

**DEPARTMENT OF BOTANY****Teaching Plan 2017-18 (Theory)**

Class: B.Sc. I		Sem I		Subject: Botany	
Sr. No.	Month	Unit No.	Topic Name	Period Required	Total Period
01	July	UNIT-I	<b>Plant Diversity (15)</b>		15
			1.1 Introduction to Plant Kingdom: Cryptogams	03	
			1.2 Diversity of plants with respect to habitat, form, nutrition and ecological status	03	
			1.3 General Account of Viruses and structure of TMV and HIV	03	
			1.4 Bacteria: structure, Nutrition and reproduction	03	
			1.5 Role of microbes in Agriculture, Medicine and Industries	03	
02	Aug- Sept	UNIT-II	<b>Algae (15)</b>		15
			2.1. Classification according to F. E. Fritsch and G. M. Smith up to classes	02	
			2.2. General characters of algae with reference to Habitat, Thallus organization, Pigmentation, Reserve food and Reproduction	02	
			2.3. General characters of following classes with special reference to examples mentioned	02	
			2.3.1. Chlorophyta - Oedogonium	03	
			2.3.2. Charophyta – Chara (Thallus structure and reproduction)	03	
			2.3.3. Phaeophyta – Sargassum (Thallus structure and reproduction)	02	
			2.3.4. Rhodophyta – Batrachospermum	01	
03		UNIT-III	<b>Fungi (15)</b>		15
			3.1. General characteristics of following classes with special reference to examples mentioned	03	
			3.1.1. Mastigomycotina : Albugo (Cystopus)	03	
			3.1.2. Ascomycotina : Aspergillus	02	
			3.1.3. Basidiomycotina : Puccinia graminis-tritici	02	
			3.1.4. Deuteromycotina : General characters	03	
			3.2 Lichen-Types & Economic importance	02	
04	Sept	Unit-IV	<b>Bryophyte (15)</b>		15
			4.1. General characters, thallus organization and life cycle of	03	
			4.1.1. Hepaticopsida – Marchantia	03	
			4.1.2. Bryopsida – Funaria	03	
			4.2. Affinities of bryophytes with algae and pteridophytes	03	
			4.5. Brief Account on some Indian Bryologist	03	
05	Sept-Oct	Unit-V	<b>Pteridophyte (15)</b>		15

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			5.1. Pteridophytes as First Vascular Plants.	<b>02</b>	
			5.3. General characters of the following classes with special reference to examples mentioned –	<b>02</b>	
			5.3.1. Sphenopsida – Equisetum	<b>03</b>	
			5.3.2. Filicopsida – Marsilea	<b>03</b>	
			5.4. Stele types in pteridophytes	<b>02</b>	
			5.5 Heterospory and Seed Habit in Pteridophytes	<b>03</b>	
<b>06</b>	<b>Oct</b>	<b>Unit-VI</b>	<b>Application of Microbes Cryptogams (15)</b>		<b>15</b>
			6.1. Economic Importance of Algae with special reference to Food, Industries, Agriculture and Harmful aspects	<b>03</b>	
			6.2. Mycorrhiza – Types and Application	<b>02</b>	
			6.3. Role of Fungi in Industries, Medicine, Food & Agriculture	<b>02</b>	
			6.4. Plant Diseases –	<b>02</b>	
			6.4.1. Viral –TMV	<b>02</b>	
			6.4.2. Bacteria – Black arm of cotton (Xanthomonos malvacearum)	<b>02</b>	
			6.4.3. Fungal – Tikka disease of groundnut (Cercospora sps.)	<b>02</b>	

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Class: B.Sc. I		Sem I		Subject: Botany	
DIVERSITY & APPLICATIONS OF MICROBES AND CRYPTOGRAMS					
LABORATORY EXERCISE (PRACTICALS)					
Sr. No.	Month	Practical No.	Practical Name	Practical Required	Total Practical
01	July		<b>ALGAE</b> Preparation of temporary mount, identification with reason of following algal materials		07
		1	1. <i>Oedogonium</i> ,	01	
		2	2 <i>Hydrodictyon</i>	01	
		3	3 <i>Chara</i> ,	01	
		4	4 <i>Vaucheria</i>	01	
		5	5 <i>Ectocarpus</i>	01	
		6	6 <i>Sargassum</i>	01	
		7	7. <i>Batrachospermum</i>	01	
02	August		<b>FUNGI AND PLANT PATHOLOGY</b>		06
		8	Study of following genera <i>Albugo</i> , <i>Uncinula</i> ,	01	
		9	<i>Penicillium</i> , <i>Agaricus</i> ,	01	
		10	<i>Puccinia</i> , <i>Cercospora</i>	01	
		11	Study of Crustose, Fruticose & Foliose Lichen	01	
		12	Study of symptoms of fungal, viral, bacterial and Mycoplasmal diseases	01	
		13	Demonstration of Mushroom Cultivation Technology	01	
03	Sept		<b>BRYOPHYTES</b>		05
		14	Study of external and anatomy features of vegetative and reproductive parts of following genera – <i>Marchantia</i> ,	01	
		15	<i>Anthoceros</i> ,	01	
		16	<i>Funaria</i> ,	01	
		17	<i>Polytrichum</i>	01	
		18	<i>Sphagnum</i>	01	
04	Sept-Oct		<b>PTERIDOPHYTES</b> Study of Pteridophyte external and anatomy features of vegetative and reproductive parts of following genera –		07
		19	<i>Lycopodium</i>	01	
		20	<i>Equisetum</i> ,	01	
		21	<i>Osmunda</i> ,	01	
		22	<i>Selaginella</i> ,	01	
		23	<i>Adiantum</i> ,	01	
		24	<i>Marsilea</i>	01	
		25	Any one fossil specimen	01	
05	Oct		Botanical excursion		
06	Oct		Common algal, fugal, pathological, bryophytic and pteridophytic collection and excursion report must be submitted at the time of practical exam		

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Class: B.Sc. I		Sem II		Subject: Botany	
GYMNOSPERM, MORPHOLOGY OF ANGIOSPERMS AND UTILIZATION OF PLANTS					
01	January	UNIT-I	UNIT-I: Palaeobotany (15)		15
			1.1. Process of plant fossilization and types of fossils	03	
			1.2. Geological Time Scale	03	
			1.3. Fossil Gymnosperms	03	
			1.3.1. Pteridospermales: Lyginopteris oldhamia	03	
			1.3.2. Bennettitales: Bennittites	03	
02	Jan-Feb	UNIT-II	UNIT-II : Gymnosperms (15)		15
			2.1. Classification according to D. D. Pant	03	
			2.2. General account: morphology, anatomy, life cycle and taxonomic position of Pinus and Gnetum	04	
			2.3. Affinities with pteridophytes and angiosperms	04	
			2.4. Economic importance of Gymnosperms	04	
03	Feb	UNIT-III	UNIT-III: Morphology (15)		15
			3.1. Diversity in Plants habits – Annual, biannual, perennials	03	
			3.2. Roots – Types of root : tap and adventitious, modification of root : for food storage, respiration and supports.	04	
			3.3. Stem – Types of Stem, Characteristic features, branching, modification of Stem – Underground and aerial	04	
			3.4. Leaf – Parts of leaf, types of leaves – simple and compound; Phyllotaxy; Venation; Stipule. Modification of leaves	04	
04	Feb	Unit-IV	UNIT-IV: Morphology (15)		15
			4.1. Inflorescences – Types: Racemose, Cymose and Special	06	
			4.2. Flower – Flower as modified shoot; Structure of flower – Calyx, Corolla, Androecium and Gynoecium. Placentation; Types of Pollination.	09	
05	March	Unit-V	UNIT-V : Morphology and Utilization of Plants (15)		15
			5.1. Fruits – Morphological types	03	
			5.2. Utilization of Plants	03	
			5.2.1. Food Plants – Wheat, Potato –Morphology, varieties and economic importance.	03	
			5.2.2. Fiber Plant – Morphology, varieties and economic importance of Cotton.	03	
			5.2.3. Oil yielding Plant – Morphology, Varieties and economic importance of Ground nut.	03	
06	March	Unit-VI	UNIT-VI: Utilization of Plants (15)		15
			6.1. Spices – General account and economic importance of Black pepper, Clove, Cinnamon and Cardamom	02	
			6.2. General account and sources of firewood, timber and Bamboos.	02	
			6.3. Essential oils – General account, economic importance of Eucalyptus.	02	
			6.4. Pharmacognosy and Phytochemistry with respect to following medicinal plants –		
			6.4.1. Aloe vera	01	
			6.4.2. Adathoda vasica	01	
			6.4.3. Asparagus racemosa	01	

