				AP- Dr.APARNA	PAL
		LESSON PLAN			CUMAR SINHA
		DEPARTMENT OF BOTANT		SB-Smt SHARM	IISTHA BASU
				RY-Dr RAJENDR	RA YONZONE
				AD-Smt ADITI D	EY
		2020-2021		PC-Smt PAYEL	CHATTERJEE
SEMESTER	PROGRAMME	ME COURSE AND NAME	TOPIC	TEACHER	NO. OF HOURS
		OF THE PAPER			
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
				58	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
				AP	30
	General	BOT-G-CC-1-1-TH	PLANT DIVERSITY I (PHYCOLOGY, MYCOLOGY, PHYTOPATHOLOGY, BRYOPHYTES AND ANATOMY)	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
				AP	24
2	Honours	Core Course 3- BOT-A-CC-2-3-TH	Plant anatomy	PC	36
		Core Course 3- BOT-A-CC-2-3-P	Plant anatomy Practical	AP	60
				AD	22
		Core Course 4- BOT-A-CC-2-4-TH	Archegoniate	SKS	22
		Core Course 4- BOT-A-CC-2-4-P	Archegoniate practical	AD	60
	0			AD	32
	General	B01-G-CC-2-2-1H	PLANT DIVERSITT II (PTERIDOPHTTES, GTMNOSPERMS, PALAEOBOTANT, MORPHOLOGT AND TAXONOMT)	RY	14
		BOT-G-CC-2-2-P	PLANT DIVERSITY II (PTERIDOPHYTES, GYMNOSPERMS, PALAEOBOTANY, MORPHOLOGY AND TAXONOMY) practical	RY	60
				AD	42
3	Honours	Core Course 5- BOT-A-CC-3-5-TH	Palaeobotany and palynology	AD	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
			Plant sustamation	AD	44
		Course /- BOT-A-CC-3-/-IH	Plant systemaucs	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
				AP	22
	General	BOT-G-CC-3-3-TH	CELL BIOLOGY, GENETICS AND MICROBIOLOGY	SB	16
				AD	22
		BOI-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
	Henewer		Direct Community Functions and Functions	40	20
4	nonours	Gore Course 8- BOT-A-CC-4-8-TH	Plant Geography, Ecology and Evolution	SB	30
		Core Course 8- BOT-A-CC-4-8-P	Plant Geography, Ecology and Evolution Practical	AP	30
				SB	30
			Economia Patanu	40	27
		CORE COURSE- 9 BOT-A-CC-4-9-TH	Economic Botany	AD 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 BUT-A-CC-4-10-P	Geneucs	PU	60
		SEC B-(BOT-A-SEC-B-4-3	PLANT BREEDING	RY	30
	Ganaral			BY	60
	General	CORE COURSE 4 BOT-G-CC-4-4-IM	PLANT PHYSIOLOGY AND METABOLISM PLANT PHYSIOLOGY AND METABOLISM -PRACTICAL	SB	24
				AD	36
			PLANT BIOTECHNOLOGY	SB	30
		SEC B BOT-G-SEC-B-4/6-3			
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-(BOI-A-DSE-A-5-2-P	INDUSTRIAL AND ENVIRONMENTAL MICROBIOLOGY -PRACTICAL	58	60
		DSE B./ROT.A.DSE.B.5.6.TH)	HOPTICHITHRAL PRACTICES AND POST, HARVEST TECHNOLOGY	PV	60
		DOL D-001-A-DOL-D-0-0-111)		- Ki	
		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
				0140	
6	Honours	CORE COURSE-13 BOT-A-CC-6-13-TH	PLANT PHYSIOLOGY	SKS	60
		CORE COURSE 13 BOT A CC 6-13-P		SKS	60
		0012 000102-10 2014-00-0-104		010	
		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
				57	
	GENERAL			RY SP	60
	GENERAL	DOE D-DOI-O-DOE-D-0-3-IN	ECONOMIC BUIANT	38	00
		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	ΤΟΡΙϹ	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, 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.	S CHALK & TALK, CHARTS, PPT, GOOGLE CLASSROOM. 5 5 6 10	JULY'22 TO DECEMBER'22

