LESSON PLAN
DEPARTMENT OF BOTANY

2021-2022

AP- Dr.APARNA PAL

SKS-Dr SUDIP KUMAR SINHA
SB-Smt SHARMISTHA BASU
RY-Dr RAJENDRA YONZONE
AD-Smt ADITI DEY
PC-Smt PAYEL CHATTERJEE

SEMESTER	PROGRAMME	COURSE AND NAME OF THE PAPER	TOPIC	TEACHER	NO. OF HOURS
1	Honours	Core Course 1- BOT-A-CC-1-1-TH	Phycology and microbiology	AD	30
				SB	30
		Core Course 1- BOT-A-CC-1-1-P	Phycology and microbiology practical	AD	30
				SB	30
		Core Course 2- BOT-A-CC-1-2-TH	Mycology and phytopathology	AP	30
				PC	30
		Core Course 2- BOT-A-CC-1-2-P	Mycology and phytopathology Practical	SKS	30
				PC	30
	General	BOT-G-CC-1-1-TH	PLANT DIVERSITY I (PHYCOLOGY, MYCOLOGY, PHYTOPATHOLOGY, BRYOPHYTES AND ANATOMY)	AP	14
				AD	14
				SKS	22
				RY	10
		BOT-G-CC-1-1-P	PLANT DIVERSITY I (PHYCOLOGY, MYCOLOGY, PHYTOPATHOLOGY, BRYOPHYTES AND ANATOMY)	RY	30
				SKS	30
2	Honours	Core Course 3- BOT-A-CC-2-3-TH	Plant anatomy	AP	24
				PC	36
		Core Course 3- BOT-A-CC-2-3-P	Plant anatomy Practical	AP	60
		Core Course 4- BOT-A-CC-2-4-TH	Archegoniate	AD	22
				SB	22
				SKS	16
		Core Course 4- BOT-A-CC-2-4-P	Archegoniate practical	AD	60
	General	BOT-G-CC-2-2-TH	PLANT DIVERSITY II (PTERIDOPHYTES, GYMNOSPERMS, PALAEOBOTANY, MORPHOLOGY AND TAXONOMY)	AD	32
				PC	14
				RY	14
		BOT-G-CC-2-2-P	PLANT DIVERSITY II (PTERIDOPHYTES, GYMNOSPERMS, PALAEOBOTANY, MORPHOLOGY AND TAXONOMY) practical	RY	60
3	Honours	Core Course 5- BOT-A-CC-3-5-TH	Palaeobotany and palynology	AD	42
				AP	18
		Core Course 5- BOT-A-CC-3-5-P	Palaeobotany and palynology Practical	AD	60
		Core Course 6- BOT-A-CC-3-6-TH	Reproductive biology of angiosperms	SB	30
				SKS	30
		Core Course 6- BOT-A-CC-3-6-P	Reproductive biology of angiosperms Practical	AP	60
		Course 7- BOT-A-CC-3-7-TH	Plant systematics	AP	44
				RY	16
		Core Course 7- BOT-A-CC-3-7-P	Plant systematics Practical	AP	30
				RY	30
		SEC A – BOT-A-SEC-A-3-1	Applied Phycology, Mycology and Microbiology (BOT-A-SEC-A-3-1)	SKS	30
	General	BOT-G-CC-3-3-TH	CELL BIOLOGY, GENETICS AND MICROBIOLOGY	AP	22
				SB	16
				AD	22
		BOT-G-CC-3-3-P	CELL BIOLOGY, GENETICS AND MICROBIOLOGY PRACTICAL	RY	60
		BOT-G-SEC-A-3/5-1	PLANT BREEDING AND BIOMETRY	SB	30
4	Honours	Core Course 8- BOT-A-CC-4-8-TH	Plant Geography,Ecology and Evolution	AP	30
				SB	30
		Core Course 8- BOT-A-CC-4-8-P	Plant Geography,Ecology and Evolution Practical	AP	30
				SB	30
		CORE COURSE- 9 BOT-A-CC-4-9-TH	Economic Botany	AD	27
				RY	33
		CORE COURSE- 9 BOT-A-CC-4-9-P	Economic Botany Practical	SKS	60
		CORE COURSE 10 BOT-A-CC-4-10-TH	Genetics	PC	60
		CORE COURSE 10 BOT-A-CC-4-10-P	Genetics	PC	60
		SEC B-(BOT-A-SEC-B-4-3	PLANT BREEDING	RY	30
	General	CORE COURSE 4 BOT-G-CC-4-4-TH	PLANT PHYSIOLOGY AND METABOLISM	RY	60
		CORE COURSE 4 BOT-G-CC-4-4-P	PLANT PHYSIOLOGY AND METABOLISM -PRACTICAL	SB	24
				AD	36
		SEC B BOT-G-SEC-B-4/6-3	PLANT BIOTECHNOLOGY	SB	30
5	Honours	CORE COURSE- 11 BOT-A-CC-5-11-TH)	CELL AND MOLECULAR BIOLOGY	PC	60
		CORE COURSE- 11 BOT-A-CC-5-11-P	CELL AND MOLECULAR BIOLOGY -PRACTICAL	PC	60

		CORE COURSE- 12 BOT-A-CC-5-12-TH)	BIOCHEMISTRY	SKS	60
		CORE COURSE- 12 BOT-A-CC-5-12-P	BIOCHEMISTRY-PRACTICAL	SKS	60
		DSE A-(BOT-A-DSE-A-5-2-TH	INDUSTRIAL AND ENVIRONMENTAL MICROBIOLOGY	SB	60
		DSE A-(BOT-A-DSE-A-5-2-P	INDUSTRIAL AND ENVIRONMENTAL MICROBIOLOGY -PRACTICAL	SB	60
		DSE B-(BOT-A-DSE-B-5-6-TH)	HORTICULTURAL PRACTICES AND POST- HARVEST TECHNOLOGY	RY	60
		DSE B-(BOT-A-DSE-B-5-6-P)	HORTICULTURAL PRACTICES AND POST- HARVEST TECHNOLOGY -PRACTICAL	RY	60
	General	DSE A-BOT-G-DSE-A-5-1-TH	PHYTOCHEMISTRY AND MEDICINAL BOTANY	AP	60
		DSE A-BOT-G-DSE-A-5-1-P	PHYTOCHEMISTRY AND MEDICINAL BOTANY -PRACTICAL	AP	60
		SEC B-(BOT-G-SEC-A-3/5-2	BIOFERTILIZERS	RY	30
6	Honours	CORE COURSE-13 BOT-A-CC-6-13-TH	PLANT PHYSIOLOGY	SKS	60
		CORE COURSE-13 BOT-A-CC-6-13-P	PLANT PHYSIOLOGY -PRACTICAL	SKS	60
		CORE COURSE 14 BOT-A-CC-6-14-TH	PLANT METABOLISM	SKS	60
		CORE COURSE 14 BOT-A-CC-6-14-P	PLANT METABOLISM -PRACTICAL	SKS	60
		DSE A- (BOT-A-DSE-A-6-3-TH)	MEDICINAL AND ETHNOBOTANY	AP	60
		DSE A- (BOT-A-DSE-A-6-3-P	MEDICINAL AND ETHNOBOTANY PRACTICAL	AP	60
		DSE B-(BOT-A-DSE-B-6-8-TH	NATURAL RESOURSE MANAGEMENT	RY	60
		DSE B-(BOT-A-DSE-B-6-8-P	NATURAL RESOURSE MANAGEMENT PRACTICAL	RY	60
	GENERAL	DSE B-BOT-G-DSE-B-6-3-TH	ECONOMIC BOTANY	SB	60
		DSE B-BOT-G-DSE-B-6-3-P	ECONOMIC BOTANY -PRACTICAL	SB	60