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		6.4.4. Azadirachta indica	01	
		6.4.5. Catharanthus roseus		
		6.4.6. Chlorophytum borivillianum	01	
		6.4.7. Emblica officinalis	01	
		6.4.8. Ocimum sanctum	01	
		6.4.9. Rauwolfia serpentina	01	
		6.4.10. Vitex negundo	01	
		6.4.11. Withania somnifera		

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GYMNOSPERM, MORPHOLOGY OF ANGIOSPERMS AND UTILIZATION OF PLANTS					
LABORATORY EXERCISE (PRACTICALS)					
Sr. No.	Month	Practical No.	Practical Name	Practical Required	Total Practical
01	January		I. Gymnosperms: Morphology and anatomy of the following members –		07
		1	a. Pinus: Root, Stem, Leaf	02	
		2	b. Gnetum: Root, Stem, Leaf	02	
		3	II. Preparation of double stained permanent mount of Pinus stem, needle and Gnetum stem and leaf	02	
		4	III. Study of fossil slides of Lyginopteris and Bennettites	01	
02	February	5	IV. Detailed morphological study of types of root, stem and leaf with its modifications	04	07
6	V. Forms of corolla	01			
7	VI. Types of placentation	01			
8	VII. Morphology of fruits	01			
03	March	9	VIII. Morphology of plant parts used and medicinal plants prescribed in syllabi	03	06
		10	IX. Utilization of plants: Spices, fiber yielding plants and food plants prescribed in syllabi	03	
		11	Botanical excursion		
04	March	12	Practical Examination		

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Class: B.Sc. II		Sem III		Subject: Botany	
ANGIOSPERM SYSTEMATICS, ANATOMY & EMBRYOLOGY					
Sr. No.	Month	Unit No.	Topic Name	Period Required	Total Period
01	July	UNIT-I	Angiosperm Systematics and Biodiversity		15
			1.1 Angiosperms: Origin and Evolution (Pteridospermean and Bennititalean Theory)	02	
			1.2 Botanical Nomenclature: Principles of rules, Taxonomic Ranks, Type concept, Valid publication.	03	
			1.3 Herbarium – Concept & significance, Royal Botanical Garden, Kolkata.	04	
			1.4 Concept of biodiversity, Ex situ and In situ conservation	04	
			1.5 Concept & importance of Biodiversity.	02	
02	August	UNIT-II	Angiosperm Systematics		15
			2.1 Systems of Classification: Bentham and Hooker’s System, Engler and Prantle’s system.	03	
			2.2 Systematic studies & economic importance of following Families: Dicotyledons (Polypetalae) : Malvaceae, Brassicaceae, Leguminosae, Apiaceae,	12	
03	Aug- Sept	UNIT-III	Angiosperm Systematics		15
			3.1 Systematic studies & economic importance of following Families: Dicotyledons (Gamopetalae): Asteraceae, Asclepiadaceae, Apocynaceae, Solanaceae, Verbenaceae, Lamiaceae.	10	
			3.2 Dicotyledons ( Monoclamydeae): Euphorbiaceae.	02	
			3.3 Monocotyledons: Liliaceae, Poaceae.	03	
04	Sept	Unit-IV	Anatomy		15
			4.1 Types of Tissues: Meristematic – Types of meristems Permanent – Simple and complex.	04	
			4.2 Characteristics of growth rings, Sapwood and heartwood.	04	
			4.3 Anatomy of root: Primary structure in dicot and monocot root, normal secondary growth in dicot root.	07	
05	Sept-Oct	Unit-V	Anatomy		15
			5.1 Anatomy of stem: Primary structure in monocot and dicot stem, normal	06	

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			secondary growth in dicot stem.		
			5.2 Anomalies in primary structure in <i>Boerhavia</i> stem, secondary structure in <i>Bignonia</i> and <i>Dracaena</i> stem.	<b>06</b>	
			5.3 Leaf Anatomy: Internal structure in <i>Nerium</i> and <i>Maize</i> leaf.	<b>03</b>	
<b>06</b>	<b>Oct</b>	<b>Unit-VI</b>	<b>Embryology</b>		<b>15</b>
			5.1 Microsporangium, microsporogenesis, development of male gametophyte.	<b>04</b>	
			5.2 Megasporangium, types of ovules, megasporogenesis, development of female gametophyte monosporic, Bisporic & tetrasporic).	<b>04</b>	
			5.3 Double fertilization and triple fusion.	<b>02</b>	
			5.4 Embryo – Classification of embryo.	<b>02</b>	
			5.5 Endosperm types & significance, Suspended animation	<b>03</b>	

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ANGIOSPERM SYSTEMATICS, ANATOMY & EMBRYOLOGY							
LABORATORY EXERCISE (PRACTICALS)							
Sr. No.	Month	Practical No.	Practical Name	Practical Required	Total Practical		
01	July		<b>Anatomy of angiosperms</b> : Preparation of double stained slides of root, stem and leaves of angiosperms mentioned in the syllabus		03		
		1	Anatomy of root in Dicot & Monocot	01			
		2	Anatomy of stem in Dicot & Monocot	01			
		3	Anatomy of Leaf in Dicot & Monocot	01			
02			<b>Taxonomy</b> : Description of ten plants belonging to different families in technical language and identification up to family level.		15		
		4	Brassicaceae	01			
	August	5	Malvaceae	01			
		6	Fabaceae	01			
		7	Caesalpinoidae	01			
		8	Mimosoidae	01			
		9	Apiaceae	01			
		10	Apocynaceae	01			
		11	Asclepiadaceae	01			
		12	Solanaceae	01			
		13	Euphorbiaceae	01			
		September	14	Lamiaceae		01	
			15	Asteraceae		01	
	16		Verbanaceae	01			
	17		Liliaceae	01			
	18		Poaceae	01			
	03			<b>Embryology of Angiosperms</b>			03
			19	Observation of wide range of flowers available in the locality and methods of their pollination.		01	
		20	Study through permanent slides of T.S. of anthers, microsporogenesis, L.S. of ovule, types of endosperms and embryo of Capsella	01			
October		21	Mounting of T.S. of anthers, Pollen grains and pollinia.	01			
04			<b>Long and short excursion tour</b>				



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Class: B.Sc. II		Sem IV		Subject: Botany	
CELL BIOLOGY, GENETICS AND BIOCHEMISTRY					
Sr. No.	Month	Unit No.	Topic Name	Period Required	Total Period
01	Dec- January	UNIT-I	Unit – I : Cell Biology		15
			1.1 Cell concept – Prokaryotic and Eukaryotic cell	02	
			1.2 Cell wall –Structure and Functions	03	
			1.3 Plasma membrane –Structure (models) and Functions	04	
			1.4 Nucleus – Ultra structure (nuclear membrane, nuclear pore complex and nucleolus) and functions	04	
			1.5 Chloroplast- Structure and Functions	02	
02	Jan- Feb	UNIT-II	Unit–II : Cell Biology Structure and functions of-		15
			2.1 Endoplasmic Reticulum	03	
			2.2 Golgi complex	02	
			2.3 Vacuole	02	
			2.4 Ribosome	02	
			2.5 Perixysome	02	
			2.6 Mitochondria	02	
			2.7 Cell cycle: Mitosis and Meiosis	02	
03	February	UNIT-III	Unit – III : Genetics		15
			3.1 Chromosome- Morphology, Types, Centromere & Telomere	04	
			3.2 Chromosomal aberrations –		
			3.2.1 Structural aberrations: Deletion, Duplication, Inversion and Translocation	05	
			3.2.2 Numerical aberrations: Euploidy and aneuploidy	06	
04	Feb- March	Unit-IV	Unit–IV: Genetics		15
			4.1 Mendellism: Mendel’s law of Dominance, Segregations and Independent assortment, Incomplete dominance	05	
			4.2 Interaction of genes- Complimentary, Supplementary and Epistasis	05	
			4.3 Problems based on Mendelism and Interaction of Genes	05	
05	Feb- March	Unit-V	Unit – V Genetics		15
			5.1 Linkage – Concept, Types and theories	03	
			5.2 Crossing over: Concept, Types and theories	04	