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

SEMESTER II HONOURS

YEAR	PAPER	UNIT	ΤΟΡΙϹ	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	BRYOPHYTES,			JANUARY
PRACTICAL	PTERIDOPHYTES,	BRYOPHYTES	6	'23 TO
	GYMNOSPERMS	the plant body: Genera as		JUNE'23
		mentioned in theoretical		
		syllabus and Riccia,	LABORATORY	
		Porella.	METHODS.	
		slides : Riccia (V.S. of		
		thallus with sporophyte),		
		Marchantia (L.S. through		
		gemma cup,		
		archegoniophore).		
		Anthoceros (L.S. of		
		sporophyte) , Funaria		
		(L.S. of capsule).	10	
		1. Morphological study of	18	
		the sporophytic plant		
		body: Genera as		
		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),		
		spike), Dryopteris		
		(gametophyte), Marsilea		
		(L.S. of sporocarp).		
		1. Morphological study:	6	
		<i>Cycas</i> (microsporophyll		
		and megasporophyll),		
		Pinus (female and male		
		Gnetum (female and male		
		cone).		
		2. Study from permanent		
		ovule), Pinus (L.S. of		
		male and female cone),		
		Ginkgo		
		(L.S. of female strobilus),		
		cone and ovule).		

SEMESTER III HONOURS

YEAR	PAPER	UNIT	ΤΟΡΙϹ	NO. OF	SESSION
2022			1 Goological timo scalo	LECTURES	
2022-	AND	PALAEOBOTANY	with dominant plant	4	TO
	PALYNOLOGY		groups through ages.		DECEMBER
			2.1Types: Body fossil	12	'22
	BOT-A-CC-3-5-TH		(Micro- and		
	THEORETICAL		Megafossils), Trace	CHALK & TALK,	
			Index fossil, 2.2.	PPT, GOOGLE	
			Different modes of	CLASSROUM	
			1975), 2.3. Conditions		
			favouring fossilization,		
			2.4. Nomenclature and Reconstruction, 2.5.		
			Principle of fossil		
			dating (a brief idea),		
			fossil study.		
			3. Fossil Pteridophytes:	10	
			Geological	10	
			distribution and		
			Evolutionary significance of 3.1.		
			Rhynia, 3.2.		
			Lepidodendron		
			Calamites		
			(Reconstructed).		
			4. Fossil gymnosperms:	10	
			Structural features and Geological	10	
			distribution of		
			reconstructed genera:		
			Williamsonia,		
			4.3.Cordaites.	<i>.</i>	
			5. Indian Gondwana System – Three-fold	6	
			division with major		
			megafossil		
			6.Palynology:	10	
		PALYNOLOGY	Spore and Pollen, 6.2.		
			6.3. NPC classification		
			(Erdtman). 6.4. Pollen		
			wall-Sporopollenin, Stratification and		
			Ornamentation		
			(sculpturing). 7.Applied Palynology:		
			Basic concepts of: 7.1.	8	
			Palaeopalynology, 7.2.		
			, croparynology, 7.5.		

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

SEMESTER IV HONOURS

YEAR	PAPER	UNIT	ΤΟΡΙϹ	NO. OF	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 <i>Cinchona, Digitalis, Papavar, Cannabis</i> 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, and Phaeophyceae, 2.2 Classification: Criteria and system of Fritsch, 2.3. Life histories of <i>Chlamydomonas, Chara</i> and <i>Ectocarpus,</i> 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	ΤΟΡΙϹ	NO. OF	SESSION
2022- 2023	PLANT DIVERSITY II BOT-G-CC-2-2-TH THEORETICAL	PTERIDOPHYTES	1. Pteridophytes 1.1Diagnostic characters and examples of Psilophyta, Lycophyta, Sphenophyta & Filicophyta(Gifford & Foster 1989). 1.2 Life histories of <i>Selaginella</i> and <i>Pteris</i> , 1.3 Economic importance	12	JANUARY '23 TO JUNE'23
		GYMNOSPERMS	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 <i>Cycas</i> and <i>Pinus</i> , 2.4 <i>Williamsonia</i> (reconstructed), 2.5 Economic importance of Gymnosperms.	12 CHALK & TALK, CHARTS, PPT.	
		PALAEOBOTANY	3. Paleobotany 3.1Fossil, fossilization process and factors of	7	

fossilization, 3.2	
study. 3.3Geological	

SEMESTER III GENERAL

YEAR	PAPER	UNIT	ΤΟΡΙϹ	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	ΤΟΡΙϹ	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

