LESSON PLAN: 2019-2020 –SEMESTER I, SEMESTER II, SEMESTER III, SEMESTER IV (HONS. &GEN)

[ONLINE CLASSES STARTED FROM 16TH MARCH, 2020]

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SACT II, DEPARTMENT OF BOTANY

SEMESTER I HONOURS

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2019-2020	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:** *5.1Chlamydomonas*, 5.2. *Oedogonium*, 5.3. *Chara*, 5.4. *Ectocarpus*, 5.5. *Polysiphonia*, 5.6. Evolutionary significance of *Prochloron*.	5 5 4 6 10 CHALK & TALK, PPT, CHARTS.	JULY'19 TO DECEMBER'19

	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'19 TO DECEMBER'19

SEMESTER II HONOURS

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2019-2020	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 6 8 CHALK & TALK, PPT, CHARTS, GOOGLE CLASSROOM & GOOGLE MEET.	JANUARY '20 TO JUNE'20 ONLINE CLASSES STARTED FROM 16TH MARCH, 2020

			4.Economic Importance with reference to Wood, Resins, Essential oils, and Drugs.	4	
	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 18 6 LABORATORY METHODS & ONLINE CLASSES	JANUARY ’20 TO JUNE’20

SEMESTER III HONOURS

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2019-2020	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. 10 10 6	JULY'19 TO DECEMBER'19
	BOT-A-CC-3-5-P PRACTICAL	PALAEOBOTANY	**1.Morphological study:** *Ptilophyllum* and *Glossopteris* leaf fossils. **2.Study from permanent slides**: T.S. of stem of *Rhynia, Lepidodendron*, *Calamites, Lyginopteris,Cordaites.*	30 LABORATORY METHODS	JULY'19 TO DECEMBER'19

SEMESTER IV HONOURS

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2019-2020	ECONOMIC BOTANY BOT-A-CC-4-9-TH THEORETICAL	ECONOMIC BOTANY	**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).	8 CHALK & TALK, PPT, CHARTS, GOOGLE CLASSROOM & GOOGLE MEET 4 4	JANUARY '20 TO JUNE'20 ONLINE CLASSES STARTED FROM 16TH MARCH, 2020

SEMESTER I GENERAL

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2019-2020	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, CHARTS.	JULY'19 TO DECEMBER '19
	BOT-G-CC-1-1-P PRACTICAL	PHYCOLOGY MYCOLOGY BRYOPHYTES	**1.Work out:** Microscopic preparation, drawing and labeling of *Chlamydomonas*, *Chara*, *Ectocarpus*, *Rhizopus* and *Ascobolus* 3.**Identification with reasons**: 3a. Cryptogamic specimens (macroscopic/microscopic as prescribed in the theoretical syllabus	30 LABORATORY METHODS	JULY'19 TO DECEMBER '19

SEMESTER II GENERAL

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2019-2020	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 fossilization, 3.2 Importance of fossil study. 3.3Geological time scale.	12 12 CHALK & TALK, PPT, CHARTS, GOOGLE CLASSROOM & GOOGLE MEET. 7	JANUARY '20 TO JUNE'20 ONLINE CLASSES STARTED FROM 16TH MARCH, 2020

SEMESTER IV GENERAL

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2019-2020	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 AND GOOGLE MEET.	JANUARY '20 TO JUNE'20 ONLINE CLASSES STARTED FROM 16TH MARCH, 2020

LESSON PLAN(Semester 1 ,semester2, Semester3, Semester4 and partIII Hons. & General)

NAME: SMT SHARMISTHA BASU

DEPARTMENT: BOTANY

Semester1 HONOURS

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2019-20	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 CHALK AND TALK , PPT	July 19 to December 19
			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)	20 CHALK AND TALK , PPT	July19 to December 19

			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.	 Laboratory method 3	

Semester 2 HONOURS

Year	Paper	Unit	Topic	No. Of lectures	Session
2019-20	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	4 8 8	January 20 to June. 20 **Online classes started from 16th March 2020** PPT, video lessons , online classes, Google classroom.

			groups of Pteridophytes. 4. Heterospory and Origin of Seed habit. 5. Economic importance as food, medicine and Agriculture. .2 lectures	4 2	

Lesson plan semester3(Hons)

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2019-20	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 PPT, video lessons , online classes, Google classroom.	July2019 to December 2019

LESSON PLAN 2019-2020 (SHARMISTHA BASU,ASSISTANT PROFESSOR BOTANY)

Lesson plan semester4(Hons.)