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			5.3 Gene mutations- Spontaneous and Induced	<b>04</b>	
			5.4 Extra-nuclear Genome- Mitochondrial DNA and Chloroplast DNA	<b>04</b>	
<b>06</b>	<b>March</b>	<b>Unit-VI</b>	<b>Unit – VI Biochemistry</b>		
			6.1 Nomenclature of Enzymes	<b>03</b>	
			6.2 Characteristics of Enzymes	<b>03</b>	
			6.3 Concept of holoenzymes, coenzymes and cofactor	<b>03</b>	
			6.4 Theories for Mechanism of action of Enzymes	<b>03</b>	
			6.5 Structure and functions Carbohydrates: Monosaccharides (Glucose), Disaccharides (Galactose) and Polysaccharides (Starch)	<b>03</b>	<b>15</b>
<b>07</b>			<b>Subject related Project &amp; Seminar</b>		

Class: B.Sc. II		Sem IV		Subject: Botany	
CELL BIOLOGY, GENETICS AND BIOCHEMISTRY					
LABORATORY EXERCISE (PRACTICALS)					
Sr. No.	Month	Practical No.	Practical Name	Practical Required	Total Practical
01	January		I Cell Biology (Any Two)		04
		1	Squash preparation for the study of various stages of mitosis	02	
		2	Smear preparation for the study of various stages of meiosis.	02	
02	February		II Genetics		03
		3	1. To prove Mendel’s Monohybrid ratio.	01	
		4	2. To prove Mendel’s Dihybrid ratio	01	
		5	3. Problems based on Interaction of genes	01	
03	Feb-March		III Biochemistry		03
		6	1. To study the enzyme activity of catalase.	01	
		7	2. To demonstrate test for glucose in grapes, & sucrose in cane sugar / beet root.	01	
		8	3. To demonstrate test for protein.	01	
03	March	9	4. To demonstrate the lipid test in oily seeds.	01	03
		10	5. To demonstrate the test for starch / cellulose.	01	
		11	6. To demonstrate the activity of enzyme amylase from germinating Wheat grains	01	
			Practical Examination		

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Class: B.Sc. III		Sem V		Subject: Botany	
PLANT PHYSIOLOGY AND ECOLOGY					
Sr. No.	Month	Unit No.	Topic Name	Period Required	Total Period
01	July	UNIT-I	Plant Water Relations		15
			1.1 Importance of water to plant life. Imbibition , Diffusion,Osmosis, Plasmolysis.	04	
			1.2 Active and passive Absorption of water.	02	
			1.3 Ascent of sap - Root Pressure and Transpiration Pull Theory.	03	
			1.4 Transpiration - Types of transpiration, Stomatal movements, Mechanism of transpiration (Starch ) sugar hypothesis), Significance. Antitranspirant, Guttation.	03	
			1.5 Mineral uptake - Active uptake - Career Concept, Passive uptake Ion Exchange.	03	
02	July-August	UNIT-II	Metabolism-		15
			2.1 Photosynthesis - Introduction, Role of Light, Photosynthetic Apparatus and Pigments, Two Pigment Systems, Photophosphorylation, C3 and C4 cycle, CAM Pathway.	07	
			2.2 Respiration - Introduction, Mitochondria as a Respiratory centre, Types of Respiration - Aerobic and Anaerobic, Mechanism of aerobic respiration- Glycolysis, Krebs cycle, Electron transport system and Chemiosmotic ATP generation, Respiratory Quotient.	08	
03	August	UNIT-III	Metabolism and growth		15
			3.1 Nitrogen Metabolism- Sources of nitrogen, Symbiotic nitrogen fixation, Role of Nitrate reductase.	06	
			3.2 Growth - Phases of growth, Growth curve, Physiological role of growth hormones ( Auxins, Gibberellins, Cytokinins, Absciscic acid, and Ethylene).	06	
			3.3 Physiology of Senescence and Abscission.	03	
04	August-Sept	Unit-IV	Plant responses		15
			4.1 Photoperiodism - Concept of Florigen,	04	

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			Role of Phytochrome,		
			4.2 Vernalization- Concept and Significance.	<b>02</b>	
			4.3 Plant movement- Tropic (Phototropic and Geotropic) and Nastic (Epinasty, Hyponasty and Seismonasty)	<b>05</b>	
			4.4 Stress physiology- Concept, Types of stress, Water and Salinity stress.	<b>04</b>	
<b>05</b>	<b>Sept</b>	<b>Unit-V</b>	<b>Ecology and Environment</b>		<b>15</b>
			5.1 Concept of environment, Concept and scope of ecology.	<b>02</b>	
			5.2 Ecological factors- Climatic- Light, Temperature and Water.	<b>02</b>	
			5.3 Atmosphere and its composition.	<b>03</b>	
			5.4 Edaphic factor- Process of soil formation, soil profile, soil biota and their role.	<b>04</b>	
			5.5 Ecological Adaptations - Morphological and Anatomical adaptation in Hydrophytes, and Xerophytes	<b>04</b>	
<b>06</b>	<b>Oct</b>	<b>Unit-VI</b>	<b>Ecosystem</b>		<b>15</b>
			6.1 Population Ecology- Natalty and Mortality, Community characteristics – Frequency, Density and Abundance	<b>05</b>	
			6.2 Ecological Succession - Hydrosere and Xerosere	<b>03</b>	
			6.3 Ecosystem – Definition, Structure and Function, Food chain, Food web, Energy flow model (Single channel model)	<b>05</b>	
			6.4 Types of Ecosystem- Pond ecosystem, Desert ecosystem.	<b>02</b>	

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Class: B.Sc. III		Sem V		Subject: Botany	
PLANT PHYSIOLOGY AND ECOLOGY					
LABORATORY EXERCISE (PRACTICALS)					
Sr. No.	Month	Practical No.	Practical Name	Practical Required	Total Practical
01	July-August		<b>Plant Physiology Major experiment (Any Seven)</b>		07
		1	To study the effect of temperature and organic solvent on permeability of plasma membrane.	01	
		2	To study osmotic pressure of cell sap by plasmolytic method.	01	
		3	To determine the path of water (ascent of sap)	01	
		4	To determine the rate of transpiration by Ganongs photometer/Screen.	01	
		5	To determine rate of photosynthesis under varying quality of light and CO2 concentration.	01	
		6	Separation of chloroplast pigments by paper chromatography/solvent extraction method.	01	
		7	To determine R.Q. using different substrates.	01	
02	August		<b>Plant Physiology Minor experiment (Any Three)</b>		03
		8	To demonstrate fermentation.	01	
		9	To demonstrate exo and endosmosis	01	
		10	To demonstrate the phenomenon of nastic movement with help of <i>Mimosa pudica</i> / or <i>Biophytum sensitivum</i> .	01	
03	Aug-Sept		<b>Ecology: Major experiment (Any Three)</b>		05
		11	Study of morphological and anatomical adaptations in hydrophytes – <i>Hydrilla</i> , <i>Eichhornia</i> , <i>Typha</i> , <i>Vallisneria</i> and <i>Nymphaea</i> (any two)	02	
		12	Study of morphological and anatomical adaptations in xerophytes - <i>Asparagus</i> , <i>Nerium</i> , <i>Casuarina</i> , <i>Euphorbia</i> , <i>Cycas</i> , <i>Opuntia</i> (any two)	02	
		13	Study of community characterstics by quadrat method.	01	
04	Sept-Oct		<b>Ecology: Minor experiment (Any Two)</b>		02
		14	Determination of pH of different soils and water samples by pH papers/ pH meter.	01	
		15	Study of meteorological instruments -Rain gauge, Hygrometer, Barometer	01	
05	Oct		<b>Subject related Project &amp; Seminar</b>		

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Class: B.Sc. III		Sem VI		Subject: Botany	
MOLECULAR BIOLOGY AND BIOTECHNOLOGY					
Sr. No.	Month	Unit No.	Topic Name	Period Required	Total Period
01	January	UNIT-I	Unit-I : DNA the genetic material :		15
			1.1 Historical account – Giffith’s Expt, Hershy and Chase Expt.	04	
			1.2 DNA– Chemical composition and Double Helical model,	02	
			1.3 DNA replication in Eukaryotes;	03	
			1.4 DNA Packaging - Nucleosome and Solenoid	03	
			1.5 Satellite, Repetitive DNA and Transposable element in plants (AC-DS system)	03	
02	January	UNIT-II	Unit-II : Gene Structure and Expression -		15
			2.1 Concept of gene, Fine structure of Gene	03	
			2.2 Gene Expression – Central Dogma, Types of RNA, Genetic code, Ribosome as a translation machine	03	
			2.3 Transcription in Eukaryotes – Mechanism of Transcription and RNA Processing	03	
			2.4 Translation in Eukaryotes.	03	
			2.5 Endomembrane system (Flow of Peptide)	03	
03	February	UNIT-III	Unit – III : Regulation of Gene Expression		15
			3.1 Regulation of Gene Expression in Prokaryotes – Operon concept with special reference to Lac Operon	03	
			3.2 Regulation of gene expression of Eukaryotes – Britton Davidson Model	03	
			3.3 Protein Folding Mechanism and Structure (Primary, Secondary, Tertiary and Quaternary)	03	
			3.4 Protein Sorting – Targeting to proteins to organelles	03	
			3.5 Protein Trafficking	03	
04	February	Unit-IV	Unit-IV : Genetic Engineering -		15