VEAD	DADED		TODIC		SECCION
TEAR	PAPER	UNIT	TOPIC	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.
			 Bacteria: Discovery, .2.2. Distinguishing features of Archaea and Bacteria, Characteristics of some major groups: Proteobacteria (Enterobacteria), 	20	July22 to December 22
			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		PPT, video lessons , Google classroom, chalk and talk method.
			Gram staining from bacterial culture. 4. Microscopic examination of bacteria from natural habitat (curd) by simple	3	Laboratory method

Semester 2 HONOURS

Year	Paper	Unit	Торіс	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.	4	January 2023to June. 2023 PPT, video
			Sporophyte structure, Reproduction and Structure of gametophyte in 2.1. Psilotum, 2.2. Selaginella, 2.3. Equisetum, 2.4. Pteris.	8	lessons,Google classroom, chalk and talk method
			3. Telome concept and its significance in the origin of different groups of Pteridophytes.	8	
			4. Heterospory and Origin of Seed habit.	4	
			5. Economic importance as food, medicine and Agriculture.	2	

Lesson plan semester3(Hons)

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

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	 Phytogeographical regions: Phytogeographical regions of India (Chatterjee 1960); Dominant flora of Eastern Himalaya, Western Himalaya and Sunderban. Endemism: Endemic types and Factors; 2.2. Age & Area hypothesis and Epibiotic theory; S. Endemism in Indian flora 	4 6	January 2023 to June 2023 PPT, video lessons,Google classroom, chalk and talk method.

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;	PPT, video lessons , online classes, Google classroom. 6	July 2022 to December 2022
			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	12	PPT, video lessons,Google
			fluidized bed bioreactors and air- lift Fermenter. 3. Microbial production of industrial products: microorganisms involved, media, fermentation conditions, down stream		classroom, chalk and talk method.
			processing and uses; filtration, centrifugation, cell disruption, solvent extraction, precipitation and ultrafiltration, lyophilisation, spray drying, hands on microbial fermentations for the production and	12	
			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 acvlase). 	8	
			5. Microbes and quality of environment: distribution of microbes in air, isolation of microorganisms from soil, air and water.	8	
			6. Microbial flora of water: water pollution, role of microbes in sewage and domestic waste water treatment systems.	8	

		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.	 Principals and functioning of instruments in microbiology laboratory Hands on sterilization techniques and preparation of culture media. 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	SESSION
				LECTURES	
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(Ger	neral)		
YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	Session
	PLANT PHYSIOLOGY AND METABOLISM (BOT-G-CC-4-4-P)	Plant Physiology	 i) Experiment on Plasmolysis. ii) Measurement of leaf area (graphical method) and determination of transpiration rate per unit 	7	January 2023 to June 2023
2022-	Practical		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.		
23		Plant biotechnology	 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.
	SEC B PLANT BIOTECHNOLOGY (BOT-G-SEC-B-4/6-		 Micropropagation- 2.1 Somatic embryogenesis and artificial seed. 	4	
	3)	JT-G-SEC-D-4/0-	 Protoplast culture and its application. 	6	
	Theory		4. Recombinant DNA technology- 4.1 Recombinant DNA, 4.2 Restriction enzymes, 4.3 Plasmids as vectors.	8	
			 Gene cloning (basic steps). 	4	
			 Achievements in crop biotechnology- 6.1 Pest resistant plant (Bt cotton), 6.2 Transgenic crops with improved quality (flavr tomato and golden rice) 	4	

YEAR	PAPER	UNIT	TOPIC	NO. OF	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.	12	January 2023 to June 2023
			 2. Rice- origin, morphology and uses. 3. Legumes: General 	12	
			account with special reference to Vigna.	8	
			 4. Beverages: Tea- morphology, processing and uses. 5. Study of the 	12	
			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.	16	
2022-23	PRACTICAL- ECONOMIC BOTANY (BOT- G-DSE-B-6-3- P)	Economic Botany	 Study of economically important plants (rice/jute/ tea) through herbarium specimens. 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

Semester 6(General)