LESSON PLAN: 2022-2023 - (HONS. &GEN)

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SACT II, DEPARTMENT OF BOTANY

SEMESTER I HONOURS

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2022-2023	PHYCOLOGY & MICROBIOLOGY BOT-A-CC-1-1-TH THEORETICAL	PHYCOLOGY	**1. GENERAL ACCOUNT**- 1.1. Thallus organization, Structure of algal cell, 1.2. Ultrastructure of Plastids and Flagella, 1.3. Origin and evolution of sex, 1.4. Life cycle patterns, 1.5. Significant contributions of important phycologists (Fritsch, Smith, R. N. Singh, T.V. Desikachary, H.D. Kumar, M.O.P. Iyengar) **2.Classification:** 2.1Criteria and basis of Fritsch's classification 2.2Classification by Lee (2008) up to phylum with examples 2.3Salient features of Cyanobacteria, Rhodophyta, Chlorophyta, Charophyta, Bacillariophyta, Xanthophyta, Phaeophyta, Heterokontophyta. **3.Cyanobacteria:** 3.1. Ultrastructure of cell, 3.2. Heterocyst - structure and function, 3.3. Ecology. **4.Bacillariophyta:** 4.1 Cell structure, 4.2. Cell division, 4.3. Auxospore formation in Centrales and Pennales. **5. Life History:** *5.1 Chlamydomonas*, 5.2. *Oedogonium*, 5.3. *Chara*, 5.4. *Ectocarpus*, 5.5. *Polysiphonia*, 5.6. Evolutionary significance of *Prochloron*.	5 CHALK & TALK, CHARTS, PPT, GOOGLE CLASSROOM. 5 4 6 10	JULY'22 TO DECEMBER'22

	PHYCOLOGY & MICROBIOLOGY BOT-A-CC-1-1-P PRACTICAL	PHYCOLOGY	**1.Work out** of the following algae with reproductive structure (Free hand drawing and drawingunder **drawing prism with magnification**): *Oedogonium*, *Chara*, *Ectocarpus.* Study of (a) **2 . S t u d y f r o m - a) Permanent slides**: *Gloeotrichia, Volvox, Vaucheria, Coleochaete, Polysiphonia,* Centric and Pennate diatom; (b) **Macroscopic specimens***: Laminaria, Sargassum.*	30 LABORATORY METHODS.	JULY'22 TO DECEMBER'22

SEMESTER II HONOURS

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2022-2023	ARCHAEGONIATE BOT-A-CC-2-4-TH THEORETICAL	GYMNOSPERMS	**1. Classification** of vascular plants by Gifford & Foster(1989) up to division (Progymnospermophyta to Gnetophyta) with diagnostic characters and examples. **2. Progymnosperms** :2.1 Diagnostic characters of the group, 2.2.Vegetative and reproductive features of *Archeopteris*, 2.3.Phylogenetic importance. **3. Life History** : Distribution in India; Vegetative and Reproductive structure of sporophyte, Development of gametophyte in : 3.1. Cycas , 3.2. Pinus and 3.3. Gnetum. **4. Economic Importance** with reference to Wood, Resins, Essential oils, and Drugs.	4 6 8 CHALK & TALK, PPT, CHARTS, GOOGLE CLASSROOM 4	JANUARY '23 TO JUNE'23

	BOT-A-CC-2-4-P PRACTICAL	BRYOPHYTES, PTERIDOPHYTES, GYMNOSPERMS	**BRYOPHYTES** **1. Morphological study** of the plant body: Genera as mentioned in theoretical syllabus and *Riccia, Porella*. **2. Study from permanent slides** : Riccia (V.S. of thallus with sporophyte), Marchantia (L.S. through gemma cup, antheridiophore , archegoniophore) , Anthoceros (L.S. of sporophyte) , Funaria (L.S. of capsule). **PTERIDOPHYTES** **1. Morphological study** of the sporophytic plant body: Genera as mentioned in the theoreticalsyllabus and *Lycopodium, Ophioglossum* and *Marsilea*. **2. Workout** of the reproductive structures: *Selaginella, Equisetum, Pteris*. **3. Study from permanent slides**: *Psilotum* (T.S. of synangium), *Lycopodium* (L.S. of strobilus), *Ophioglossum* (L.S. of spike), *Dryopteris* (gametophyte), *Marsilea* (L.S. of sporocarp). **GYMNOSPERMS** **1. Morphological study**: *Cycas* (microsporophyll and megasporophyll), *Pinus* (female and male cone), *Gnetum* (female and male cone). **2. Study from permanent slides**: *Cycas* (L.S. of ovule), *Pinus* (L.S. of male and female cone), *Ginkgo* (L.S. of female strobilus), *Gnetum* (L.S. of male cone and ovule).	6 LABORATORY METHODS. 18 6	JANUARY ’23 TO JUNE’23

SEMESTER III HONOURS

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2022-2023	PALAEOBOTANY AND PALYNOLOGY BOT-A-CC-3-5-TH THEORETICAL	PALAEOBOTANY	**1. Geological time scale** with dominant plant groups through ages. **2. Plant Fossil**: 2.1Types: Body fossil (Micro- and Megafossils), Trace fossil, Chemical fossil, Index fossil, 2.2. Different modes of preservation (Schopf, 1975), 2.3. Conditions favouring fossilization, 2.4. Nomenclature and Reconstruction, 2.5. Principle of fossil dating (a brief idea), 2.6. Importance of fossil study. **3. Fossil Pteridophytes:** Structural features, Geological distribution and Evolutionary significance of 3.1. *Rhynia*, 3.2. *Lepidodendron* (Reconstructed), 3.3. *Calamites* (Reconstructed). **4. Fossil gymnosperms:** Structural features and Geological distribution of reconstructed genera: 4.1. *Lyginopteris*, 4.2. *Williamsonia*, 4.3.*Cordaites*. **5. Indian Gondwana** System – Three-fold division with major megafossil assemblages.	4 12 CHALK & TALK, PPT, GOOGLE CLASSROOM 10 10 6	JULY'22 TO DECEMBER '22
		PALYNOLOGY	**6. Palynology:** Spore and Pollen, 6.2. Pollen aperture types, 6.3. NPC classification (Erdtman). 6.4. Pollen wall-Sporopollenin, Stratification and Ornamentation (sculpturing). **7. Applied Palynology:** Basic concepts of: 7.1. Palaeopalynology, 7.2. Aeropalynology, 7.3.	10 8	

	BOT-A-CC-3-5-P PRACTICAL	PALAEOBOTANY PALYNOLOGY	Forensic palynology, 7.4.Melissopalynology. **1. Morphological study:** *Ptilophyllum* and *Glossopteris* leaf fossils. **2. Study from permanent slides**: T.S. of stem of *Rhynia, Lepidodendron, Calamites, Lyginopteris,Cordaites*. Study of Pollen types (colpate, porate and colporate) from permanent slides. Slides may be prepared from specimens: Colpate (*Leonurus sibiricus/ Brassica* sp.), Porate (*Hibiscusrosa-sinensis*), Colporate (*Cassia sophera/ C. tora*).	40 LABORATORY METHODS. 20	JULY'22 TO DECEMBER '22