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			4.1 Tools and techniques of recombinant DNA technology,	<b>02</b>	
			4.2 Restriction Enzymes – Nomenclature and Types	<b>02</b>	
			4.3 Cloning vectors – Plasmids, Phages, Cosmids	<b>03</b>	
			4.4 Gene Source- Genomic and c-DNA library	<b>03</b>	
			4.5 Gene Transfer Techniques – Direct - (1) Chemical method, (2) Electroporation, (3) Gene gun method Indirect – Agrobacterium mediated gene transfer	<b>03</b>	
			4.6 Gene Amplification - _Polymerase Chain Reaction (PCR	<b>02</b>	
<b>05</b>	<b>Feb-March</b>	<b>Unit-V</b>	<b>Unit-V : Plant Tissue Culture -</b>		
			5.1 Basic aspects of plant tissue culture	<b>03</b>	
			5.2 Laboratory Requirement – Infrastructure, Instruments (laminar air flow, autoclave, growth chamber), Culture Media (MS Media), Growth Hormone (Auxin, Cytokinin and Gibberellins) Sterilization Techniques	<b>06</b>	
			5.3 Tissue Culture Technique - Cellular totipotency, differentiation and morphogenesis; Callus Culture; Micro propagation	<b>06</b>	<b>15</b>
<b>06</b>	<b>March</b>	<b>Unit-VI</b>	<b>Unit-VI : Applications of Biotechnology</b>		
			6.1 Agriculture – Haploid plant production (Anther and Pollen Culture); Protoplast Culture and Somatic Hybridization; Transgenic Plant - BT Cotton, Synthetic seed. Salient achievements of crop biotechnology	<b>04</b>	
			6.2 Industry– Fermentation Technology- Bakery Products and Alcohol Productions.	<b>04</b>	
			6.3 Health Care – Edible Vaccines	<b>03</b>	
			6.4 Conservation – Cryopreservation, Genetically Modified Organisms: - Pros and Cons	<b>04</b>	<b>15</b>
<b>07</b>	<b>March</b>		<b>Subject related Project &amp; Seminar</b>		

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Class: B.Sc. III		Sem VI		Subject: Botany	
MOLECULAR BIOLOGY AND BIOTECHNOLOGY					
LABORATORY EXERCISE (PRACTICALS)					
Sr. No.	Month	Practical No.	Practical Name	Practical Required	Total Practical
01	January		1) Molecular biology (Major) (Any One)		06
		1	1. Isolation of DNA by crude method	02	
			2) Molecular biology (Minor) (Any One)		
		2	1. Demonstration of DNA Electrophoresis	02	
			3) Biotechnology (Any Six)		
		3	1. Working Principle and application of Autoclave	02	
02	February	4	2. Working Principle and application of Laminar Air Flow.	01	05
		5	3. Cleaning and Sterilization of Glassware	01	
		6	4. Sterilization of Explant	01	
		7	6. Demonstration of in vitro culture techniques – anther and pollen culture	02	
03	March	8	9. Demonstration of technique of Micropropagation	02	02
			Visit to molecular biology, biotechnological research institute/ industry		
04				Practical Examination	



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Class: B.Sc. I		Sem I		Subject: Botany	
Sr. No.	Month	Unit No.	Topic Name	Period Required	Total Period
01	July	UNIT-I	<b>Plant Diversity (15)</b>		15
			1.1 Introduction to Plant Kingdom: Cryptogams	03	
			1.2 Diversity of plants with respect to habitat, form, nutrition and ecological status	03	
			1.3 General Account of Viruses and structure of TMV and HIV	03	
			1.4 Bacteria: structure, Nutrition and reproduction	03	
			1.5 Role of microbes in Agriculture, Medicine and Industries	03	
02	Aug- Sept	UNIT-II	<b>Algae (15)</b>		15
			2.1. Classification according to F. E. Fritsch and G. M. Smith up to classes	02	
			2.2. General characters of algae with reference to Habitat, Thallus organization, Pigmentation, Reserve food and Reproduction	02	
			2.3. General characters of following classes with special reference to examples mentioned	02	
			2.3.1. Chlorophyta - Oedogonium	03	
			2.3.2. Charophyta – Chara (Thallus structure and reproduction)	03	
			2.3.3. Phaeophyta – Sargassum (Thallus structure and reproduction)	02	
			2.3.4. Rhodophyta – Batrachospermum	01	
03		UNIT-III	<b>Fungi (15)</b>		15
			3.1. General characteristics of following classes with special reference to examples mentioned	03	
			3.1.1. Mastigomycotina : Albugo (Cystopus)	03	
			3.1.2. Ascomycotina : Aspergillus	02	
			3.1.3. Basidiomycotina : Puccinia graminis-tritici	02	
			3.1.4. Deuteromycotina : General characters	03	
04	Sept	Unit-IV	<b>Bryophyte (15)</b>		15
			4.1. General characters, thallus organization and life cycle of	03	
			4.1.1. Hepaticopsida – Marchantia	03	
			4.1.2. Bryopsida – Funaria	03	
			4.2. Affinities of bryophytes with algae and pteridophytes	03	
			4.5. Brief Account on some Indian Bryologist	03	
05	Sept-Oct	Unit-V	<b>Pteridophyte (15)</b>		15

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			5.1. Pteridophytes as First Vascular Plants.	<b>02</b>	
			5.3. General characters of the following classes with special reference to examples mentioned –	<b>02</b>	
			5.3.1. Sphenopsida – Equisetum	<b>03</b>	
			5.3.2. Filicopsida – Marsilea	<b>03</b>	
			5.4. Stele types in pteridophytes	<b>02</b>	
			5.5 Heterospory and Seed Habit in Pteridophytes	<b>03</b>	
<b>06</b>	<b>Oct</b>	<b>Unit-VI</b>	<b>Application of Microbes Cryptogams (15)</b>		<b>15</b>
			6.1. Economic Importance of Algae with special reference to Food, Industries, Agriculture and Harmful aspects	<b>03</b>	
			6.2. Mycorrhiza – Types and Application	<b>02</b>	
			6.3. Role of Fungi in Industries, Medicine, Food & Agriculture	<b>02</b>	
			6.4. Plant Diseases –	<b>02</b>	
			6.4.1. Viral –TMV	<b>02</b>	
			6.4.2. Bacteria – Black arm of cotton (Xanthomonos malvacearum)	<b>02</b>	
			6.4.3. Fungal – Tikka disease of groundnut (Cercospora sps.)	<b>02</b>	

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Class: B.Sc. I		Sem I		Subject: Botany	
DIVERSITY & APPLICATIONS OF MICROBES AND CRYPTOGRAMS					
LABORATORY EXERCISE (PRACTICALS)					
Sr. No.	Month	Practical No.	Practical Name	Practical Required	Total Practical
01	July		<b>ALGAE</b> Preparation of temporary mount, identification with reason of following algal materials		07
		1	1. <i>Oedogonium</i> ,	01	
		2	2 <i>Hydrodictyon</i>	01	
		3	3 <i>Chara</i> ,	01	
		4	4 <i>Vaucheria</i>	01	
		5	5 <i>Ectocarpus</i>	01	
		6	6 <i>Sargassum</i>	01	
		7	7. <i>Batrachospermum</i>	01	
02	August		<b>FUNGI AND PLANT PATHOLOGY</b>		06
		8	Study of following genera <i>Albugo</i> , <i>Uncinula</i> ,	01	
		9	<i>Penicillium</i> , <i>Agaricus</i> ,	01	
		10	<i>Puccinia</i> , <i>Cercospora</i>	01	
		11	Study of Crustose, Fruticose & Foliose Lichen	01	
		12	Study of symptoms of fungal, viral, bacterial and Mycoplasmal diseases	01	
		13	Demonstration of Mushroom Cultivation Technology	01	
03	Sept		<b>BRYOPHYTES</b>		05
		14	Study of external and anatomy features of vegetative and reproductive parts of following genera – <i>Marchantia</i> ,	01	
		15	<i>Anthoceros</i> ,	01	
		16	<i>Funaria</i> ,	01	
		17	<i>Polytrichum</i>	01	
		18	<i>Sphagnum</i>	01	
04	Sept-Oct		<b>PTERIDOPHYTES</b> Study of Pteridophyte external and anatomy features of vegetative and reproductive parts of following genera –		07
		19	<i>Lycopodium</i>	01	
		20	<i>Equisetum</i> ,	01	
		21	<i>Osmunda</i> ,	01	
		22	<i>Selaginella</i> ,	01	
		23	<i>Adiantum</i> ,	01	
		24	<i>Marsilea</i>	01	
		25	Any one fossil specimen	01	
05	Oct		Botanical excursion		
06	Oct		Common algal, fugal, pathological, bryophytic and pteridophytic collection and excursion report must be submitted at the time of practical exam		