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	SESSION
				LECTURES	
2022-	CORE	THEORY	1. Terms	6	JULY 2022
2023			and Definitions: Disease	-	TO
2025			concept, 1.2. Symptoms,		
	PLANT		1.3. Etiology & causal		DECEIVIBER
	PATHOLOGY		complex, 1.4. Primary		2022
			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	6	
			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	8	
			Quarantine, 3.2.		
			2.4 Integrated		
			3.4. IIILEgraleu.	10	
			4. Symptoms ,	10	
			cycle and Control		
			measures of late hlight		
			of Potato 12 Brown		
			snot of rice 13 Rlack		
			stem rust of wheat AA		
			Stem rot of jute		
			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.	10	

	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	SESSION
				LECTURES	
2022-2023	CORE COURSE	THEORY	1.Cell	8	JANUARY
	3 – PLANT		wall:Ultrastructure		2023TO JUNE
	ANATOMY		& Chemical		2023
			constituents, 1.2.		
			Plasmodesmata-		
			ultrastructure, 1.3.		
			Concept of		
			Apoplast and		
			Symplast, 1.4.		
			Growth and		
			Thickening of cell		
			wall.		
			2. Stomata: Types	4	
			(Metcalfe and		
			Chalk, Stebbins		
			and Khush).		
			3. Stele:	4	
			3.1 Leaf-trace and		
			leaf-gap, 3.2.		
			Stelar types &		
			evolution		
			6.Mechanical	4	
			tissues and the		
			Principles		
			governing their		
			distribution in		
			plants.		
			9.Scope of plant	4	
			anatomy:		

	applicat	tion in	
	systema	atics,	
	forensio	cs and	
	pharma	cognosy	

SEMESTER 3 GENERAL

YEAR	PAPER	UNIT	ΤΟΡΙϹ	NO. OF	SESSION
				LECTURES	
2022-2023		PRACTICAL	Cell Biology:		JULY 2022-
			Staining		DECEMBER
			(Aceto-orcein)		2022
			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)		

SEMESTER 2 GENERAL

LECTURES 2021-2022 CORE COURSE THEORY Angiosperm 12 JANU/ 2023-	ARY -
2021-2022 CORE COURSE THEORY Angiosperm 12 JANU/ 2 Operation 2 Operation 2023-	ARY -
PLANT Inflorescence JUNE2 DIVERSITY II types with examples, Flower, Fruits and seeds- type and examples.	2023
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. JANU, JUNE 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, JANU, JUNE	ARY TO

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

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

SEMESTER 4 HONOURS

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

	three point test		
	cross, calculation		
	of recombination		
	frequencies, 2.5.		
	Co-efficient of		
	coincidence and		
	interference,		
	mapping function.		
	2.6. Problems on		
	gene manning		
	2.7 Molecular		
	manning - ISH		
	EISH (brief idea)		
	i isi (bilei idea).		
	Epistacis and		
	Lpistasis anu Dolygonia		
	inhoritance in		
	inneritance in		
	plants		
	Aneuploidy and		
	Polyploidy: Types,		
	examples, meiotic		
	behaviour and	4	
	importance of:		
	4.1. Aneuploidy,		
	4.2. Polyploidy,	0	
	4.3. Speciation and	8	
	evolution through		
	polyploidy.		
	Chromosomal		
	aberration: Types		
	and meiotic		
	behaviour of: 5.1.		
	Deletion, 5.2.		
	Duplication, 5.3.		
	Translocation, and		
	5.4. Inversion.		
	IVIUTATION-	6	
	Point mutation-		
	Transversion and		
	Frame chift		
	mutation 6.7		
	Molecular		
	mechanisms		
	(tautomerisation.		
	alkylation		

			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	 Introduction to chromosome preparation: Pre- treatment, Fixation, Staining, Squash and Smear preparation, Preparation of permanent slides. Determinati on of mitotic index and frequency of different mitotic stages in pre-fixed root tips of Allium cepa. 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 cena. Aloe	
	vera lens	
	esculenta	
	4 Study of	
	chromosomal	
	aberrations	
	developed due to	
	exposure to any two	
	nollutante/	
	politicidas etc	
	5 Study of	
	5. Study Of	
	chromosomo, Smoor	
	chromosome: Smear	
	preparation of	
	melotic cells,	
	identification of	
	different stages and	
	Tree hand drawing	
	of the following	
	specimens from	
	flower buds: Allium	
	cepa and Setcreasea	
	sp.	
	6.	
	Identificatio	
	n 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

