Post-harvest technology-short-term storage (Refrigeration- up to 24 hours), long-term storage (canning, pickles, papads etc.), drying, storage in salt solutions.	Technology, 2020, Techno World, Kolkata. 2. Tewari, P. & Kapoor, S.C. Mushroom Cultivation, 1988, Mittal Publications, Delhi.	04		
	4.3. Food preparations from mushrooms.		02		
5. Additional Topics: (RY)	5.1. Uses of spent mushroom substrate.		01		
	5.2. Strain improvements in cultivated mushroom; Nutritional and medicinal value of edible mushrooms.		02		
	5.3. Research centres- National level and regional level.		01		
	5.4. Cost-benefit ratio.		01		
	5.5. Mushroom based Industry.		02		
	5.6. Mushroom market in India and abroad.	02			
		TOTAL	45 hr.		

LESSON PLAN

Department Name: BOTANY

Name of Faculty: ANJAN HAZRA (AH)

Paper Name & Code: MUSHROOM CULTIVATION TECHNOLOGY (PRACTICAL), BOT-MD-SEC-1-P

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
1. Section, staining, slide preparation, description, drawing: (AH)	Macro and microscopic identification of some common edible mushrooms (<i>Agaricus</i> , <i>Pleurotus</i>)	1. Som, D. 2021. A Practical Manual on Mushroom Cultivation. P.K. Publishers & Distributors. 2. Stamets, P. and Chilton, J.S. 1985. The Mushroom Cultivator: A Practical Guide to Growing Mushrooms at Home. Richmond Publishing Co Ltd. 3. Reyes, R.G., Kalaw, S.P., Cruz, D.G.V., Tokunaga, K., Sumi, R., Mori, N. and Eguchi F. 2018. A practical guide to mushroom pharming. SEAMEO BIOTROP.	4x2 = 8	Study of fresh Specimens.	
2. Media types and composition: (AH)	Media preparation.		2x2 = 4	Hands on experiment.	
3. Demonstration: (AH)	Fungal tissue culture.		2x2 = 4	Hands on experiment.	
4. Subculturing: (AH)	Sub-culturing for maintenance of culture.		2x2 = 4	Hands on experiment.	
5. Demonstration: (AH)	Spawn production.		1x2 = 2	Hands on experiment.	
6. Cultivation: (AH)	Cultivation of <i>Pleurotus/Calocybe</i> .		4x2 = 8	Hands on experiment.	
		TOTAL	30 hr.		

LESSON PLAN

Department Name: BOTANY

Name of Faculty: RAJENDRA YONZONE (RY), ANJAN HAZRA (AH)

Paper Name & Code: ECONOMIC BOTANY (THEORY), BOT-MD-CC-3-3-TH

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
1. Origin of cultivated crops: (RY)	Concepts of centre of origin, their importance with reference to Vavilov's work. Importance of germplasm diversity.		04	Chalk and Talk.	
2. Cereals, pulses and oils: (RY)	2.1. Cereals: Rice, cultivation, processing and uses, Millets as future cereals.	1. Mukherjee, S. College Botany, Vol. III, latest Ed., New Central Book Agency 2. Mitra, D., Guha, J., Chowdhuri, S.K. Studies in Botany, Vol. II, latest Ed. D.N. Moulik for Moulik Library. 3. Kochhar, S.L. 2012. Economic Botany in Tropics, MacMillan & Co. New Delhi, India.	04		
	2.2. Pulses and Legumes: Cultivation and uses of Gram and Mung Bean. Importance to man and environment.		03		
	2.3. Oil and fats: General description, Classification, Extraction, uses and health implications of Mustard and Coconut (Botanical name, family and uses). Essential oils- general account, extraction methods and their uses.		05		
3. Sugar, starch, spices and beverages: (AH)	3.1. Processing of sugarcane to products and byproducts. Extraction/ processing from Potato and Sugar beet.		1. Kochhar, S.L. 2012. Economic Botany in Tropics, MacMillan & Co. New Delhi, India. 2. Pandey, B.P. 1978. Economic botany for degree honours and postgraduate students.	02	Chalk and Talk, PowerPoint presentation, Demonstrative Videos, Google Classroom.
	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.	05			
	3.3. Beverages: Tea and coffee (plant habit, processing and uses).	02			
4. Narcotics, timbers and fibres: (AH)	4.1. Habit forming drugs with special reference to Cannabis and Tobacco (processing, uses and health hazards).		04		

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	4.2. Timber: General account with special reference to Sal and Teak.		04		
	4.3. Fibers: Cotton and Jute (extraction and uses).		04		
5. Vegetables and fruits: (RY)	5.1. 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.	1. Kochhar, S.L. 2012. Economic Botany in Tropics, MacMillan & Co. New Delhi, India.	04	Chalk and Talk.	
	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.		04		
		Total	45 hr.		