SEMESTER IV HONOURS

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2022-2023	ECONOMIC BOTANY BOT-A-CC-4-9-TH THEORETICAL	ECONOMIC BOTANY	**5.Spices**: Listing of important spices, their family and part used. **6.Beverages:** Tea (morphology, processing and uses). **8.Drug-yielding plants:** Therapeutic and habit- forming drugs with special reference to *Cinchona,Digitalis*, *Papavar, Cannabis* and Tobacco (morphology, processing, uses and health hazards). **9. Timber**: general account with special reference to Sal and Teak. **10. Fibers**: Cotton and Jute (Morphology, extraction and uses).	6 5 8 CHALK & TALK, PPT, GOOGLE CLASSROOM 4 4	JANUARY '23 TO JUNE'23

SEMESTER I GENERAL

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2022-2023	PLANT DIVERSITY BOT-G-CC-1-1-TH THEORETICAL	PHYCOLOGY	2.Phycology **2.1 Diagnostic characters** and examples of Cyanophyceae, Rhodophyceae, Chlorophyceae, Charophyceae and Phaeophyceae**, 2.2 Classification**: Criteria and system of Fritsch, **2.3. Life histories** of *Chlamydomonas*, *Chara* and *Ectocarpus*, **2.4.** Role of algae in the environment,agriculture, biotechnology and industry.	14 CHALK & TALK, PPT.	JULY'22 TO DECEMBER '22

SEMESTER II GENERAL

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2022-2023	PLANT DIVERSITY II BOT-G-CC-2-2-TH THEORETICAL	PTERIDOPHYTES GYMNOSPERMS PALAEOBOTANY	**1. Pteridophytes** 1.1Diagnostic characters and examples of Psilophyta, Lycophyta, Sphenophyta & Filicophyta(Gifford & Foster 1989). 1.2 Life histories of *Selaginella* and *Pteris*, 1.3 Economic importance. **2.Gymnosperms** 2.1Progymnosperms (brief idea), 2.2 Diagnostic characters and examples of Cycadophyta, Coniferophyta and Gnetophyta (Gifford & Foster 1989), 2.3 Life histories of *Cycas* and *Pinus*, 2.4*Williamsonia* (reconstructed), 2.5 Economic importance of Gymnosperms. **3. Paleobotany** 3.1Fossil, fossilization process and factors of	12 12 CHALK & TALK, CHARTS, PPT. 7	JANUARY '23 TO JUNE'23

			fossilization, 3.2 Importance of fossil study. 3.3Geological time scale.		

SEMESTER III GENERAL

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2022-2023	CELL BIOLOGY, GENETICS AND MICROBIOLOGY BOT-G-CC-3-3-TH THEORETICAL	CELL BIOLOGY AND GENETICS	**4.Genetic Code-** properties. **5.Linkage** group and Genetic map (three-point test cross). **6. Mutation** – 6.1 Point mutation (tautomerisation; transition, transversion and frame shift), 6.2 Mutagen-physical and chemical. **7. Brief concept of Split gene, Transposons.**	4 6 8 CHALK & TALK, PPT. 4	JULY'22 TO DECEMBER'22

SEMESTER IV GENERAL

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2022-2023	PLANT PHYSIOLOGY AND METABOLISM BOT-G-CC-4-4-P PRACTICAL	PLANT PHYSIOLOGY	Plant Physiology: i)Experiment on **Plasmolysis** ii)Measurement of leaf area (graphical method) and determination of **transpiration** rate per unit area by weighing method. iii) **Imbibition** of water by dry seeds - proteinaceous and fatty seeds.	30 LABORATORY METHODS.	JANUARY '23 TO JUNE'23

LESSON PLAN 2022-23 (Semester 1 ,semester2, Semester3, Semester4 ,Semester 5 & Semester6 Hons. & General)

NAME: SMT SHARMISTHA BASU

DEPARTMENT: BOTANY

Semester1 HONOURS

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2022-23	CORE COURSE 1 PHYCOLOGY AND MICROBIOLOGY (BOT-A-CC-1-1-TH) THEORETICAL	Microbiology	MICROBIOLOGY 1. Virus: 1.1. Discovery, 1.2.Plant virus- types, 1.3. Transmission and translocation of Plant virus, 1.4. TMV-	6	July 22 to December 22 PPT, video lessons , Google classroom, chalk and talk method.
			2. Bacteria: 2.1. Discovery, .2.2. Distinguishing features of Archaea and Bacteria, 2.3. Characteristics of some major groups: Proteobacteria (Enterobacteria), Firmicutes, Mollicutes, Actinobacteria, Spirochaetes, Chlamydiae, 2.4. Bacterial growth curve and generation time, 2.5.Flagella (ultrastructure) & Pilli, 2.6. Cell wall – chemical structure and differences between Gram +ve & Gram – ve bacteria, 2.7. Bacterial genome and plasmid, 2.8. Endospore - formation, structure and function, 2.9.Genetic Recombination (a) Transformation – with special emphasis on Natural and Induced competence and DNA uptake, (b) Conjugation– F- factor, F+ X F–, Hfr X F–, concept of F', chromosome mobilization, (c) Transduction– Generalised and specialized Practical Gram staining from bacterial culture. 4. Microscopic examination of bacteria from natural habitat (curd) by simple staining.	20 3	July22 to December 22 PPT, video lessons , Google classroom, chalk and talk method. Laboratory method

Lesson plan 2022-23 (Sharmistha Basu, Assistant Professor,Botany)

Semester 2 HONOURS

Year	Paper	Unit	Topic	No. Of lectures	Session
2022-23	Archegoniate (BOT-A-CC-2-4-TH,	Pteridophytes	1. General Account: 1.1. Colonisation and rise of early land plants, 1.2. Classification of vascular plants by Gifford & Foster (1989) upto division (Rhyniophyta to Filicophyta) with diagnostic characters and examples. Sporophyte structure, Reproduction and Structure of gametophyte in 2.1. Psilotum, 2.2. Selaginella, 2.3. Equisetum, 2.4. Pteris. 3. Telome concept and its significance in the origin of different groups of Pteridophytes. 4. Heterospory and Origin of Seed habit. 5. Economic importance as food, medicine and Agriculture.	4 8 8 4 2	January 2023to June. 2023 PPT, video lessons,Google classroom, chalk and talk method..

Lesson plan 2022-23 (Sharmistha Basu, Assistant Professor,Botany)

Lesson plan semester3(Hons)

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2022-23	CORE COURCE-6 REPRODUCTIVE BIOLOGY OF ANGIOSPERMS (BOT-A-CC-3-6-TH) THEORETICAL	MORPHOLOGY OF ANGIOSPERMS	1. Inflorescence types with examples. 2. Flower, induction of flowering, flower development- genetic and molecular aspects. 3. Fruits and seeds - types with examples	8 14 8	July 2022 to December 2022 PPT, video lessons,Google classroom, chalk and talk method.

Lesson plan semester4(Hons.)

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2022-23	CORE COURSE-8 PLANT GEOGRAPHY, ECOLOGY AND EVOLUTION (BOT-A-CC-4-8-TH)	Plant geography	1. Phytogeographical regions: 1.1. Phytogeographical regions of India (Chatterjee 1960); 1.2. Dominant flora of Eastern Himalaya, Western Himalaya and Sunderban. 2. Endemism: 2.1 Endemic types and Factors; 2.2. Age & Area hypothesis and Epibiotic theory; 2.3. Endemism in Indian flora	4 4 6	January 2023 to June 2023 PPT, video lessons,Google classroom, chalk and talk method.

Lesson plan 2022-23 (Sharmistha Basu, Assistant Professor,Botany)

Semester V Hons. Lesson plan.