2022-2023 CC11 CELL THEORY 1. Origin and JULY 2022 AND Evolution of Collect DECEMBER	2022-2023 CC11 CELL AND MOLECULAR BIOLOGY THEORY 1. Origin and Evolution of Cells: Evolution of nucleic acid (from 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. 6 Nucleolus- ultrastructure and ribosome biogenesis, 2.3. Chromatin ultrastructure and DNA packaging in eukaryotic chromosome; 2.4. Centromere: types,
MOLECULAR Evolution of Cens. DECEMBEN BIOLOGY nucleic acid (from 6 2022 BIOLOGY nucleic acid (from 6 2022 BIOLOGY Navord, Ribozymes, 5 First cell, 1.2. Origin of eukaryotic cell 6 (endosymbiotic theory), 1.3. Small 7 RNA- riboswitch, RNA interference, si RNA, mi RNA- brief idea, 1.4.Organellar DNA (cp- and mt- DNA). 2. 2. Nucleus and Chromosome: Nuclear Nuclear envelope, Nuclear 1amina and Nuclear 6 pore complex, 2.2. 6 Nucleolus- 0 ultrastructure and ribosome biogenesis, 2.3. Chromatin 0 DNA packaging in eukaryotic chromosome, 2.4. Centromere: types, structure and functional functional functional	structure and function. 3. Cell cycle and its regulation:

and spindle 6 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): Central Dogma, 1.2. Semiconservative DNA replication – mechanism, enzymes involved in DNA 20 replication mechanism, enzymes involved in DNA polymerae, DNA gyrase, Helicase, Ligase, primase and other accessory proteins, 1.3. Eukaryotic 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 profe bNA		Kinetochore		
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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		nroteins		
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chromosome telomere, telomerase concept, 1.4. Fidelity of DNA replication- prokaryote: nucleotide selection, proof reading, mismatch repair; eukaryote: through selection of error prone DNA		renlication at the end		
telomere, telomerase concept, 1.4. Fidelity of DNA replication- prokaryote: nucleotide selection, proof reading, mismatch repair; eukaryote: through selection of error prone DNA		chromosome		
concept, 1.4. Fidelity of DNA replication- prokaryote: nucleotide selection, proof reading, mismatch repair; eukaryote: through selection of error prone DNA		telomere, telomerase		
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prokaryote: nucleotide selection, proof reading, mismatch repair; eukaryote: through selection of error prone DNA		of DNA replication-		
nucleotide selection, proof reading, mismatch repair; eukaryote: through selection of error prone DNA		prokarvote:		
proof reading, mismatch repair; eukaryote: through selection of error prone DNA		nucleotide selection		
mismatch repair; eukaryote: through selection of error prone DNA		proof reading		
eukaryote: through selection of error prone DNA		mismatch repair.		
selection of error prone DNA		eukarvote: through		
prone DNA		selection of error		
		prone DNA		

		polymerase, 1.5.Transcription, 1.6 RNA processing, 1.7. Aminoacylation of tRNA, 1.8. Translation. 2. Gene Regulation: 2.1 Concept of Lac-	4	
		operon, 2.2. Positive and negative control. 1 Properties- evidences & exceptions, 3.2.	4	
		Decipherence of codon (Binding technique). 4. Recombinant DNA Technology:	10	
		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	
	PRACTICAL	 Study of plant cell structure with the help of epidermal peal mount of Onion/Rhoeo/Crinum Measuremen t of cell size by the 		JULY 2022- DECEMBER 2022
		technique of micrometry. 3. Counting cells per unit volume with the help of		