LESSON PLAN

Department Name: BOTANY

Name of Faculty: RAJENDRA YONZONE (RY)

Paper Name & Code: ECONOMIC BOTANY (PRACTICAL), BOT-MD-CC-3-3-P

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
1. Identification: (RY)	Identification of economically important plants (as listed below) from fresh/herbarium sheets/ preserved specimens: Cereals: Rice and Wheat.	1. Pandey, B.P. 2017. Modern Practical Botany Vol 1. S Chand & Company Pvt.	03	Laboratory method. Practical demonstration.	
	Legume: Gram, Mung bean and Soybean (habit, fruit and seed structure).		03		
	Spices and condiments: Coriander, Cumin, Bay leaf, Black pepper, Cinnamon.		03		
	Tea and coffee (plant habit and parts used).		03		
	Common vegetables: Potato, Cucumber, Brinjal, Lady's finger, Carrot, Sweet potato.		03		
	Fruits (only identify the type of fruit) as listed in theoretical syllabus (Mango, Papaya, Custard apple, Pineapple, Tamarind, Jackfruit, Banana, Guava, Pomegranate, Apple, Strawberry, Wood apple, Litchi and Grapes).		06		
Fibres: jute and cotton (plant and parts used).	03				
2. Field visit: (RY)	One field visit to give an idea about cultivation of Rice/Jute/Tea/Potato.		06	One day local excursion.	
		Total	30 hr. including field work		

LESSON PLAN

Department Name: BOTANY

Name of Faculty: RAJENDRA YONZONE (RY), ANJAN HAZRA (AH)

Paper Name & Code: MUSHROOM CULTIVATION TECHNOLOGY (THEORY), BOT-MD-SEC-3-Th

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
1. Introduction: (RY)	1.1. Introduction, History of mushroom cultivation.	1. Acharya, K., Roy, A. & Sarkar, J. Mushroom Cultivation Technology, 2020, Techno World, Kolkata.. 2. Tewari, P. & Kapoor, S.C. Mushroom Cultivation, 1988, Mittal Publications, Delhi.	02	Chalk and talk.	
	1.2. Current overview of mushroom production in the world.		01		
	1.3. Mushroom biology-classification of mushrooms, edible mushrooms in India, poisonous mushrooms, mushroom poisoning.		03		
2. Infrastructure and instruments: (RY)	2.1. Infrastructure-structural design and layout of mushroom farm, substrates (locally available).		03		
	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.		04		
	2.3. Methods of sterilization.		02		
3. Cultivation procedure: (AH)	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.	1. Acharya, K., Roy, A. & Sarkar, J. Mushroom Cultivation Technology, 2020, Techno World, Kolkata.. 2. Tewari, P. & Kapoor, S.C. Mushroom Cultivation, 1988, Mittal Publications, Delhi.	05	Chalk and talk, Power-Point Presentation, class notes, e-resources	
	3.2. Production of spawn- cultivation of oyster mushroom, paddy-straw mushroom, milky mushroom and white button mushroom.		03		
	3.3. Cultivation of medicinal mushroom (<i>Cordyceps</i> and <i>Ganoderma</i>).		04		
	4.1. Mushroom diseases and management strategies.	1. Acharya, K., Roy, A. & Sarkar, J. Mushroom Cultivation	03	Chalk and talk	

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
4. Disease and Management: (RY)	4.2. Post-harvest technology-short-term storage (Refrigeration- up to 24 hours), long-term storage (canning, pickles, papads etc.), drying, storage in salt solutions.	Technology, 2020, Techno World, Kolkata. 2. Tewari, P. & Kapoor, S.C. Mushroom Cultivation, 1988, Mittal Publications, Delhi.	04		
	4.3. Food preparations from mushrooms.		02		
5. Additional Topics: (RY)	5.1. Uses of spent mushroom substrate.		01		
	5.2. Strain improvements in cultivated mushroom; Nutritional and medicinal value of edible mushrooms.		02		
	5.3. Research centres- National level and regional level.		01		
	5.4. Cost-benefit ratio.		01		
	5.5. Mushroom based Industry.		02		
	5.6. Mushroom market in India and abroad.		02		
		TOTAL	45 hr.		