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2022-23	Semester V BOT-A-DSE-A-5-2-TH	Industrial and Environmental Biology	Scope of microbes in industry and environment. 2. Bioreactors/ Fermenters and fermentation process: solid- state and liquid-state (stationary and submerged) fermentations; batch and continuous fermentations. Components of a typical ..... bioreactors, types of bioreactors- laboratory, pilot scale and production fermenters. Constantly stirred fermenter, tower fermenter, fixed bed and fluidized bed bioreactors and air- lift Fermenter. 3. Microbial production of industrial products: microorganisms involved, media, fermentation conditions, down stream processing and uses; filtration, centrifugation, cell disruption, solvent extraction, precipitation and ultrafiltration, lyophilisation, spray drying, hands on microbial fermentations for the production and estimation of enzymes amylase or lipase activity, organic acids (citric or glutamic acid), alcohol (ethanol) and antibiotic (Penicillin). 4. Microbial enzymes of industrial interest and enzyme immobilization: microorganisms for industrial applications. Methods of immobilization, advantages and applications of immobilization, large scale application of immobilized enzymes (glucose isomerase and penicillin acylase). 5. Microbes and quality of environment: distribution of microbes in air, isolation of microorganisms from soil, air and water. 6. Microbial flora of water: water pollution, role of microbes in sewage and domestic waste water treatment systems.	PPT, video lessons , online classes, Google classroom. 6 12 12 8 8 8	July 2022 to December 2022 PPT, video lessons,Google classroom, chalk and talk method.

			Determination of BOD, COD of water samples. Microorganisms as indicators of water quality, check coliform and fecal coliform in water samples. 7. Microbes in agriculture and remediation of contaminated soils: biological fixation, mycorrhizae, bioremediation of contaminated soils, isolation of root nodulating bacteria, arbuscular mycorrhizal colonization in plant roots.	8	
	BOT-A-DSE-A-5-2-P	Industrial and Environmental Biology Practical.	1. Principals and functioning of instruments in microbiology laboratory 2. Hands on sterilization techniques and preparation of culture media. 3. Preparation of slant, stab and pouring petriplate.	7	July 2022 to December 2022 PPT, video lessons , online classes, Google classroom. Laboratory method Industrial visits.

Semester3(General)

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2022-23	SEMESTER III CORE COURSE 3 CELL BIOLOGY, GENETICS AND MICROBIOLOGY (BOT-G-CC-3-3-TH) THEORETICAL	Microbes	2.1 Viruses- Discovery, general structure, replication (general account), DNA virus (T-phage); Lytic and lysogenic cycle, RNA virus (TMV); Economic importance; 2.2 Bacteria- discovery, general characteristics and cell structure; reproduction- vegetative, asexual and recombination (conjugation, transformation and transduction); Economic importance.	16	July 22 to December 22 PPT, video lessons,Google classroom, chalk and talk method.
	CELL BIOLOGY, GENETICS AND MICROBIOLOGY (BOT-G-CC-3-3-P	Microbiology	Practical Workout gram staining (curd/any natural source) 3. Identification with reasons: slides of Different forms of bacteria (Coccus, Bacillus, Spiral)	6 Laboratory method	July 2022 to December 2022

Semester 4(General)

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	Session
2022-23	PLANT PHYSIOLOGY AND METABOLISM (BOT-G-CC-4-4-P) Practical	Plant Physiology	i) Experiment on Plasmolysis. ii) Measurement of leaf area (graphical method) and determination of transpiration rate per unit area by weighing method. iii) Imbibition of water by dry seeds - proteinaceous and fatty seeds. iv) Evolution of O2 during photosynthesis (using graduated tube). v) Evolution of CO2 during aerobic respiration and measurement of volume.	**7**	January 2023 to June 2023
	SEC B PLANT BIOTECHNOLOGY (BOT-G-SEC-B-4/6-3) Theory	Plant biotechnology	1. Plant tissue culture- 1.1 Introduction and basic concepts, 1.2 Cellular potency, 1.3 Callus culture and plant regeneration.	**4**	PPT, video lessons,Google classroom, chalk and talk method.
			2. Micropropagation- 2.1 Somatic embryogenesis and artificial seed.	**4**	
			3. Protoplast culture and its application.	**6**	
			4. Recombinant DNA technology- 4.1 Recombinant DNA, 4.2 Restriction enzymes, 4.3 Plasmids as vectors.	**8**	
			5. Gene cloning (basic steps).	**4**	
			6. Achievements in crop biotechnology- 6.1 Pest resistant plant (Bt cotton), 6.2 Transgenic crops with improved quality (flavr tomato and golden rice)	**4**	

Semester 6(General)

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2022-23	DSE B ECONOMIC BOTANY (BOT-G-DSE-B-6-3-TH) THEORETICAL	Economic Botany	1. Origin of cultivated plants: 1.1 Concepts of centres of origin and their importance with reference to Vavilov's work. 2. Rice- origin, morphology and uses. 3. Legumes: General account with special reference to Vigna. 4. Beverages: Tea- morphology, processing and uses. 5. Study of the following economically important plants (Scientific names, families, parts used and importance): 5.1 Cereals- Rice, wheat, 5.2 Pulses- Mong, gram, 5.3 Spices- Ginger, cumin, 5.4 Beverages- Tea, coffee, 5.5 Medicinal plants- Cinchona, neem, Ipecac, Vasaka, 5.6 Oil yielding plants- Mustard, groundnut, coconut, 5.7 Vegetables- Potato, raddish, bottle groud, cabbage, 5.8 Fibre yielding plants- Cotton, jute, 5.9 Timber yielding plants- Teak, Sal 5.10 Fruits- Mango, apple, 5.11 Sugar yielding plant- Sugarcane.	12 12 8 12 16	January 2023 to June 2023
2022-23	PRACTICAL-ECONOMIC BOTANY (BOT-G-DSE-B-6-3-P)	Economic Botany	1.Study of economically important plants (rice/jute/ tea) through herbarium specimens. 2. Study of cultivation practices in field.	Teaching through herbarium, field studies and visit to agricultural lands.video lessons and PPT,Laboratory method	January 2023 to June 2023

LESSON PLAN 2022-2023

SEMESTER 1,SEMESTER 2,SEMESTER 3,SEMESTER 4,SEMESTER 5

NAME :PAYEL CHATTERJEE

DEPARTMENT :BOTANY

SEMESTER 1 HONOURS

YEAR	PAPER	UNIT	TOPIC	NO .0F LECTURES	SESSION
2022-2023	CORE COURSE 2-PLANT PATHOLOGY	THEORY	1. Terms and Definitions: Disease concept, 1.2. Symptoms, 1.3. Etiology & causal complex, 1.4. Primary and secondary inocula, 1.5. Infection, 1.6. Pathogenecity and pathogenesis, 1.7. Necrotroph and Biotroph, 1.8. Koch's Postulates, 1.9. Endemic, Epidemic, Pandemic and Sporadic disease, 1.10. Disease triangle, 1.11. Disease cycle (monocyclic, polycyclic and polyetic). 2. Host – Parasite Interaction: Mechanism of infection (Brief idea about Pre-penetration, Penetration and Post-penetration), Pathotoxin (Definition,criteria and example), 2.3. Defense mechanism with special reference to Phytoalexin, 2.4. Resistance- Systemic acquired and Induced systemic. 3. Plant Disease Management : Quarantine, 3.2. Chemical, 3.3. Biological, 3.4. Integrated. 4. Symptoms , Causal organism, Disease cycle and Control measures of:Late blight of Potato, 4.2. Brown spot of rice, 4.3. Black stem rust of wheat, 4.4. Stem rot of jute.	6 6 8 10	JULY 2022 TO DECEMBER 2022

		PRACTICAL	1. Preparation of fungal media (PDA). 2. Sterilization process. 3. Isolation of pathogen from diseased leaf. 4. Inoculation of fruit and subculturing. 5. Identification : Pathological specimens of Brown spot of rice, Bacterial blight of rice , Loose smut of wheat, Stem rot of jute, Late blight of potato; Slides of uredial, telial, pycnial & aecial stages of Puccinia graminis.		