	haemocytometer	
	(Yeast/pollengrains)	
	4. Cytochemical	
	staining of DNA-	
	Pvronine-methyl	
	green staining.	
	5. Estimation of	
	DNA content through	
	DPA staining	
	6 Estimation of	
	DNA through arcinol	
	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	ТОРІС	NO. OF LECTURES	SESSION	
			General account of the microscope and staining and semi-permanent preparation of slide.			
2020-21			General account of micrometry and standerdization of alloted microscope in both low and high magnification.			
	CC2 (PRACTICAL)	CC2 PRACTICAL- PRACTICAL) MYCOLOGY	Work out of the following fungi with reproductive structures (including microscopic measurement of Reproductive structures): Semi-permanent preparation with cotton blue-lactophenol staining of <i>Rhizopus</i> (asexual), <i>Ascobolus</i> , <i>Agaricus</i> .		AUGUST TO DECEMBER	
			Study from permanent slides: Zygospore of <i>Rhizopus</i> , Conidia of <i>Fusarium</i> , Conidiophore of <i>Penicillium.</i> Morphological study of Fungi (fruit body of <i>Polyporus</i> , <i>Cyathus</i>), Lichens (fruticose and foliose)	Study from permanent slides: Zygospore of <i>Rhizopus</i> , Conidia of <i>Fusarium</i> , Conidiophore of <i>Penicillium.</i>		
				Morphological study of Fungi (fruit body of <i>Polyporus</i> , <i>Cyathus</i>), Lichens (fruticose and foliose)		
			One local excursion to be conducted for study and collection of macrofungi.		AUGUST	

SEMESTER II (HONS.)

YEAR	PAPER	UNIT	ТОРІС	NO. OF LECTURES	SESSION
			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	
		PRVOBUVES	 Life History: Gametophyte structure and Reproduction, Development and Structure of sporophyte, Spore dispersal in: 2.1. Marchantia , 2.2. Anthoceros , 2.3. Funaria . 	6	FEBRUARY TO PRE-
2020-21		DRIOPHILES	 Phylogeny: Unifying features of archaegoniates; transition to land habit, Origin of Alternation of Generations (Homologous and Antithetic theory), Evolution of Sporophytes (Progressive and Regressive concept), Origin of Bryophytes. 	6	SUMMER RECCESS

	 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 (PRACTICALI)	Botanical excursion to familiarize the students with the natural habitats of Archaegoniate is organized.		MARCH/ APRIL

SEMESTER III (HONS.)

YEAR	PAPER	UNIT	ТОРІС	NO. OF LECTURES	SESSION
			 Pre-fertilisation changes : 1.1. Microsporogenesis and Microgametogenesis, 1.2. Megasporogenesis and Megagametogenesis (monosporic, bisporic and tetrasporic). 	6	
	CC6 (THEORY)	EMBRYOLOGY	 Pertilisation: Pollen germination, Pollen tube- growth, entry into ovule and discharge, Double fertilization. 	6	JULY TO DECEMBER
			 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	
2020-21			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	
	SECA1	APPLIED PHYCOLOGY, MYCOLOGY AND MICROBIOLOGY	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	JULY TO DECEMBER

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	
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SEMESTER IV (HONS.)

YEAR	PAPER	UNIT	ΤΟΡΙϹ	NO. OF LECTURES	SESSION
2020-21	CC9 (PRACTICAL)	ECONOMIC BOTANY	 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) Legume: Soybean, ground nut (habit, fruit, seed structure, micro-chemical tests) 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. Tea- tea leaves, tests for tannin Mustard- plant specimen, seeds, tests for fat in crushed seeds Habit sketch of Digitalis, Papaver and Cannabis. Sal, Teak- section of young stem. 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	ΤΟΡΙϹ	NO. OF LECTURES	SESSION
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			 Biochemical Foundations : 1. Biochemical Foundations : 1.1. Covalent and non-covalent bonds; hydrogen bond; Van der Waal's forces; Definition and explanation of covalent bond	5	
			 Molecules of life : 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	JULY TO PRE- PUJA
	6612		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	
2020-21	(THEORY)	BIOCHEMISTRY	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 Ca²⁺ 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	ТОРІС	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	ТОРІС	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 <i>Tecoma</i> & <i>Dracaena</i>. 	10	POST PUJA TO WINTER VACATION

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

YEAR	PAPER	UNIT	ТОРІС	NO. OF LECTURES	SESSION
			 Plant-water relations: Concept of water potential, components of water potential in plant system, 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. 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
			 5.1. 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	ТОРІС	NO. OF LECTURES	SESSION
2020-21	CC13 (PRACTICAL)	PLANT PHYSIOLOGY	 Determination of loss of water per stoma per hour. Relationship between transpiration and evaporation. Measurement of osmotic pressure of storage tissue by weighing method. Measurement of osmotic pressure of <i>Rhoeo</i> leaf by plasmolytic method. Effect of temperature on absorption of water by storage tissue and determination of Q₁₀. Rate of imbibition of water by starchy, proteinaceous and fatty seeds and effect of seed coat. To study the phenomenon of seed germination (effect of light). To study the induction of amylase activity in germinating grains. To study the effect of different 		FEBRUARY TO PRE- SUMMER RECESS