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Class: B.Sc. I		Sem II		Subject: Botany	
GYMNOSPERM, MORPHOLOGY OF ANGIOSPERMS AND UTILIZATION OF PLANTS					
01	January	UNIT-I	UNIT-I: Palaeobotany (15)		15
			1.1. Process of plant fossilization and types of fossils	03	
			1.2. Geological Time Scale	03	
			1.3. Fossil Gymnosperms	03	
			1.3.1. Pteridospermales: Lyginopteris oldhamia	03	
			1.3.2. Bennettitales: Bennittites	03	
02	Jan-Feb	UNIT-II	UNIT-II : Gymnosperms (15)		15
			2.1. Classification according to D. D. Pant	03	
			2.2. General account: morphology, anatomy, life cycle and taxonomic position of Pinus and Gnetum	04	
			2.3. Affinities with pteridophytes and angiosperms	04	
			2.4. Economic importance of Gymnosperms	04	
03	Feb	UNIT-III	UNIT-III: Morphology (15)		15
			3.1. Diversity in Plants habits – Annual, biannual, perennials	03	
			3.2. Roots – Types of root : tap and adventitious, modification of root : for food storage, respiration and supports.	04	
			3.3. Stem – Types of Stem, Characteristic features, branching, modification of Stem – Underground and aerial	04	
			3.4. Leaf – Parts of leaf, types of leaves – simple and compound; Phyllotaxy; Venation; Stipule. Modification of leaves	04	
04	Feb	Unit-IV	UNIT-IV: Morphology (15)		15
			4.1. Inflorescences – Types: Racemose, Cymose and Special	06	
			4.2. Flower – Flower as modified shoot; Structure of flower – Calyx, Corolla, Androecium and Gynoecium. Placentation; Types of Pollination.	09	
05	March	Unit-V	UNIT-V : Morphology and Utilization of Plants (15)		15
			5.1. Fruits – Morphological types	03	
			5.2. Utilization of Plants	03	
			5.2.1. Food Plants – Wheat, Potato –Morphology, varieties and economic importance.	03	
			5.2.2. Fiber Plant – Morphology, varieties and economic importance of Cotton.	03	
			5.2.3. Oil yielding Plant – Morphology, Varieties and economic importance of Ground nut.	03	
06	March	Unit-VI	UNIT-VI: Utilization of Plants (15)		15
			6.1. Spices – General account and economic importance of Black pepper, Clove, Cinnamon and Cardamom	02	
			6.2. General account and sources of firewood, timber and Bamboos.	02	
			6.3. Essential oils – General account, economic importance of Eucalyptus.	02	
			6.4. Pharmacognosy and Phytochemistry with respect to following medicinal plants –		
			6.4.1. Aloe vera	01	
			6.4.2. Adathoda vasica	01	
			6.4.3. Asparagus racemosa	01	

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		6.4.4. Azadirachta indica	01	
		6.4.5. Catharanthus roseus		
		6.4.6. Chlorophytum borivillianum	01	
		6.4.7. Emblica officinalis	01	
		6.4.8. Ocimum sanctum	01	
		6.4.9. Rauwolfia serpentina	01	
		6.4.10. Vitex negundo	01	
		6.4.11. Withania somnifera		

Class: B.Sc. I		Sem II		Subject: Botany	
GYMNOSPERM, MORPHOLOGY OF ANGIOSPERMS AND UTILIZATION OF PLANTS					
LABORATORY EXERCISE (PRACTICALS)					
Sr. No.	Month	Practical No.	Practical Name	Practical Required	Total Practical
01	January		I. Gymnosperms: Morphology and anatomy of the following members –		07
		1	a. Pinus: Root, Stem, Leaf	02	
		2	b. Gnetum: Root, Stem, Leaf	02	
		3	II. Preparation of double stained permanent mount of Pinus stem, needle and Gnetum stem and leaf	02	
		4	III. Study of fossil slides of Lyginopteris and Bennettites	01	
02	February	5	IV. Detailed morphological study of types of root, stem and leaf with its modifications	04	07
6	V. Forms of corolla	01			
7	VI. Types of placentation	01			
8	VII. Morphology of fruits	01			
03	March	9	VIII. Morphology of plant parts used and medicinal plants prescribed in syllabi	03	06
		10	IX. Utilization of plants: Spices, fiber yielding plants and food plants prescribed in syllabi	03	
		11	Botanical excursion		
04	March	12	Practical Examination		

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Class: B.Sc. II		Sem III		Subject: Botany	
ANGIOSPERM SYSTEMATICS, ANATOMY & EMBRYOLOGY					
Sr. No.	Month	Unit No.	Topic Name	Period Required	Total Period
01	July	UNIT-I	Angiosperm Systematics and Biodiversity		15
			1.1 Angiosperms: Origin and Evolution (Pteridospermean and Bennititalean Theory)	02	
			1.2 Botanical Nomenclature: Principles of rules, Taxonomic Ranks, Type concept, Valid publication.	03	
			1.3 Herbarium – Concept & significance, Royal Botanical Garden, Kolkata.	04	
			1.4 Concept of biodiversity, Ex situ and In situ conservation	04	
			1.5 Concept & importance of Biodiversity.	02	
02	August	UNIT-II	Angiosperm Systematics		15
			2.1 Systems of Classification: Bentham and Hooker’s System, Engler and Prantle’s system.	03	
			2.2 Systematic studies & economic importance of following Families: Dicotyledons (Polypetalae) : Malvaceae, Brassicaceae, Leguminosae, Apiaceae,	12	
03	Aug- Sept	UNIT-III	Angiosperm Systematics		15
			3.1 Systematic studies & economic importance of following Families: Dicotyledons (Gamopetalae): Asteraceae, Asclepiadaceae, Apocynaceae, Solanaceae, Verbenaceae, Lamiaceae.	10	
			3.2 Dicotyledons ( Monoclamydeae): Euphorbiaceae.	02	
			3.3 Monocotyledons: Liliaceae, Poaceae.	03	
04	Sept	Unit-IV	Anatomy		15
			4.1 Types of Tissues: Meristematic – Types of meristems Permanent – Simple and complex.	04	
			4.2 Characteristics of growth rings, Sapwood and heartwood.	04	
			4.3 Anatomy of root: Primary structure in dicot and monocot root, normal secondary growth in dicot root.	07	
05	Sept-Oct	Unit-V	Anatomy		15
			5.1 Anatomy of stem: Primary structure in monocot and dicot stem, normal	06	

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			secondary growth in dicot stem.		
			5.2 Anomalies in primary structure in <i>Boerhavia</i> stem, secondary structure in <i>Bignonia</i> and <i>Dracaena</i> stem.	<b>06</b>	
			5.3 Leaf Anatomy: Internal structure in <i>Nerium</i> and <i>Maize</i> leaf.	<b>03</b>	
<b>06</b>	<b>Oct</b>	<b>Unit-VI</b>	<b>Embryology</b>		<b>15</b>
			5.1 Microsporangium, microsporogenesis, development of male gametophyte.	<b>04</b>	
			5.2 Megasporangium, types of ovules, megasporogenesis, development of female gametophyte monosporic, Bisporic & tetrasporic).	<b>04</b>	
			5.3 Double fertilization and triple fusion.	<b>02</b>	
			5.4 Embryo – Classification of embryo.	<b>02</b>	
			5.5 Endosperm types & significance, Suspended animation	<b>03</b>	