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2019-20	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 PPT, video lessons , online classes, Google classroom Offline classes till 14/3/2020.	January 2020 to June 2020
	PLANT PHYSIOLOGY AND METABOLISM (BOT-G-CC-4-4-P) Practical	Plant Physiology	. 1. Plant tissue culture- 1.1 Introduction and basic concepts, 1.2 Cellular potency, 1.3 Callus culture and plant regeneration. 2. Micropropagation- 2.1 Somatic embryogenesis and artificial seed. 3. Protoplast culture and its application.	**4** **4** **6**	January 2020 to June 2020

	SEC B PLANT BIOTECHNOLOGY (BOT-G-SEC-B-4/6-3) Theory	Plant biotechnology	4. Recombinant DNA technology- 4.1 Recombinant DNA, 4.2 Restriction enzymes, 4.3 Plasmids as vectors. 5. Gene cloning (basic steps). 6. Achievements in crop biotechnology- 6.1 Pest resistant plant (Bt cotton), 6.2 Transgenic crops with improved quality (flavr tomato and golden rice)	**8** **4** **4** PPT, video lessons , online classes, Google classroom	

LESSON PLAN

III[rd] YEAR HONS.

NAME: SMT SHARMISTHA BASU

DEPARTMENT: BOTANY

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2019-20	VI	PLANT BIOTECHNOLOGY	**PLANT BIOTECHNOLOGY** 1. *Plant tissue culture – Introduction:* 1.1. Cellular totipotency, 1.2. Tissue culture media, 1.3. Aseptic manipulation. 2. *Callus culture* : 2.1. Callus initiation, growth and maintenance, 2.2. Applications. 3. *Micropropagation* : 3.1. Organogenesis (direct and indirect), 3.2.	2 2 2	JULY TO PRE-PUJA

			Somatic embryogenesis, Artificial seed, 3.3. Significance. 4. *Haploid Culture* 4.1. Anther and Pollen culture methods, 4.2. Significance .	2 CHALK AND TALK AND PPT	
	VI	PLANT BIOTECHNOLOGY	5. *Protoplast Culture* : 5.1. Protoplast isolation and culture, 5.2. Protoplast fusion (somatic hybridization), 5.3. Significance. 6. *Plant Genetic Engineering* : 6.1. Brief concept of different gene transfer methods, special emphasis on *Agrobacterium* mediated gene transfer, Role of Reporter gene, 6.2. Achievements in crop biotechnology (suitable examples of transgenic plants).	2 2 CHALK AND TALK AND PPT	POST-PUJA TO WINTER VACATION
	VI	PLANT BREEDING AND BIOMETRY	**PLANT BREEDING** 1. *Plant Breeding:* 14 1.1 Maintenance of germplasm, 1.2 Mass selection and	6	POST-WINTER VACATION TO TEST

			Pure line selection, 1.3 Back cross method,1.4. Heterosis and hybrid seed production, 1.5. Male sterility and its use in plant breeding, 1.6 Molecular Breeding (use of DNA markers in plant breeding).	CHALK AND TALK AND PPT	
	VIII(PRACTICAL)	MICROBIOLOGY **PLANT PATHOLOGY**	**MICROBIOLOGY** 1. Preparation of bacterial media – (a) Nutrient agar and nutrient broth, (b) Preparation of slants and pouring Petriplates. 2. Sub-culturing of bacterial culture. 1. Preparation of fungal media (PDA). 2. Sterilization process. 3. Isolation of pathogen from diseased leaf. 4. Inoculation of fruit and subculturing.	3 3 LABORATORY METHOD	JULY TO PRE-PUJA