LESSON PLAN

Department Name: BOTANY

Name of Faculty: ANJAN HAZRA (AH)

Paper Name & Code: MUSHROOM CULTIVATION TECHNOLOGY (PRACTICAL), BOT-MD-SEC-3-P

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
1. Section, staining, slide preparation, description, drawing: (AH)	Macro and microscopic identification of some common edible mushrooms (<i>Agaricus</i> , <i>Pleurotus</i>)	1. Som, D. 2021. A Practical Manual on Mushroom Cultivation. P.K. Publishers & Distributors. 2. Stamets, P. and Chilton, J.S. 1985. The Mushroom Cultivator: A Practical Guide to Growing Mushrooms at Home. Richmond Publishing Co Ltd. 3. Reyes, R.G., Kalaw, S.P., Cruz, D.G.V., Tokunaga, K., Sumi, R., Mori, N. and Eguchi F. 2018. A practical guide to mushroom pharming. SEAMEO BIOTROP.	4x2 = 8	Study of fresh Specimens.	
2. Media types and composition: (AH)	Media preparation.		2x2 = 4	Hands on experiment.	
3. Demonstration: (AH)	Fungal tissue culture.		2x2 = 4	Hands on experiment.	
4. Subculturing: (AH)	Sub-culturing for maintenance of culture.		2x2 = 4	Hands on experiment.	
5. Demonstration: (AH)	Spawn production.		1x2 = 2	Hands on experiment.	
6. Cultivation: (AH)	Cultivation of <i>Pleurotus/Calocybe</i> .		4x2 = 8	Hands on experiment.	
		TOTAL	30 hr.		

LESSON PLAN

Department Name: BOTANY

Name of Faculty: ANJAN HAZRA (AH), PAYEL CHATTERJEE (PC)

Paper Name & Code: PLANT DIVERSITY (THEORY), BOT-MD-CC1-3-Th (Minor+MDC100)

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
1. Introduction to plant kingdom. (AH)	1.1. Origin of life and evolution of plant cells.	1. Ganguli, H.C., Das, K.S.K. & Dutta, C.T. College Botany, Vol. I, latest Ed., New Central Book Agency. 2. Ganguli, H.C. and Kar, A.K. College Botany, Vol. II, latest Ed., New Central Book Agency. 3. Mukherjee, S. College Botany, Vol. III, latest Ed., New Central Book Agency. 4. Hait, G., Ghosh, A. and Bhattacharya, K. A Text Book of Botany (Vols. I & II), 2007, New Central Book Agency. 5. Mitra, D., Guha, J. & Chowdhuri, S.K. Studies in Botany (Vols. I & II), Latest Ed., Das Printers.	01	Chalk and talk method.	
	1.2. Importance of plants as source of food, fuel and their role in ecosystem services (as carbon sink, sequestering etc.).		02		
2. Algae. (PC)	2.1. Salient features of Cyanophyceae, Chlorophyceae, Charophyceae, Phaeophyceae, Rhodophyceae and Bacillariophyceae.		02	Chalk and talk.	
	2.2. Criteria and system of classification (Fritsch, 1935).		02		
	2.3. Economic importance of algae in environment, agriculture, biotechnology and industry.		02		
3. Fungi. (PC)	3.1. Salient features of Myxomycota, Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina, Deuteromycotina.		02		
	3.2. System of classification up to Sub-division (Ainsworth, 1973),		01		
	3.3. Economic importance of fungi (food, medicine and agriculture).		02		
	3.4. Fungal symbioses: Mycorrhiza, Lichen and their importance.	01			
4. Bryophytes.			03	Chalk and talk.	