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Class: B.Sc. II		Sem III		Subject: Botany			
ANGIOSPERM SYSTEMATICS, ANATOMY & EMBRYOLOGY							
LABORATORY EXERCISE (PRACTICALS)							
Sr. No.	Month	Practical No.	Practical Name	Practical Required	Total Practical		
01	July		<b>Anatomy of angiosperms</b> : Preparation of double stained slides of root, stem and leaves of angiosperms mentioned in the syllabus		03		
		1	Anatomy of root in Dicot & Monocot	01			
		2	Anatomy of stem in Dicot & Monocot	01			
		3	Anatomy of Leaf in Dicot & Monocot	01			
02			<b>Taxonomy</b> : Description of ten plants belonging to different families in technical language and identification up to family level.		15		
		4	Brassicaceae	01			
		5	Malvaceae	01			
	August	6	Fabaceae	01			
		7	Caesalpinoidae	01			
		8	Mimosoidae	01			
		9	Apiaceae	01			
		10	Apocynaceae	01			
		11	Asclepiadaceae	01			
		12	Solanaceae	01			
		13	Euphorbiaceae	01			
		September	14	Lamiaceae		01	
			15	Asteraceae		01	
	16		Verbanaceae	01			
	17		Liliaceae	01			
	18		Poaceae	01			
	03			<b>Embryology of Angiosperms</b>			03
			19	Observation of wide range of flowers available in the locality and methods of their pollination.		01	
20			Study through permanent slides of T.S. of anthers, microsporogenesis, L.S. of ovule, types of endosperms and embryo of Capsella	01			
October		21	Mounting of T.S. of anthers, Pollen grains and pollinia.	01			
04			<b>Long and short excursion tour</b>				



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Class: B.Sc. II		Sem IV		Subject: Botany	
CELL BIOLOGY, GENETICS AND BIOCHEMISTRY					
Sr. No.	Month	Unit No.	Topic Name	Period Required	Total Period
01	Dec- January	UNIT-I	Unit – I : Cell Biology		15
			1.1 Cell concept – Prokaryotic and Eukaryotic cell	02	
			1.2 Cell wall –Structure and Functions	03	
			1.3 Plasma membrane –Structure (models) and Functions	04	
			1.4 Nucleus – Ultra structure (nuclear membrane, nuclear pore complex and nucleolus) and functions	04	
			1.5 Chloroplast- Structure and Functions	02	
02	Jan- Feb	UNIT-II	Unit–II : Cell Biology Structure and functions of-		15
			2.1 Endoplasmic Reticulum	03	
			2.2 Golgi complex	02	
			2.3 Vacuole	02	
			2.4 Ribosome	02	
			2.5 Perixysome	02	
			2.6 Mitochondria	02	
			2.7 Cell cycle: Mitosis and Meiosis	02	
03	February	UNIT-III	Unit – III : Genetics		15
			3.1 Chromosome- Morphology, Types, Centromere & Telomere	04	
			3.2 Chromosomal aberrations –		
			3.2.1 Structural aberrations: Deletion, Duplication, Inversion and Translocation	05	
			3.2.2 Numerical aberrations: Euploidy and aneuploidy	06	
04	Feb- March	Unit-IV	Unit–IV: Genetics		15
			4.1 Mendellism: Mendel’s law of Dominance, Segregations and Independent assortment, Incomplete dominance	05	
			4.2 Interaction of genes- Complimentary, Supplementary and Epistasis	05	
			4.3 Problems based on Mendelism and Interaction of Genes	05	
05	Feb- March	Unit-V	Unit – V Genetics		15
			5.1 Linkage – Concept, Types and theories	03	
			5.2 Crossing over: Concept, Types and theories	04	

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			5.3 Gene mutations- Spontaneous and Induced	<b>04</b>	
			5.4 Extra-nuclear Genome- Mitochondrial DNA and Chloroplast DNA	<b>04</b>	
<b>06</b>	<b>March</b>	<b>Unit-VI</b>	<b>Unit – VI Biochemistry</b>		
			6.1 Nomenclature of Enzymes	<b>03</b>	
			6.2 Characteristics of Enzymes	<b>03</b>	
			6.3 Concept of holoenzymes, coenzymes and cofactor	<b>03</b>	
			6.4 Theories for Mechanism of action of Enzymes	<b>03</b>	
			6.5 Structure and functions Carbohydrates: Monosaccharides (Glucose), Disaccharides (Galactose) and Polysaccharides (Starch)	<b>03</b>	<b>15</b>
<b>07</b>			<b>Subject related Project &amp; Seminar</b>		

Class: B.Sc. II		Sem IV		Subject: Botany	
CELL BIOLOGY, GENETICS AND BIOCHEMISTRY					
LABORATORY EXERCISE (PRACTICALS)					
Sr. No.	Month	Practical No.	Practical Name	Practical Required	Total Practical
01	January		I Cell Biology (Any Two)		04
		1	Squash preparation for the study of various stages of mitosis	02	
		2	Smear preparation for the study of various stages of meiosis.	02	
02	February		II Genetics		03
		3	1. To prove Mendel’s Monohybrid ratio.	01	
		4	2. To prove Mendel’s Dihybrid ratio	01	
		5	3. Problems based on Interaction of genes	01	
03	Feb-March		III Biochemistry		03
		6	1. To study the enzyme activity of catalase.	01	
		7	2. To demonstrate test for glucose in grapes, & sucrose in cane sugar / beet root.	01	
		8	3. To demonstrate test for protein.	01	
03	March	9	4. To demonstrate the lipid test in oily seeds.	01	03
		10	5. To demonstrate the test for starch / cellulose.	01	
		11	6. To demonstrate the activity of enzyme amylase from germinating Wheat grains	01	
			Practical Examination		

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Class: B.Sc. III		Sem V		Subject: Botany	
PLANT PHYSIOLOGY AND ECOLOGY					
Sr. No.	Month	Unit No.	Topic Name	Period Required	Total Period
01	July	UNIT-I	Plant Water Relations		15
			1.1 Importance of water to plant life. Imbibition , Diffusion,Osmosis, Plasmolysis.	04	
			1.2 Active and passive Absorption of water.	02	
			1.3 Ascent of sap - Root Pressure and Transpiration Pull Theory.	03	
			1.4 Transpiration - Types of transpiration, Stomatal movements, Mechanism of transpiration (Starch ) sugar hypothesis), Significance. Antitranspirant, Guttation.	03	
			1.5 Mineral uptake - Active uptake - Career Concept, Passive uptake Ion Exchange.	03	
02	July-August	UNIT-II	Metabolism-		15
			2.1 Photosynthesis - Introduction, Role of Light, Photosynthetic Apparatus and Pigments, Two Pigment Systems, Photophosphorylation, C3 and C4 cycle, CAM Pathway.	07	
			2.2 Respiration - Introduction, Mitochondria as a Respiratory centre, Types of Respiration - Aerobic and Anaerobic, Mechanism of aerobic respiration- Glycolysis, Krebs cycle, Electron transport system and Chemiosmotic ATP generation, Respiratory Quotient.	08	
03	August	UNIT-III	Metabolism and growth		15
			3.1 Nitrogen Metabolism- Sources of nitrogen, Symbiotic nitrogen fixation, Role of Nitrate reductase.	06	
			3.2 Growth - Phases of growth, Growth curve, Physiological role of growth hormones ( Auxins, Gibberellins, Cytokinins, Absciscic acid, and Ethylene).	06	
			3.3 Physiology of Senescence and Abscission.	03	
04	August-Sept	Unit-IV	Plant responses		15
			4.1 Photoperiodism - Concept of Florigen,	04	

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			Role of Phytochrome,		
			4.2 Vernalization- Concept and Significance.	<b>02</b>	
			4.3 Plant movement- Tropic (Phototropic and Geotropic) and Nastic (Epinasty, Hyponasty and Seismonasty)	<b>05</b>	
			4.4 Stress physiology- Concept, Types of stress, Water and Salinity stress.	<b>04</b>	
<b>05</b>	<b>Sept</b>	<b>Unit-V</b>	<b>Ecology and Environment</b>		<b>15</b>
			5.1 Concept of environment, Concept and scope of ecology.	<b>02</b>	
			5.2 Ecological factors- Climatic- Light, Temperature and Water.	<b>02</b>	
			5.3 Atmosphere and its composition.	<b>03</b>	
			5.4 Edaphic factor- Process of soil formation, soil profile, soil biota and their role.	<b>04</b>	
			5.5 Ecological Adaptations - Morphological and Anatomical adaptation in Hydrophytes, and Xerophytes	<b>04</b>	
<b>06</b>	<b>Oct</b>	<b>Unit-VI</b>	<b>Ecosystem</b>		<b>15</b>
			6.1 Population Ecology- Natalty and Mortality, Community characteristics – Frequency, Density and Abundance	<b>05</b>	
			6.2 Ecological Succession - Hydrosere and Xerosere	<b>03</b>	
			6.3 Ecosystem – Definition, Structure and Function, Food chain, Food web, Energy flow model (Single channel model)	<b>05</b>	
			6.4 Types of Ecosystem- Pond ecosystem, Desert ecosystem.	<b>02</b>	