	VIII(PRACTICAL)	MICROBIOLOGY	3. Gram staining from bacterial culture. 4. Microscopic examination of bacteria from natural habitat(curd) by simple staining.	3 3	POST-PUJA TO WINTER VACATION
	VIII(PRACTICAL)	PLANT PATHOLOGY	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.*	3 LABORATORY METHOD	POST WINTER VACATION TO TEST

LESSON PLAN 2019-2020 (SHARMISTHA BASU,ASSISTANT PROFESSOR BOTANY)

Semester3(General) lesson plan

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2019-20	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 CHALK AND TALK AND PPT	July 19 to December 19
	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 19 to December 19

Semester 4(General) lesson plan.

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 2 Experiments were done before the lockdown situation in laboratory.	Januar2020 to June 2020

			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.	**Rest of the Experiments could not be completed in the laboratory due to lockdown situation. Hence, teaching will be done by online videos, online demonstrations through virtual laboratory etc.**	

IIIrd year General

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2019-20	IVA	Module VII	Module VII 1. Biofertilizer: 1.1 Sources 1.2 Production, 1.3 Application.	4 Chalk and talk method, PPT, MULTIMEDIA ANIMATIONS	JULY TO PRE-PUJA
	IVB	Module VIII	Practical Module VIII 1. Acquaintance with laboratory instruments - Autoclave, Incubator, Clinical centrifuge, Analytical balance, pH Meter, Colorimeter, Water bath, Distillation plant. 2. Sterilization technique by autoclaving	Laboratory method 8.	

	IV A	MODULE VII	2. Mushroom: 2.1 Food value, 2.2 Cultivation technique of Pleurotus. 3. Plant disease control: 3.1 Quarantine, 3.2 Biological control, 3.3 Chemical Control.	6 Chalk and talk method, PPT, MULTIMEDIA ANIMATIONS	POST-PUJA TO WINTER VACATION
	IVB	MODULE VIII	PRACTICAL Preparation of PDA medium (slants, pouring of plates). 4. Bacteria staining by simple staining method (methylene blue/crystal violet) from curd. 6. Determination of Goodness of fit of normal monohybrid ratios (3: I and I: 1) by Chi-square	6 Laboratory method	
	IVA	MODULE VII	4. Plant Breeding: 4.1 Mass and Pure line selection, 4.2 Heterosis and hybrid seed production	5 Chalk and talk method, PPT, MULTIMEDIA ANIMATIONS	POST-WINTER VACATION TO TEST
	IV B	MODULE VIII	PRACTICAL 5. Acquaintance with common medicinal plants and their useful parts : ***Terminalia arjuna, Centella asiatica, Saraca asoca, Adhatoda vasica, Andrographis paniculata, Asteracantha longifolia, Eclipta alba, Aloe barbadensis, Rauvolfia serpentina, Vitex negundo, Herpestis monieria, Holarrhena***	Laboratory method and field visits.	

			antidysenterica, Boerhaavia repens. 7. Visit to a Medicinal Plant Garden.	Field survey and excursions.	

LESSON PLAN 2019-2020

(SEMESTER 1, SEMESTER 2, SEMESTER 4 AND PART III HONOURS

NAME :PAYEL CHATTERJEE

DEPARTMENT :BOTANY

SEMESTER 1 HONOURS

YEAR	PAPER	UNIT	TOPIC	NO .0F LECTURES	SESSION
2019-2020	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 2019 TO DECEMBER 2019

		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
2019-20	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 2020 TO JUNE 2020 **Online classes started from 16th March 2020 PPT,VIDEO LESSONS,ONLINE CLASSES,GOGLE CLASSROOM

			application in systematics, forensics and pharmacognosy		

SEMESTER 2 GENERAL

YEAR	PAPER	UNIT	TOPIC	NO .0F LECTURES	SESSION
2019-2020	CORE COURSE 2 PLANT DIVERSITY II	THEORY	Angiosperm Morphology- Inflorescence types with examples, Flower, Fruits and seeds- type and examples.	12	JANUARY2020 –JUNE 2020 ONLINE CLASSES FROM 16TH MARCH
		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		JANUARY2020 TO JUNE2020 ONLINE CLASSES FRPM 16TH MARCH

			types, transfusion tissue, sieve tube, sunken stomata, lenticels), 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
2019-2020	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),	6 12	JANUARY2020-JUNE 2020 ONLINE CLASSES FROM 16TH MARCH PPT,VIDEO LESSONS,ONLINE CLASSES,GOGLE CLASSROOM