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
(AH)	4.1. Salient features of Hepaticopsida, Anthocerotopsida and Bryopsida,	1. Mitra, D., Guha, J. & Chowdhuri, S.K. Studies in Botany (Vols. I & II), Latest Ed., Das Printers.		Chalk and talk.	
	4.2. System of classification up to Class (Proskauer 1957).		01		
	4.3. Amphibian nature of bryophytes.		01		
	4.4. Economic and ecological importance.		02		
5. Pteridophytes. (AH)	5.1. Salient features of Psilophyta, Lycophyta, Sphenophyta and Filicophyta.		02		
	5.2. System of classification up to Division (Gifford & Foster 1989).		02		
	5.3. Economic importance (food, medicine & agriculture).		01		
6. Gymnosperms. (PC)	6.1. Salient features of Cycadophyta, Coniferophyta and Gnetophyta.		02		
	6.2. Outline classification up to Division: Progymnospermophyta to Gnetophyta (Gifford & Foster 1989).	02			
	6.3. Economic importance (wood, resin, essential oil & drugs).	02			
7. Angiosperms. (PC)	7.1. Types and morphology of leaf, stem and root.	1. Mitra, D., Guha, J. & Chowdhuri, S.K. Studies in Botany (Vols. I & II), Latest Ed., Das Printers.	03	Chalk and talk.	
	7.2. Inflorescence types with examples		03		
	7.3. Flower: Different parts and forms of calyx, corolla, androecium and gynoecium; aestivation and placentation.		04		
	7.4. Types with examples-fruits and seeds.		02		
		TOTAL	45 hr.		

LESSON PLAN

Department Name: BOTANY

Name of Faculty: ADITI DEY (AD)

Paper Name & Code: PLANT DIVERSITY (PRACTICAL), BOT-MD-CC1-3-P (Minor+MDC100)

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
1. Flower- dissection, drawing and study (AD)	a) Different parts, b) Adhesion and cohesion, c) Placentation, d) Aestivation.	1. Chatterjee, T., Santra, S.C. and Das, A. Practical College Botany, New Central Book Agency. 2. Focus on college practical Botany by Prof. P. Maji. Rita Book Agency.	12	Laboratory method. Demonstration using different flower specimens. Hands on activities.	
2. Study of ovules (AD)	Types (Fresh specimens/ permanent slides/ photographs).		2	Laboratory method. Demonstration using fresh specimens, permanent slides and photographs.	
3. Fruits (AD)	Different types- study from fresh/ preserved specimens.	1. Chatterjee, T., Santra, S.C. and Das, A. Practical College Botany, New Central Book Agency. 2. Mitra, D., Guha, J. & Chowdhuri, S.K. Studies in Botany (Vols. I & II), Latest Ed., Das Printers.	2	Laboratory method. Demonstration using fresh specimens, preserved specimens, charts and photographs. Hands on activities.	
4. Inflorescence types (AD)	Study from fresh/ preserved specimens.	3. Focus on college practical Botany by Prof. P. Maji. Rita Book Agency.	2	Laboratory method. Demonstration using fresh specimens, preserved specimens, charts and photographs. Hands on activities.	
5. Identification on the basis of reproductive and structural features from preserved specimens/ permanent slides (AD)	Algae (<i>Nostoc</i> , <i>Oedogonium</i> and <i>Ectocarpus</i>), Fungi (<i>Rhizopus</i> , <i>Ascobolus</i> and <i>Agaricus</i>), Bryophytes (<i>Marchantia</i> , <i>Anthoceros</i> and <i>Funaria</i>), Pteridophytes (<i>Selaginella</i> , <i>Equisetum</i> and <i>Pteris</i>),		9	Laboratory method. Demonstration using preserved specimens and permanent slides. Hands on activities.	

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	Gymnosperms (male cone and female cone/ megasporophyll of <i>Cycas</i> , <i>Pinus</i> and <i>Gnetum</i>).				
3. Field work (AD)	A field notebook supported with photographs taken during field study to be submitted giving comprehensive idea about different types of inflorescences, flowers and fruits.	-----	One day local excursion to study plants in their natural habitat. 3hr	Experiential learning through field visits. immersive field trips, hands on activities.	
			TOTAL	30 hr.	

LESSON PLAN

Department Name: BOTANY

Name of Faculty: ADITI DEY (AD) & SHARMISTHA BASU (SB)