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Class: B.Sc. III		Sem V		Subject: Botany	
PLANT PHYSIOLOGY AND ECOLOGY					
LABORATORY EXERCISE (PRACTICALS)					
Sr. No.	Month	Practical No.	Practical Name	Practical Required	Total Practical
01	July- August		<b>Plant Physiology Major experiment (Any Seven)</b>		07
		1	To study the effect of temperature and organic solvent on permeability of plasma membrane.	01	
		2	To study osmotic pressure of cell sap by plasmolytic method.	01	
		3	To determine the path of water (ascent of sap)	01	
		4	To determine the rate of transpiration by Ganongs photometer/Screen.	01	
		5	To determine rate of photosynthesis under varying quality of light and CO2 concentration.	01	
		6	Separation of chloroplast pigments by paper chromatography/solvent extraction method.	01	
		7	To determine R.Q. using different substrates.	01	
02	August		<b>Plant Physiology Minor experiment (Any Three)</b>		03
		8	To demonstrate fermentation.	01	
		9	To demonstrate exo and endosmosis	01	
		10	To demonstrate the phenomenon of nastic movement with help of <i>Mimosa pudica</i> / or <i>Biophytum sensitivum</i> .	01	
03	Aug-Sept		<b>Ecology: Major experiment (Any Three)</b>		05
		11	Study of morphological and anatomical adaptations in hydrophytes – <i>Hydrilla</i> , <i>Eichhornia</i> , <i>Typha</i> , <i>Vallisneria</i> and <i>Nymphaea</i> (any two)	02	
		12	Study of morphological and anatomical adaptations in xerophytes - <i>Asparagus</i> , <i>Nerium</i> , <i>Casuarina</i> , <i>Euphorbia</i> , <i>Cycas</i> , <i>Opuntia</i> (any two)	02	
		13	Study of community characterstics by quadrat method.	01	
04	Sept-Oct		<b>Ecology: Minor experiment (Any Two)</b>		02
		14	Determination of pH of different soils and water samples by pH papers/ pH meter.	01	
		15	Study of meteorological instruments -Rain gauge, Hygrometer, Barometer	01	
05	Oct		<b>Subject related Project &amp; Seminar</b>		

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Class: B.Sc. III		Sem VI		Subject: Botany	
MOLECULAR BIOLOGY AND BIOTECHNOLOGY					
Sr. No.	Month	Unit No.	Topic Name	Period Required	Total Period
01	January	UNIT-I	Unit-I : DNA the genetic material :		15
			1.1 Historical account – Giffith’s Expt, Hershy and Chase Expt.	04	
			1.2 DNA– Chemical composition and Double Helical model,	02	
			1.3 DNA replication in Eukaryotes;	03	
			1.4 DNA Packaging - Nucleosome and Solenoid	03	
			1.5 Satellite, Repetitive DNA and Transposable element in plants (AC-DS system)	03	
02	January	UNIT-II	Unit-II : Gene Structure and Expression -		15
			2.1 Concept of gene, Fine structure of Gene	03	
			2.2 Gene Expression – Central Dogma, Types of RNA, Genetic code, Ribosome as a translation machine	03	
			2.3 Transcription in Eukaryotes – Mechanism of Transcription and RNA Processing	03	
			2.4 Translation in Eukaryotes.	03	
			2.5 Endomembrane system (Flow of Peptide)	03	
03	February	UNIT-III	Unit – III : Regulation of Gene Expression		15
			3.1 Regulation of Gene Expression in Prokaryotes – Operon concept with special reference to Lac Operon	03	
			3.2 Regulation of gene expression of Eukaryotes – Britton Davidson Model	03	
			3.3 Protein Folding Mechanism and Structure (Primary, Secondary, Tertiary and Quaternary)	03	
			3.4 Protein Sorting – Targeting to proteins to organelles	03	
			3.5 Protein Trafficking	03	
04	February	Unit-IV	Unit-IV : Genetic Engineering -		15

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			4.1 Tools and techniques of recombinant DNA technology,	<b>02</b>	
			4.2 Restriction Enzymes – Nomenclature and Types	<b>02</b>	
			4.3 Cloning vectors – Plasmids, Phages, Cosmids	<b>03</b>	
			4.4 Gene Source- Genomic and c-DNA library	<b>03</b>	
			4.5 Gene Transfer Techniques – Direct - (1) Chemical method, (2) Electroporation, (3) Gene gun method Indirect – Agrobacterium mediated gene transfer	<b>03</b>	
			4.6 Gene Amplification - _Polymerase Chain Reaction (PCR	<b>02</b>	
<b>05</b>	<b>Feb-March</b>	<b>Unit-V</b>	<b>Unit-V : Plant Tissue Culture -</b>		
			5.1 Basic aspects of plant tissue culture	<b>03</b>	
			5.2 Laboratory Requirement – Infrastructure, Instruments (laminar air flow, autoclave, growth chamber), Culture Media (MS Media), Growth Hormone (Auxin, Cytokinin and Gibberellins) Sterilization Techniques	<b>06</b>	
			5.3 Tissue Culture Technique - Cellular totipotency, differentiation and morphogenesis; Callus Culture; Micro propagation	<b>06</b>	<b>15</b>
<b>06</b>	<b>March</b>	<b>Unit-VI</b>	<b>Unit-VI : Applications of Biotechnology</b>		
			6.1 Agriculture – Haploid plant production (Anther and Pollen Culture); Protoplast Culture and Somatic Hybridization; Transgenic Plant - BT Cotton, Synthetic seed. Salient achievements of crop biotechnology	<b>04</b>	
			6.2 Industry– Fermentation Technology- Bakery Products and Alcohol Productions.	<b>04</b>	
			6.3 Health Care – Edible Vaccines	<b>03</b>	
			6.4 Conservation – Cryopreservation, Genetically Modified Organisms: - Pros and Cons	<b>04</b>	<b>15</b>
<b>07</b>	<b>March</b>		<b>Subject related Project &amp; Seminar</b>		

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Class: B.Sc. III		Sem VI		Subject: Botany	
MOLECULAR BIOLOGY AND BIOTECHNOLOGY					
LABORATORY EXERCISE (PRACTICALS)					
Sr. No.	Month	Practical No.	Practical Name	Practical Required	Total Practical
01	January		1) Molecular biology (Major) (Any One)		06
		1	1. Isolation of DNA by crude method	02	
			2) Molecular biology (Minor) (Any One)		
		2	1. Demonstration of DNA Electrophoresis	02	
			3) Biotechnology (Any Six)		
		3	1. Working Principle and application of Autoclave	02	
02	February	4	2. Working Principle and application of Laminar Air Flow.	01	05
		5	3. Cleaning and Sterilization of Glassware	01	
		6	4. Sterilization of Explant	01	
		7	6. Demonstration of in vitro culture techniques – anther and pollen culture	02	
03	March	8	9. Demonstration of technique of Micropropogation	02	02
			Visit to molecular biology, biotechnological research institute/ industry		
04				Practical Examination	