			2.4. Gene mapping with three point test cross, detection of middle gene in 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	16 4 8 6	

			Frame shift mutation, 6.2. 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	
2019-2020	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		JANUARY TO JUNE 2020 ONLINE CLASSES FROM 16TH MARCH PPT,VIDEO LESSONS,ONLINE CLASSES,GOGLE CLASSROOM

			chromosome: Metaphase chromosome preparation, free hand drawing under high power 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:		

PART III HONOURS

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2019-2020	VI	CELL BIOLOGY THEORY	1.Origin and Evolution of Cells :Concept of RNA world, Ribozymes, First cell, 1.2. Origin of eukaryotic cell, 1.3. Organellar DNA (cp-and mt-DNA).	3	JULY 2019TO PRE PUJA
			2.Nucleus and Chromosome :Nuclear envelope , Nuclear lamina and Nuclear pore complex,	4	
		GENETICS *& MOLECULAR BIOLOGY*	*1. Linkage, Crossing over and Gene Mapping :* Complete and incomplete linkage, linkage group, 1.2 Detection of crossing over(McClintock's experiment), 1.3 Molecular mechanism of crossing over (Holliday model), 1.4 Gene mapping (three point test cross), 1.5 Co-	7	

			efficient of coincidence and interference, Mapping function, 1.6 Problems on gene mapping, 1.7 Molecular mapping – ISH, FISH (brief idea). 2. *Epistasis and Polygenic inheritance* in plants. 3. *Aneuploidy and Polyploidy*: Types, examples, meiotic behaviour and importance of: 3.1 Aneuploidy, 3.2 Polyploidy.	1 3	
		CELL BIOLOGY THEORY GENETICS *&* *MOLECULAR BIOLOGY*	2.2. Nucleolus-ultrastructure and ribosome biogenesis, 2.3. Chromatin ultrastructure and DNA packaging in eukaryotic chromosome, 2.4. Karyotype concept and its parameters 2. Cell cycle and its regulation : 3.1. Centromere, kinetochore, spindle apparatus & telomere–structural organization and functions, 4. *Chromosomal aberration*: Typesand meiotic behaviour of: 4.1 Deletion, 4.2 Duplication, 4.3 Translocation, 4.4Inversion. 5. Mutation : Point mutation-Transition,	2 1 1 2 3 4	POST PUJA TO WINTER VACCATION

			Transversion and Frame shift mutation, 5.2 Molecular mechanism (tautomerisation, alkylation, deamination, base analogue incorporation, dimerisation), 5.3 DNA repair (brief idea). 6. Structural organisation of Gene : One Gene–one polypeptide concept, 6.2 Complementation test (rII locus), 6.3 Split gene, 6.4 Overlapping gene, 6.5 Repetitive DNA- tandem and interspersed, 6.6 Transposon (Ac-Ds system Homoeotic gene in plants (ABC model in *Arabidopsis*). *7. DNA Replication, Transcription and Translation (Prokaryotes & Eukaryotes):* Central Dogma, 7.2 Semiconservative replication – mechanism, 7.3 Transcription, 7.4 RNA processing, 7.5 Aminoacylation of tRNA, 7.6 Translation.), 6.7	4 10	