SEMESTER 2 HONOURS

YEAR	PAPER	UNIT	TOPIC	NO .0F LECTURES	SESSION
2022-2023	CORE COURSE 3 – PLANT ANATOMY	THEORY	1.Cell wall:Ultrastructure & Chemical constituents, 1.2. Plasmodesmata-ultrastructure, 1.3. Concept of Apoplast and Symplast, 1.4. Growth and Thickening of cell wall. 2. Stomata: Types (Metcalfe and Chalk, Stebbins and Khush). 3. Stele: 3.1 Leaf-trace and leaf-gap, 3.2. Stelar types & evolution 6.Mechanical tissues and the Principles governing their distribution in plants. 9.Scope of plant anatomy:	8 4 4 4 4	JANUARY 2023TO JUNE 2023

			application in systematics, forensics and pharmacognosy		

SEMESTER 3 GENERAL

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2022-2023		PRACTICAL	Cell Biology: Staining (Aceto-orcein) and squash preparation of onion root tip: study of mitotic stages. Determination of mitotic index (from onion root tip). 2. Microbiology: Workout gram staining (curd/any natural source) 3.Identification with reasons: Cytological slides of different mitotic and meiotic stages. Different forms of bacteria (Coccus, Bacillus, Spiral)		JULY 2022-DECEMBER 2022

SEMESTER 2 GENERAL

YEAR	PAPER	UNIT	TOPIC	NO .0F LECTURES	SESSION
2021-2022	CORE COURSE 2 PLANT DIVERSITY II	THEORY	Angiosperm Morphology- Inflorescence types with examples, Flower, Fruits and seeds- type and examples.	12	JANUARY 2023-JUNE2023
		PRACTICAL	Dissection, drawing and labelling, description of angiospermic plants and floral parts, floral formula and floral diagram, identification (family) from the following families: Leguminosae (Fabaceae), Malvaceae, Solanaceae, Labiatea (Lamiaceae), Acanthaceae. Identification with reasons: Macroscopic specimens of Selaginella and Pteris, male and female strobilus of Cycas and Pinus, Anatomical slides (stellar types, transfusion tissue, sieve tube, sunken stomata, lenticels),		JANUARY TO JUNE

			inflorescence types. 3. Spot identification of the following Angiospermic plants (scientific names and families): Sida rhombifolia (Malvaceae), Abutilon indicum (Malvaceae), Cassia sophera (Fabaceae), Tephrosia halimtonii (Fabaceae), Crotolaria palida (Fabaceae), Coccinia grandis (Cucurbitaceae), Solanum indicum (Solanaceae), Nicotiana plumbagenifolia (Solanaceae), Leucas aspera (Lamiaceae), Leonurus sibiricus (Lamiaceae), Parthenium hysterophorus (Asteraceae), Tridax procumbense (Asteraceae), Eclipta prostrate (Asteraceae), Eragrostis tenella (Poaceae), Chrysopogon aciculantus		

			(Poaceae), Eleusine indica (Poaceae), Vanda taesellata (Orchidaceae)		

SEMESTER 4 HONOURS

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2022-2023	CC10 GENETICS	THEORY	Introduction: Mendelian genetics and its extension Linkage, Crossing over and Gene Map Complete and incomplete linkage (example), linked gene does not assort independently (example), linkage group, 2.2. Crossing over, crossing over produces recombination (example), detection of crossing over (McClintock's experiment), and 2.3.Molecular mechanism of crossing over (Holliday model), 2.4. Gene mapping with three point test cross, detection of middle gene in	6 12 16	JANUARY2023-JUNE 2023

			three point test cross, calculation of recombination frequencies, 2.5. Co-efficient of coincidence and interference, mapping function, 2.6. Problems on gene mapping, 2.7. Molecular mapping – ISH, FISH (brief idea). Epistasis and Polygenic inheritance in plants Aneuploidy and Polyploidy: Types, examples, meiotic behaviour and importance of: 4.1. Aneuploidy, 4.2. Polyploidy, 4.3. Speciation and evolution through polyploidy. Chromosomal aberration: Types and meiotic behaviour of: 5.1. Deletion, 5.2. Duplication, 5.3. Translocation, and 5.4. Inversion. Mutation- Point mutation- Transition, Transversion and Frame shift mutation, 6.2. Molecular mechanisms (tautomerisation, alkylation,	4 8 6	

			deamination, base analogue incorporation, dimerisation), 6.3. DNA repair (brief idea). 7. Structural organisation of Gene: One Gene–one polypeptide concept, 7.2. Split gene, 7.3. Overlapping gene, 7.4. Repetitive DNA-tandem and interspersed, 7.5. Transposon (Ac-Ds system), 7.6. Homoeotic gene in plants (ABCE Quartet model of flowering).	8 12	
2021-2022	CC10	PRACTICAL	1. Introduction to chromosome preparation: Pre-treatment, Fixation, Staining, Squash and Smear preparation, Preparation of permanent slides. 2. Determination of mitotic index and frequency of different mitotic stages in pre-fixed root tips of Allium cepa. 3. Study of mitotic chromosome: Metaphase chromosome preparation, free hand drawing under high power		JANUARY TO JUNE 2023

			objective, drawing with drawing prism under oil immersion lens, determination of 2n number, and comment on chromosome morphology of the following specimens fro Allium cepa, Aloe vera, Lens esculenta. 4. Study of chromosomal aberrations developed due to exposure to any two pollutants/ pesticides etc. 5. Study of meiotic chromosome: Smear preparation of meiotic cells, identification of different stages and free hand drawing of the following specimens from flower buds: Allium cepa and Setcreasea sp. 6. Identification from permanent slides : Meiosis – (i) normal stages (ii) abnormal stages – laggard, anaphase bridge, ring chromosome (Rhoeo discolor); Mitosis – (i) normal stages, (ii) abnormal stages- early separation, late separation, multipolarity, sticky bridge, laggard, fragmentation, (ii)		

			pollen mitosis.m root tips:		

SEMESTER 5 HONOURS

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2022-2023	CC11 CELL AND MOLECULAR BIOLOGY	THEORY	1. Origin and Evolution of Cells: Evolution of nucleic acid (from PNA to DNA), Concept of RNA world, Ribozymes, First cell, 1.2. Origin of eukaryotic cell (endosymbiotic theory), 1.3. Small RNA- riboswitch, RNA interference, si RNA, mi RNA- brief idea, 1.4.Organellar DNA (cp- and mt- DNA). 2. Nucleus and Chromosome: Nuclear envelope, Nuclear lamina and Nuclear pore complex, 2.2. Nucleolus- ultrastructure and ribosome biogenesis, 2.3. Chromatin ultrastructure and DNA packaging in eukaryotic chromosome, 2.4. Centromere: types, structure and function. 3. Cell cycle and its regulation:	6 6	JULY 2022-DECEMBER 2022