YEAR	PAPER	UNIT	торіс	NO. OF LECTURES	SESSION
			1. Concept of metabolism: Introduction, Anabolic and catabolic metabolic pathways, regulation of metabolism, role of regulatory enzymes (allosteric, covalent modulation and isozymes)	4	
			 Photosynthesis : Chemical structure of chlorophyll a and b, absorption and action spectra, biological significance of carotenoid pigments, Two main functions of carotenoids. 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. Calvin cycle–Biochemical reactions & stoichiometry, reactions with structure. HSK Pathway– three variants of the pathway, Kranz anatomy, pathway with structure. Photorespiration – mechanism and significance, pathway with structure and subcellular localization. Crassulacean acid metabolism –mechanism and ecological significance. Pathway with structure, example, CAM idling. 	10	
2020-21	CC14 (THEORY)	PLANT METABOLISM	 Respiration : 1 EMP pathway, regulation and its anabolic role, Pathway with structure. 2 Conversion of Pyruvic acid to AcetylCoA, PDH enzyme complex composition and reaction. 3 TCA-cycle and its amphibolic role, 4. Oxidative pentose phosphate pathway and its significance, pathway with structure. 5 Mitochondrial electron transport system, Components uncouplers; examples and functions. 6 Oxidation of cytosolic NADH + H⁺ Three different modes. 7 Stoichiometry of glucose oxidation (aerobic). 	8	FEBRUARY TO PRE- SUMMER RECESS

			 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	
			 Lipid metabolism: S.1. synthesis and breakdown of triglycerides, β-oxidation, glyoxalate cycle, gluconeogenesis and its role in mobilization of the lipids during seed germinbations, a- oxidation. 	6	
			6. Mechanism of signal transduction: receptor-ligand interactions, second messenger concept, calcium-calmodilin, G protein, MAP-kinase cascade.	6	
YEAR	PAPER	UNIT	ТОРІС	NO. OF LECTURES	SESSION

SEMESTER I GENERAL

YEAR	PAPER	UNIT	ТОРІС	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 <i>Tecoma</i> & <i>Dracaena</i>. 	10	POST PUJA TO WINTER VACATION
	CC1 (PRACTICAL)		 Work out: Microscopic preparation, drawing and labeling of <i>Chlamydomonas</i>, <i>Chara</i>, <i>Ectocarpus</i>, <i>Rhizopus</i> and <i>Ascobolus</i>. Anatomical studies (following double staining method) of: 2a. Stem- <i>Cucurbita</i>, sunflower and maize. 2b. Root- <i>Colocassia</i>, gram and orchid. 2c. Leaf- <i>Nerium</i> Identification with reasons: 3a. Cryptogamic specimens (macroscopic/microscopic as prescribed in the theoretical syllabus. 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	ΤΟΡΙϹ	NO. OF LECTURES	SESSION
			 Proteins Primary, secondary and tertiary structure, Nucleic acid- DNA structure, RNA types, Enzyme- Classifications with examples (IUBMB), Mechanism of action. 	5	
2020-21	2020-21 CC4 (THEORY) PHY ME ⁻	PLANT PHYSIOLOGY AND METABOLISM	 Transport in plants 1 Ascent of sap and Xylem cavitation , 2.2 Phloem transport and source-sink relation. 	3	
			 Transpiration 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	ΤΟΡΙϹ	NO. OF LECTURES	SESSION
2020-21	DSE-A (PRACTICAL)	PHYTOCHEMISTRY AND MEDICINAL BOTANY	 Preparations of solution and buffers Acquaintance with laboratory instruments- Autoclave, Incubator, Clinical centrifuge, Analytical balance, pH meter, Colorimeter, Water bath, Distillation plant, Laminar air flow. Qualitative test for proteins and carbohydrates, reducing and non reducing sugar (glucose, fructose and sucrose) Tests (chemical) for tannin and alkaloid. 		AUGUST TO DECEMBER
			Identification of medicinal plants		
			Field study (local) and listing of medicinal plants.		