		CELL BIOLOGY	Dynamics of chromosome movement in anaphase, Mechanism of cell cycle control in Yeast (checkpoints and role of MPF), Apoptosis (Brief idea). GENETICS *&* *MOLECULAR BIOLOGY* Gene Regulation : Concept of Lac-operon, Positive and negative control. Genetic Code : Properties-evidences & exceptions, Decipherence of codon (Binding technique) . 10. Recombinant DNA Technology: Enzyme (Restriction endonuclease, ligase), Vector (plasmid pBR 322) Marker gene, Steps of cloning technique, PCR and its application 10.6 Genomic DNA and cDNA library. 11. *Bioinformatics* : Brief concept on Genomics, 11.2 Proteomics	2 4 1 2 4 1	POST WINTER VACCATION TO TEST
	VIII (PRACTICAL)	CELL BIOLOGY AND GENETICS	1. Introduction to chromosome preparation: Pre-treatment, Fixation, Staining, Squash and Smear	24	JULY TP PRE PUJA

			preparation, Preparation of permanent slides. 2.Determination of mitotic index and frequency of different mitotic stages in pre-fixed root tips of A*llium cepa.*		
		CELL BIOLOGY AND GENETICS	3. Study of mitotic chromosome : Metaphase chromosome preparation , free hand drawing under high power objective, drawing with drawing prism under oil immersion lens, determination of 2n number, comment on chromosome morphology of the following specimens from root tips: *Aloe vera , Lens esculenta.* 4. *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.	27 17	POST PUJA TO WINTER VACCATION
		CELL BIOLOGY AND GENETICS	5. *Identification from permanent slides* : Meiosis – (i) normal stages (ii) abnormal stages – laggard, anaphase bridge, ring chromosome (*Rhoeo discolor*);	6	POST WINTER VACCATION TO TEST

			Mitosis –(i) normal stages, (ii) abnormal stages- early separation, late separation, multipolarity , sticky bridge, fragmentation, (ii) pollen mitosis.		

LESSON PLAN (SESSION 2019-2020)

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

SEMESTER I (HONS.)

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2019-20	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
2019-20	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.		

SEMESTER III (HONS.)

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2019-20	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	
2019-20	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
2019-20	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

IIIrd YEAR HONS.

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
			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	

2019-20	V	BIOCHEMISTRY	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	JULY TO PRE-PUJA
			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 TO WINTER VACATION
			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.	4	
			5. Phosphorylation: ATP Synthesis-Chemiosmotic model, Detail mechanism. Oxidative and Photophosphorylation-Mechanism and differences.	2	POST-WINTER VACATION TO TEST
			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. Organic Translocation : 2.1 Phloem sap, Composition, P-protein, Types and function. 2.2 Phloem loading and unloading, Detail mechanism. 2.3 Mass-flow (pressure flow) hypothesis and its critical evaluation, Concept and evaluation.	4	
			3. Photosynthesis : 3.1 Chemical structure of chlorophyll a and b, Detail structure, absorption and action spectra, Concept, biological significance of carotenoid pigments, Two main functions of carotenoids. 3.2 Red drop and Emerson effect, Concept, Components of photosystems (light harvesting complex), Description, Photochemical reaction centre, Description, Cyclic and noncyclic electron transport, Differences and description, Water splitting mechanism, Detail mechanism. 3.3 Calvin cycle–Biochemical reactions & stoichiometry, Pathway reactions with structure. 3.4 HSK Pathway– three variants of the pathway, Kranz anatomy, pathway with structure. 3.5. Photosynthetic efficiency of C3 and C4 plants and crop productivity, Comparison. 3.6. Photorespiration – mechanism and significance, pathway with structure and subcellular localization. 3.7 Crassulacean acid metabolism –mechanism and ecological significance. Pathway with structure, example, CAM idling.	8	JULY TO PRE-PUJA
2019-20	V	PLANT PHYSIOLOGY	4. Respiration : 4.1 EMP pathway, regulation and its anabolic role, Pathway with structure. 4.2 Conversion of Pyruvic acid to AcetylCoA, PDH enzyme complex composition and reaction. 4.3 TCA-cycle and its amphibolic role, 4.4. Oxidative pentose phosphate pathway and its significance, pathway with structure. 4.5 ß-oxidation of fatty acids and significance, pathway with structure. 4.6 Mitochondrial electron transport system, Components uncouplers; examples and functions. 4.7 Oxidation of cytosolic NADH + H^+ Three different modes. 4.8 Stoichiometry of glucose oxidation (aerobic).	6	