			Kinetochore and spindle apparatus-structural organization and functions, 3.2.Microtubules-structure, organization and function, 3.3. Mechanism of cell cycle control in Yeast (checkpoints and role of MPF), Apoptosis (Brief idea). 1. DNA Replication, Transcription and Translation (Prokaryotes & Eukaryotes): Central Dogma, 1.2. Semiconservative DNA replication – mechanism, enzymes involved in DNA replication- DNA polymerase, DNA gyrase, Helicase, Ligase, primase and other accessory proteins, 1.3. Eukaryotic replication with special reference to replication licensing factor, assembly of new nucleosome, replication at the end chromosome telomere, telomerase concept, 1.4. Fidelity of DNA replication-prokaryote: nucleotide selection, proof reading, mismatch repair; eukaryote: through selection of error prone DNA	6 20	

			polymerase, 1.5.Transcription, 1.6 RNA processing, 1.7. Aminoacylation of tRNA, 1.8. Translation. 2. Gene Regulation: 2.1 Concept of Lac-operon, 2.2. Positive and negative control. **1**Properties-evidences & exceptions, 3.2. Decipherence of codon (Binding technique). 4. Recombinant DNA Technology: Restriction endonuclease, - types and roles, 4.2. Vector (plasmid pBR 322), 4.3. Marker gene, 4.4. Steps of cloning technique, 4.5. PCR and its application, 4.6. Genomic DNA and cDNA library. 5. Development and causes of Cancer (in general and brief), tumor suppressor gene and oncogene.	4 4 10 4	
		PRACTICAL	1. Study of plant cell structure with the help of epidermal peal mount of Onion/Rhoeo/Crinum 2. Measurement of cell size by the technique of micrometry. 3. Counting cells per unit volume with the help of		JULY 2022-DECEMBER 2022

			haemocytometer (Yeast/pollengrains) 4. Cytochemical staining of DNA- Pyronine-methyl green staining. 5. Estimation of DNA content through DPA staining. 6. Estimation of RNA through orcinol method. 7. Study of nucleolus through hematoxylin/ orcin staining and determination of nucleolar frequency.		

LESSON PLAN (SESSION 2020-2021)

NAME: **DR. SUDIP KUMAR SINHA**
DESIGNATION: **ASSISTANT PROFESSOR**
DEPARTMENT: **BOTANY**

SEMESTER I (HONS.)

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2020-21	CC2 (PRACTICAL)	PRACTICAL-MYCOLOGY	General account of the microscope and staining and semi-permanent preparation of slide.		AUGUST TO DECEMBER
			General account of micrometry and standerdization of alloted microscope in both low and high magnification.		
			Work out of the following fungi with reproductive structures (including microscopic measurement of Reproductive structures): Semi-permanent preparation with cotton blue-lactophenol staining of *Rhizopus* (asexual), *Ascobolus* , *Agaricus* .		
			Study from permanent slides: Zygospore of *Rhizopus* , Conidia of *Fusarium* , Conidiophore of *Penicillium.*		
			Morphological study of Fungi (fruit body of *Polyporus* , *Cyathus*), Lichens (fruticose and foliose)		
			One local excursion to be conducted for study and collection of macrofungi.		AUGUST

SEMESTER II (HONS.)

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2020-21	CC4 (THEORY)	BRYOPHYTES	BRYOPHYTES 1. General Account : 1.1. General characteristics and adaptations to land habit, 1.2. Classification (Strotler and Crandle Strotler, 2009) up to class with diagnostic characters and examples.	4	FEBRUARY TO PRE-SUMMER RECCESS
			2. Life History: Gametophyte structure and Reproduction, Development and Structure of sporophyte, Spore dispersal in: 2.1. *Marchantia* , 2.2. *Anthoceros* , 2.3. *Funaria* .	6	
			3. Phylogeny: 3.1. Unifying features of archaegoniates; transition to land habit, 3.2. Origin of Alternation of Generations (Homologous and Antithetic theory), 3.3. Evolution of Sporophytes (Progressive and Regressive concept), 3.4. Origin of Bryophytes.	6	

			4. Importance : Role of bryophytes in: 4.1. Plant succession, 4.2. Pollution Monitoring, 4.3. Economic importance of bryophytes with special reference to *Sphagnum.*	3	
	CC4 (PRACTICALl)		Botanical excursion to familiarize the students with the natural habitats of Archaegoniate is organized.		MARCH/ APRIL

SEMESTER III (HONS.)

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2020-21	CC6 (THEORY)	EMBRYOLOGY	1. Pre-fertilisation changes : 1.1. Microsporogenesis and Microgametogenesis, 1.2. Megasporogenesis and Megagametogenesis (monosporic, bisporic and tetrasporic).	6	JULY TO DECEMBER
			2. Fertilisation: 2.1. Pollen germination, 2.2. Pollen tube- growth, entry into ovule and discharge, 2.3. Double fertilization.	6	
			3. Post-fertilization changes : 3.1. Embryogenesis in Capsella, 3.2. Development of Endosperm (3 types).	4	
			4. Apomixis & Polyembryony: 4.1. Apomixis-Apospory and Apogamy, 4.2.Polyembryony- different types.	4	
	SECA1	APPLIED PHYCOLOGY, MYCOLOGY AND MICROBIOLOGY	APPLIED PHYCOLOGY 1. Algae as food and source of phycocolloid (Agar-agar, Algin, Carrageenan), 2. Diatomite, 3. Algal toxin, 4. Algal Biotechnology – potential of microalgae for SCP, β-carotene, Biodiesel, bioplastics from algae.	8	JULY TO DECEMBER
			APPLIED MYCOLOGY 1. Fungi as food, 2. Cheese and Ethanol-Industrial production (brief outline), 3. Fungal sources and uses of Enzyme (Cellulase), Amino acid (Tryptophan), Vitamin (Riboflavin), Antibiotic (Griseofulvin), Pharmaceuticals (Cyclosporin-A). 4. Aflatoxin	9	

			APPLIED MICROBIOLOGY 1. Industrial Production of Vinegar and Streptomycin (brief outline), 2. Microbial sources and uses of Enzyme (Amylase, Protease), Amino acid (Glutamic acid, Lysine), Polysaccharides (Dextran), 3. Use of microbes as Biofertilizer and Biopesticides, 3.4. Use of microbes in mineral processing.	8	

SEMESTER IV (HONS.)

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2020-21	CC9 (PRACTICAL)	ECONOMIC BOTANY	1. Cereals: Wheat (habit sketch, L.S./T.S. of grain, starch grains, micro-chemical tests); rice (habit sketch, study of paddy and grain, starch grains, micro-chemical tests) 2. Legume: Soybean, ground nut (habit, fruit, seed structure, micro-chemical tests) 3. Source of sugars and starches: Sugarcane (habit sketch; cane juice- micro-chemical tests); potato (habit sketch, tuber morphology, T.S. of tuber to show localization of starch grains, W.M. of starch grains, micro-chemical tests. 4. Tea- tea leaves, tests for tannin 5. Mustard- plant specimen, seeds, tests for fat in crushed seeds 6. Habit sketch of Digitalis, Papaver and Cannabis. 7. Sal, Teak- section of young stem. 8. Jute- specimen, transverse section of stem, tests for lignin on T.S. of stem and study of fibre following maceration technique.		FEBRUARY TO PRE-SUMMER RECCESS

SEMESTER V (HONS.)