Paper Name & Code: PLANTS AROUND US (THEORETICAL), IDC in Botany

Planned						
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments	
1. Introduction: (AD)	1.1. Introduction to plant groups: Algae, Bryophytes, Pteridophytes, Gymnosperms, Angiosperms (Monocot and Dicot).		02	Chalk and talk and power point presentation.		
	1.2. Fungi -general characters.		01			
	1.3. Contributions of Theophrastus, Charak, Sushruta, Linnaeus, Mendel and J.C. Bose.		02			
2. Plant body: (AD)	2.1. Plant cell and tissue.		1. Studies in Botany {vol-I}- J.N, Mitra, D. Mitra & S. Chowdhury (Moulik Library).	01	Blackboard, class notes, e-resources.	
	2.2. Morphology of root, stem, leaf, flower, fruit and seed.		2. A Textbook of Botany (vol.I)- G. Hait, K. Bhattacharya & A. K. Ghosh (New Central Book Agency).	02		
3. Plants and ecosystem: (SB)	3.1. Phytodiversity and conservation.		3. Udvid Bigyan (Vol-I) (Bengali) S. Chowdhury, N. Datta, D. Mitra & J. Guha (Moulik Library).	01	Chalk and talk and power point presentation.	
	3.2. Biodiversity hotspots of India.		4. College Botany (vol II)-H.C. Gangulee, A.K. Kar, S.C. Santra (New Central Book Agency).	01		
	3.3. Forest types in India.		5. Snatak Udvidbidya (Semester I)- J.K. Sikdar, K. Sen, P. Giri. (Santra Publication).	01		
	3.4. Plant-based adaptations to climate change.			01		
	3.5. Concept of 'Carbon footprint'- role of plants in reducing carbon footprint.			01		
4. Plants and society: (SB)	4.1. Plants in day-to-day life (brief general information including uses)- major cereals (rice, wheat and maize).			01		
	4.2. Pulses (mung and pea).			01		
	4.3. Oil (mustard, coconut).		01			
	4.4 Sugar (sugarcane and beet root).		01			

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
	4.5 Vegetables (potato, brinjal, ladies finger and spinach).		01		
	4.6 Fruits (apple, banana, guava, mango and jackfruit).		01		
	4.7. Beverages (tea, coffee, beer and wine).		01		
	4.8. Plants as timber (sal and teak).		01		
	4.9. Non-timber-energy (fossil and non-fossil), resin, honey and essential oil (lavender and citronella oil).		01		
	4.10. Fiber (jute and cotton).		01		
	4.11. Ornamental plants (rose, marigold, tuberose, gulmohar, jarul, kalanchoe).		01		
	4.12. Importance of bacteria (<i>Lactobacillus</i> , <i>E. coli</i> and <i>Rhizobium</i>), and Fungi (<i>Phytophthora</i> , <i>Agaricus</i> and <i>Penicillium</i>).		01		
5. Plants and human health: (SB)	5.1. Important medicinal plants and their uses- basak (<i>Justicia adhatoda</i>), ghritakumari (<i>Aloe vera</i>), cinchona (<i>Cinchona officinalis</i>), neem (<i>Azadirachta indica</i>), kalmegh (<i>Andrographis paniculata</i>), pudina (<i>Mentha arvensis</i>), tulsi (<i>Ocimum sanctum</i>), sarpagandha (<i>Rauvolfia serpentina</i>).		04	Blackboard, class notes, e-resources.	
	5.2. Plant-derived medicinal compounds and uses (Quinine, Reserpine, Vincristine, Curcumin, Gingerol).		01		
		TOTAL	30 hr.		

LESSON PLAN

Department Name: BOTANY

Name of Faculty: SHARMISTHA BASU (SB)

Paper Name & Code: PLANTS AROUND US (PRACTICAL), IDC in Botany

Planned					
Unit / Group / Module / Article	Topics	Reference Books	No of Lecture Planned	Content Delivery Technique	Remarks / Comments
1. Identification: (SB)	Morphological study plant specimens Microscopic study <i>Nostoc</i> , <i>Oedogonium</i> (with oogonium), <i>Rhizopus</i> , <i>Penicillium</i> (sporangiophore). Macroscopic study <i>Agaricus</i> (fruit body), <i>Marchantia</i> with gemma cup, antheridiophore/archaeogoniophore, Moss sporophyte, <i>Pteris</i> (fertile leaf/pinna), <i>Pinus</i> -male and female cone. Fruits of tomato, peas, cucumber, citrus, apple & banana.	1. Dr. P. Maji, Focus on College Practical Botany, Rita Book Agency, Latest Edition.	3x7 = 21	Identification from permanent slides and preserved specimens.	
	2. Work out of flower: (SB)		Floral parts of <i>Hibiscus rosa-sinensis</i> , <i>Clitoria ternatea</i> & <i>Datura metel</i> .	3x3 = 09	Work out of fresh Specimens.
		TOTAL	30 hr.		