			5. Nitrogen Metabolism : 5.1. Assimilation of nitrate by plants, Biochemical reaction with structure. 5.2. Biochemistry of dinitrogen fixation in Rhizobium, Process of nodule formation, leghemoglobin, reaction of dinitrogen fixation. 5.3. General principle of amino acid biosynthesis (including GS and GOGAT enzyme system), Reaction with structure. 6. Plant Growth Regulators : 6.1. Physiological roles of Auxin, Gibberellin, Cytokinin, Abscisic acid, Ethylene, Detail physiological roles. 6.2. Chemical nature –IAA, GA_3, Kinetin, Chemical structure, synthetic auxin. 6.3. Biosynthesis and bioassay of IAA, Tryptophan dependent and independent pathway of auxin biosynthesis. 6.4 Mode of action of IAA, Acid growth hypothesis, auxin signaling. 6.5. Brassinosteroids and Polyamines as PGRs (brief idea).	10	POST-PUJA TO WINTER VACATION
			7. Photomorphogenesis : 7.1 Concept of photomorphogenesis, 7.2 Photoperiodism and plant types, Classification of photoperiodic plants. 7.3 Perception of photoperiodic stimulus, Explanation with experiments. 7.4 Critical day length, concept of light monitoring, 7.5 Phytochrome – chemical nature, interconversion, function in flowering, structure, localization, interconversion, signaling. 7.6 Role of GA in flowering, Mechanism. 7.7 Verbalization – role of low temperature in flowering, Molecular Mechanism of verbalization. 7.8 Concept of biological clock and biorhythm, Brief idea. 8. Seed dormancy: 8.1 Types; Causes and Methods of breaking seed dormancy, Description with examples. 8.2 Biochemistry of seed germination, Role of GA and phytochrome in seed germination. 9. Physiology of Senescence and Ageing. Brief idea. 10. Stress Physiology: Plant responses to:10.1 Water stress, 10.2 Temperature stress, 10.3 Salt stress Brief idea of all of the above.	10	POST-WINTER VACATION TO TEST
YEAR	**PAPER**	**UNIT**	**TOPIC**	**NO. OF LECTURES**	**SESSION**

2019-20	VIII	PLANT PHYSIOLOGY BIOCHEMISTRY PRACTICAL	PLANT PHYSIOLOGY 1. Determination of loss of water per stoma per hour. 2. Relationship between transpiration and evaporation. 3. Rate of photosynthesis under varying HCO^{-3} concentration in an aquatic plant using bicarbonate and to find out the optimum and toxic concentration. 4. Separation of plastidial pigments. 5. Measurement of oxygen uptake by respiring tissue (per g/hr.) 6. Determination of the RQ of germinating seeds. 7. Measurement of osmotic pressure of storage tissue by weighing method. 8. Measurement of osmotic pressure of *Rhoeo* leaf by plasmolytic method. 9. Effect of temperature on absorption of water by storage tissue and determination of Q_{10}. 10. Comparison of imbibitions of water by starchy, proteinaceous and fatty seeds.		JULY TO PRE-PUJA
		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. Estimation of catalase activity in plant samples. 5. Estimation of urease activity in plant samples. 6. Colorimetric estimation of protein by Folin phenol reagent.		POST-PUJA TO WINTER VACATION
		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.		POST-WINTER VACATION TO TEST

SEMESTER I GENERAL

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION

2019-20	CC1 (THEORETICAL)	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 IV GENERAL

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2019-20	CC4	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	

IIIrd YEAR GENERAL

YEAR	PAPER	UNIT	TOPIC	NO. OF LECTURES	SESSION
2019-20	IV A	MODULE VII	7. Recombinant DNA Technology: 7.1 Recombinant DNA, restriction enzymes, plasmids as vector, 7.2 Gene cloning (basic steps), 7.3 Transgenic plants.	7	JULY TO PRE-PUJA
			8. Pharmacognosy: 8.1 Scope and importance, 8.2 Secondary metabolites- alkaloids, terpenoids, phenolics and their functions.	5	POST-PUJA TO WINTER VACATION
			8.3 Organoleptic evaluation of crude drugs.	2	POST-WINTER VACATION TO TEST