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION

2020-21	CC12 (THEORY)	BIOCHEMISTRY	1. Biochemical Foundations : 1.1. Covalent and non-covalent bonds; hydrogen bond; Van der Waal's forces; Definition and explanation of covalent bond and other interactions. Importance of non-covalent interaction in biological system. 1.2. Structure and properties of water; Structure of water molecule, tetrahedron conformation, hydrogen bond formation in water, properties of water. 1.3. pH and buffer (inorganic and organic); Ionization of water, concept of pH, definition of buffer, mechanism of buffer action, types of buffer. 1.4. Handerson-Hasselbalch equation; Deduction and application. 1.5. Isoelectric point; Definition, deduction and application of isoelectric point.	5	JULY TO PRE-PUJA
			2. Molecules of life : 2.1. Nucleic Acids – structure of nucleosides and nucleotides; Brief introduction and history of discovery, structure of nitrogenous bases and sugars, structure of nucleoside and nucleotides. oligo- and poly nucleotides; Application of oligonucleotides, Watson and Crick model of DNA, B & Z form of DNA; Difference between A,B and Z form of DNA. RNA- different forms; Primary, secondary and tertiary structure of mRNA, rRNA and tRNA and their functions. Nucleotide derivatives (ATP, NADP); Structure and function.	4	
			2.2. Proteins – structure and classification of amino acids; General structure and property, classification and essential amino acids. Primary, secondary, tertiary and quaternary structure of proteins; Primary structure of protein, formation of peptide bond, configuration of peptide plane, Ramachandran plot, secondary structure- α-helix, βsheets, loops, super secondary structure- domain and motif, tertiary structure, CATH and SCOP classification, Quaternary structure.	4	
			2.3. Carbohydrates - structure of mono-, di and polysaccharide; Structure, description, types, and example. stereoisomers, enantiomers and epimers; Definition, description and example.	2	

			2.4. Lipids - structure of simple lipid and compound lipid (phospholipids and glycolipids), Types, structure, example, fatty acids- saturated and unsaturated, Types, structure and nomenclature.	2	
			3.Energy flow and enzymology : 3.1. Bioenergetics-Thermodynamic principles; Laws of thermodynamics, concept of entropy and enthalpy, exergonic and endergonic reactions, free energy; Concept of ΔG. Energy rich bonds-phosphoryl group transfer and ATP; Detail description. Redox potentials and Biological redox reactions, Concept of redox potential, half reaction, Nernst equation. 3.2. Enzymes–classification and nomenclature (IUBMB); 6 types and example, Co-factors and co-enzymes; Definitions and examples isozymes; Definition and examples. 3.3. Mechanism of enzyme action; Two main types of theory regarding mechanism. Enzyme inhibition; Types of enzyme inhibition with example. 3.4. Enzyme kinetics (Michaelis-Menten equation) and simple problems. Basic idea about chemical kinetics, Derivation of Michaelis-Menten equation, Modification.	5	POST-PUJA
			4.1. Membrane chemistry, Detail structure of the membrane components. 4.2. Membrane transport (uniport, symport, antiport); Diffusion, facilitated diffusion, channels, active transport. mechanism of ion uptake; Brief mechanism. 4.3. Signal transduction pathway and second messenger concept - G-protein and Ca^{2+} as messenger; Detail pathway & G-protein & calcium-calmodulin system. 5. Phosphorylation: ATP Synthesis-Chemiosmotic model, Detail mechanism. Oxidative and Photophosphorylation-Mechanism and differences.	6	

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2020-21	CC12 (PRACTICAL)	BIOCHEMISTRY QUANTITATIVE	Quantitative : 1. Estimation of amino-nitrogen by formol titration method (glycine). 2. Estimation of glucose by Benedict's quantitative reagent. 3. Estimation of titratable acidity from lemon. 4. 5. Estimation of catalase activity in plant samples and effect of substrate, enzyme concentration and pH on enzyme activity. 5. Estimation of urease activity in plant samples. 6. Colorimetric estimation of protein by Folin phenol reagent.		AUGUST TO DECEMBER
		BIOCHEMISTRY QUALITATIVE	Qualitative : 1. Detection of organic acids: citric, tartaric, oxalic and malic from laboratory samples. 2. Detection of carbohydrate and protein from plant samples. 3. Detection of the nature of carbohydrate–glucose, fructose, sucrose and starch from laboratory sample. 4. Detection of Ca, Mg, Fe, S from plant ash sample.		

SEMESTER I GENERAL

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2020-21	CC1 (THEORY)	BRYOPHYTES	5.1 Unifying features of archaegoniates and transition to land habit, 5.2 Amphibian nature of bryophytes, 5.3 Diagnostic characters and examples of Hepaticopsida, Anthocerotopsida and Bryopsida (Proskauer 1957), 5.4 Life histories of *Marchantia* and *Funaria* , 5.5 Ecological and economic importance.	12	AUGUST TO PRE-PUJA
		ANATOMY	6. Anatomy 6.1. Stomata - Types (Metcalfe & Chalk), 6.2. Anatomy of root, stem and leaf of monocots and dicots, 6.3. Stelar types and evolution, 6.4. Secondary growth – normal in dicot stem and anomaly in stem of *Tecoma* & *Dracaena* .	10	POST PUJA TO WINTER VACATION

	CC1 (PRACTICAL)		1. Work out: Microscopic preparation, drawing and labeling of *Chlamydomonas* , *Chara* , *Ectocarpus* , *Rhizopus* and *Ascobolus.* 2. Anatomical studies (following double staining method) of: 2a. Stem- *Cucurbita* , sunflower and maize. 2b. Root- *Colocassia* , gram and orchid. 2c. Leaf- *Nerium* 3. Identification with reasons: 3a. Cryptogamic specimens (macroscopic/microscopic as prescribed in the theoretical syllabus. 3b. Pathological specimens (herbarium sheets) of Late blight of potato, Brown spot of rice and stem rot of jute.		AUGUST TO WINTER VACATION

SEMESTER VI (HONS.)

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
			1. Plant-water relations: 1.1 Concept of water potential, components of water potential in plant system, 1.2 Soil-plant-Atmosphere continuum concept, Absorption of water in land plants, Cohesion and adhesion, transpiration pull theory, Cavitation in xylem and embolism, Definition, types, mechanism of formation and removal. 1.3 Stomatal physiology-mechanism of opening and closing, Role of carbon di oxide, potassium ion, abscisic acid and blue light in stomatal movement, Detail mechanism, Antitranspirants, types and example.	5	
			2. Mineral nutrition: essential and beneficial elements, macro- and micronutrients, methods of study and use of nutrient solutions, criteria for essentiality, mineral deficiency symptoms, roles of essential elements, chelating agents.	2	
			3. Organic Translocation: 3.1. Phloem sap, P-protein, 3.2. Phloem loading and unloading, 3.3. Mass-flow (pressure flow) hypothesis and its critical evaluation.	4	

2020-21	CC13 (THEORY)	PLANT PHYSIOLOGY	4. Plant Growth Regulators : 4.1. Physiological roles of Auxin, Gibberellin, Cytokinin, Abscisic acid, Ethylene, Detail physiological roles. 4.2. Chemical nature –IAA, GA3, Kinetin, Chemical structure, synthetic auxin. 4.3. Biosynthesis and bioassay of IAA, Tryptophan dependent and independent pathway of auxin biosynthesis. 4.4 Mode of action of IAA, Acid growth hypothesis, auxin signaling. 4.5. Brassinosteroids and Polyamines as PGRs (brief idea).	10	FEBRUARY TO PRE-SUMMER RECESS
			5. Photomorphogenesis: 5.1. Concept of photomorphogenesis, 5.2. Photoperiodism and plant types, 5.3. Perception of photoperiodic stimulus, 5.4. Critical day length, concept of light monitoring, 5.5. Phytochrome, cryptochrome and phototropins- chemical nature and role in photomorphogenesis, 5.6. Role of GA in flowering, 5.7. Vernalisation – role of low temperature in flowering, 5.8. Concept of biological clock and biorhythm.	6	
			6. Seed dormancy: 6.1. Types, Causes and Methods of breaking seed dormancy, 6.2. Biochemistry of seed germination.	4	
			7. Physiology of Senescence and Ageing.	2	
YEAR	**PAPER**	**UNIT**	**TOPIC**	**NO. OF LECTURES**	**SESSION**
2020-21	CC13 (PRACTICAL)	PLANT PHYSIOLOGY	1. Determination of loss of water per stoma per hour. 2. Relationship between transpiration and evaporation. 3. Measurement of osmotic pressure of storage tissue by weighing method. 4. Measurement of osmotic pressure of *Rhoeo* leaf by plasmolytic method. 5. Effect of temperature on absorption of water by storage tissue and determination of Q_{10}. 6. Rate of imbibition of water by starchy, proteinaceous and fatty seeds and effect of seed coat. 7. To study the phenomenon of seed germination (effect of light). 8. To study the induction of amylase activity in germinating grains. 9. To study the effect of different concentrations of IAA on *Avena* coleopotile elongation (IAA bioassay)		FEBRUARY TO PRE-SUMMER RECESS

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2020-21	CC14 (THEORY)	PLANT METABOLISM	1. Concept of metabolism: Introduction, Anabolic and catabolic metabolic pathways, regulation of metabolism, role of regulatory enzymes (allosteric, covalent modulation and isozymes)	4	FEBRUARY TO PRE-SUMMER RECESS
			2. Photosynthesis : 2.1 Chemical structure of chlorophyll a and b, absorption and action spectra, biological significance of carotenoid pigments, Two main functions of carotenoids. 2.2 Red drop and Emerson effect, Concept, Components of photosystems (LHC), Description, Photochemical reaction centre, Description, Cyclic and noncyclic electron transport, Differences and description, Water splitting mechanism, Detail mechanism. 2.3 Calvin cycle–Biochemical reactions & stoichiometry, reactions with structure. 2.4 HSK Pathway– three variants of the pathway, Kranz anatomy, pathway with structure. 2.5. Photosynthetic efficiency of C3 and C4 plants and crop productivity, Comparison. 2.6. Photorespiration – mechanism and significance, pathway with structure and subcellular localization. 2.7 Crassulacean acid metabolism –mechanism and ecological significance. Pathway with structure, example, CAM idling.	10	
			3. Respiration : 3.1 EMP pathway, regulation and its anabolic role, Pathway with structure. 3.2 Conversion of Pyruvic acid to AcetylCoA, PDH enzyme complex composition and reaction. 3.3 TCA-cycle and its amphibolic role, 3.4. Oxidative pentose phosphate pathway and its significance, pathway with structure. 3.5 Mitochondrial electron transport system, Components uncouplers; examples and functions. 3.6 Oxidation of cytosolic NADH + H^+ Three different modes. 3.7 Stoichiometry of glucose oxidation (aerobic).	8	

			4. Nitrogen Metabolism : 4.1. Assimilation of nitrate by plants, Biochemical reaction with structure. 4.2. Biochemistry of dinitrogen fixation in Rhizobium, Process of nodule formation, leghemoglobin, reaction of dinitrogen fixation. 4.3. General principle of amino acid biosynthesis (including GS and GOGAT enzyme system), Reaction with structure.	7	
			5. Lipid metabolism: 5.1. synthesis and breakdown of triglycerides, ß-oxidation, glyoxalate cycle, gluconeogenesis and its role in mobilization of the lipids during seed germinbations, α-oxidation.	6	
			6. Mechanism of signal transduction: receptor-ligand interactions, second messenger concept, calcium-calmodilin, G protein, MAP-kinase cascade.	6	
YEAR	**PAPER**	**UNIT**	**TOPIC**	**NO. OF LECTURES**	**SESSION**
2020-21	CC14 (PRACTICAL)	PLANT METABOLISM	1. A basic idea of chromatography: Principle, paper chromatography and column chromatography; demonstration of column chromatography. 2. Separation of plastidial pigments by solvent and paper chromatography. 3. Estimation of total chlorophyll content from different chronologically aged leaves (young, mature and senescence) by Arnon method. 4. Effect of HCO_3^- concentration on oxygen evolution during photosynthesis in an aquatic plant and to find out the optimum and toxic concentration (either by volume measurement or bubble counting). 5. Measurement of oxygen uptake by respiring tissue (per g/hr.) 6. Determination of the RQ of germinating seeds. 7. Test of seed viability by TTC method.		FEBRUARY TO PRE-SUMMER RECESS

SEMESTER I GENERAL

YEAR	**PAPER**	**UNIT**	**TOPIC**	**NO. OF LECTURES**	**SESSION**
	CC1 (THEORY)	BRYOPHYTES	5.1 Unifying features of archaegoniates and transition to land habit, 5.2 Amphibian nature of bryophytes, 5.3 Diagnostic characters and examples of Hepaticopsida, Anthocerotopsida and Bryopsida (Proskauer 1957), 5.4 Life histories of *Marchantia* and *Funaria* , 5.5 Ecological and economic importance.	12	AUGUST TO PRE-PUJA

2020-21		ANATOMY	6. Anatomy 6.1. Stomata - Types (Metcalfe & Chalk), 6.2. Anatomy of root, stem and leaf of monocots and dicots, 6.3. Stelar types and evolution, 6.4. Secondary growth – normal in dicot stem and anomaly in stem of *Tecoma* & *Dracaena* .	10	POST PUJA TO WINTER VACATION
	CC1 (PRACTICAL)		1. Work out: Microscopic preparation, drawing and labeling of *Chlamydomonas* , *Chara* , *Ectocarpus* , *Rhizopus* and *Ascobolus.* 2. Anatomical studies (following double staining method) of: 2a. Stem- *Cucurbita* , sunflower and maize. 2b. Root- *Colocassia* , gram and orchid. 2c. Leaf- *Nerium* 3. Identification with reasons: 3a. Cryptogamic specimens (macroscopic/microscopic as prescribed in the theoretical syllabus. 3b. Pathological specimens (herbarium sheets) of Late blight of potato, Brown spot of rice and stem rot of jute.		AUGUST TO WINTER VACATION

SEMESTER IV GENERAL

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2020-21	CC4 (THEORY)	PLANT PHYSIOLOGY AND METABOLISM	1. Proteins 1.1 Primary, secondary and tertiary structure, 1.2 Nucleic acid- DNA structure, RNA types, 1.3 Enzyme- Classifications with examples (IUBMB), Mechanism of action.	5	
			2. Transport in plants 2.1 Ascent of sap and Xylem cavitation , 2.2 Phloem transport and source-sink relation.	3	
			3. Transpiration 3.1 Mechanism of stomatal movement, significance.	2	
			4. Photosynthesis 4.1 Pigments, Action spectra and Enhancement effect, 4.2 Electron transport system and Photophosphorylation, 4.3 C3 and C4 photosynthesis, CAM-Reaction and Significance.	5	

SEMESTER V GENERAL

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2020-21	DSE-A (PRACTICAL)	PHYTOCHEMISTRY AND MEDICINAL BOTANY	1. Preparations of solution and buffers 2. Acquaintance with laboratory instruments- Autoclave, Incubator, Clinical centrifuge, Analytical balance, pH meter, Colorimeter, Water bath, Distillation plant, Laminar air flow. 3. Qualitative test for proteins and carbohydrates, reducing and non reducing sugar (glucose, fructose and sucrose) 4. Tests (chemical) for tannin and alkaloid.		AUGUST TO DECEMBER
			Identification of medicinal plants		
			Field study (local) and listing of medicinal plants.		