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Class: B.Sc. I		Sem I		Subject: Botany	
Sr. No.	Month	Unit No.	Topic Name	Period Required	Total Period
01	July	UNIT-I	<b>Plant Diversity (15)</b>		15
			1.1 Introduction to Plant Kingdom: Cryptogams	03	
			1.2 Diversity of plants with respect to habitat, form, nutrition and ecological status	03	
			1.3 General Account of Viruses and structure of TMV and HIV	03	
			1.4 Bacteria: structure, Nutrition and reproduction	03	
			1.5 Role of microbes in Agriculture, Medicine and Industries	03	
02	Aug- Sept	UNIT-II	<b>Algae (15)</b>		15
			2.1. Classification according to F. E. Fritsch and G. M. Smith up to classes	02	
			2.2. General characters of algae with reference to Habitat, Thallus organization, Pigmentation, Reserve food and Reproduction	02	
			2.3. General characters of following classes with special reference to examples mentioned	02	
			2.3.1. Chlorophyta - Oedogonium	03	
			2.3.2. Charophyta – Chara (Thallus structure and reproduction)	03	
			2.3.3. Phaeophyta – Sargassum (Thallus structure and reproduction)	02	
			2.3.4. Rhodophyta – Batrachospermum	01	
03		UNIT-III	<b>Fungi (15)</b>		15
			3.1. General characteristics of following classes with special reference to examples mentioned	03	
			3.1.1. Mastigomycotina : Albugo (Cystopus)	03	
			3.1.2. Ascomycotina : Aspergillus	02	
			3.1.3. Basidiomycotina : Puccinia graminis-tritici	02	
			3.1.4. Deuteromycotina : General characters	03	
04	Sept	Unit-IV	<b>Bryophyte (15)</b>		15
			4.1. General characters, thallus organization and life cycle of	03	
			4.1.1. Hepaticopsida – Marchantia	03	
			4.1.2. Bryopsida – Funaria	03	
			4.2. Affinities of bryophytes with algae and pteridophytes	03	
			4.5. Brief Account on some Indian Bryologist	03	
05	Sept-Oct	Unit-V	<b>Pteridophyte (15)</b>		15

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			5.1. Pteridophytes as First Vascular Plants.	<b>02</b>	
			5.3. General characters of the following classes with special reference to examples mentioned –	<b>02</b>	
			5.3.1. Sphenopsida – Equisetum	<b>03</b>	
			5.3.2. Filicopsida – Marsilea	<b>03</b>	
			5.4. Stele types in pteridophytes	<b>02</b>	
			5.5 Heterospory and Seed Habit in Pteridophytes	<b>03</b>	
<b>06</b>	<b>Oct</b>	<b>Unit-VI</b>	<b>Application of Microbes Cryptogams (15)</b>		<b>15</b>
			6.1. Economic Importance of Algae with special reference to Food, Industries, Agriculture and Harmful aspects	<b>03</b>	
			6.2. Mycorrhiza – Types and Application	<b>02</b>	
			6.3. Role of Fungi in Industries, Medicine, Food & Agriculture	<b>02</b>	
			6.4. Plant Diseases –	<b>02</b>	
			6.4.1. Viral –TMV	<b>02</b>	
			6.4.2. Bacteria – Black arm of cotton (Xanthomonos malvacearum)	<b>02</b>	
			6.4.3. Fungal – Tikka disease of groundnut (Cercospora sps.)	<b>02</b>	

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Class: B.Sc. I		Sem I		Subject: Botany	
DIVERSITY & APPLICATIONS OF MICROBES AND CRYPTOGRAMS					
LABORATORY EXERCISE (PRACTICALS)					
Sr. No.	Month	Practical No.	Practical Name	Practical Required	Total Practical
01	July		<b>ALGAE</b> Preparation of temporary mount, identification with reason of following algal materials		07
		1	1. <i>Oedogonium</i> ,	01	
		2	2 <i>Hydrodictyon</i>	01	
		3	3 <i>Chara</i> ,	01	
		4	4 <i>Vaucheria</i>	01	
		5	5 <i>Ectocarpus</i>	01	
		6	6 <i>Sargassum</i>	01	
		7	7. <i>Batrachospermum</i>	01	
02	August		<b>FUNGI AND PLANT PATHOLOGY</b>		06
		8	Study of following genera <i>Albugo</i> , <i>Uncinula</i> ,	01	
		9	<i>Penicillium</i> , <i>Agaricus</i> ,	01	
		10	<i>Puccinia</i> , <i>Cercospora</i>	01	
		11	Study of Crustose, Fruticose & Foliose Lichen	01	
		12	Study of symptoms of fungal, viral, bacterial and Mycoplasmal diseases	01	
		13	Demonstration of Mushroom Cultivation Technology	01	
03	Sept		<b>BRYOPHYTES</b>		05
		14	Study of external and anatomy features of vegetative and reproductive parts of following genera – <i>Marchantia</i> ,	01	
		15	<i>Anthoceros</i> ,	01	
		16	<i>Funaria</i> ,	01	
		17	<i>Polytrichum</i>	01	
		18	<i>Sphagnum</i>	01	
04	Sept-Oct		<b>PTERIDOPHYTES</b> Study of Pteridophyte external and anatomy features of vegetative and reproductive parts of following genera –		07
		19	<i>Lycopodium</i>	01	
		20	<i>Equisetum</i> ,	01	
		21	<i>Osmunda</i> ,	01	
		22	<i>Selaginella</i> ,	01	
		23	<i>Adiantum</i> ,	01	
		24	<i>Marsilea</i>	01	
		25	Any one fossil specimen	01	
05	Oct		Botanical excursion		
06	Oct		Common algal, fugal, pathological, bryophytic and pteridophytic collection and excursion report must be submitted at the time of practical exam		

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Class: B.Sc. I		Sem II		Subject: Botany	
GYMNOSPERM, MORPHOLOGY OF ANGIOSPERMS AND UTILIZATION OF PLANTS					
01	January	UNIT-I	UNIT-I: Palaeobotany (15)		15
			1.1. Process of plant fossilization and types of fossils	03	
			1.2. Geological Time Scale	03	
			1.3. Fossil Gymnosperms	03	
			1.3.1. Pteridospermales: Lyginopteris oldhamia	03	
			1.3.2. Bennettitales: Bennittites	03	
02	Jan-Feb	UNIT-II	UNIT-II : Gymnosperms (15)		15
			2.1. Classification according to D. D. Pant	03	
			2.2. General account: morphology, anatomy, life cycle and taxonomic position of Pinus and Gnetum	04	
			2.3. Affinities with pteridophytes and angiosperms	04	
			2.4. Economic importance of Gymnosperms	04	
03	Feb	UNIT-III	UNIT-III: Morphology (15)		15
			3.1. Diversity in Plants habits – Annual, biannual, perennials	03	
			3.2. Roots – Types of root : tap and adventitious, modification of root : for food storage, respiration and supports.	04	
			3.3. Stem – Types of Stem, Characteristic features, branching, modification of Stem – Underground and aerial	04	
			3.4. Leaf – Parts of leaf, types of leaves – simple and compound; Phyllotaxy; Venation; Stipule. Modification of leaves	04	
04	Feb	Unit-IV	UNIT-IV: Morphology (15)		15
			4.1. Inflorescences – Types: Racemose, Cymose and Special	06	
			4.2. Flower – Flower as modified shoot; Structure of flower – Calyx, Corolla, Androecium and Gynoecium. Placentation; Types of Pollination.	09	
05	March	Unit-V	UNIT-V : Morphology and Utilization of Plants (15)		15
			5.1. Fruits – Morphological types	03	
			5.2. Utilization of Plants	03	
			5.2.1. Food Plants – Wheat, Potato –Morphology, varieties and economic importance.	03	
			5.2.2. Fiber Plant – Morphology, varieties and economic importance of Cotton.	03	
			5.2.3. Oil yielding Plant – Morphology, Varieties and economic importance of Ground nut.	03	
06	March	Unit-VI	UNIT-VI: Utilization of Plants (15)		15
			6.1. Spices – General account and economic importance of Black pepper, Clove, Cinnamon and Cardamom	02	
			6.2. General account and sources of firewood, timber and Bamboos.	02	
			6.3. Essential oils – General account, economic importance of Eucalyptus.	02	
			6.4. Pharmacognosy and Phytochemistry with respect to following medicinal plants –		
			6.4.1. Aloe vera	01	
			6.4.2. Adathoda vasica	01	
			6.4.3. Asparagus racemosa	01	

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		6.4.4. Azadirachta indica	01	
		6.4.5. Catharanthus roseus		
		6.4.6. Chlorophytum borivillianum	01	
		6.4.7. Emblica officinalis	01	
		6.4.8. Ocimum sanctum	01	
		6.4.9. Rauwolfia serpentina	01	
		6.4.10. Vitex negundo	01	
		6.4.11. Withania somnifera		

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GYMNOSPERM, MORPHOLOGY OF ANGIOSPERMS AND UTILIZATION OF PLANTS					
LABORATORY EXERCISE (PRACTICALS)					
Sr. No.	Month	Practical No.	Practical Name	Practical Required	Total Practical
01	January		I. Gymnosperms: Morphology and anatomy of the following members –		07
		1	a. Pinus: Root, Stem, Leaf	02	
		2	b. Gnetum: Root, Stem, Leaf	02	
		3	II. Preparation of double stained permanent mount of Pinus stem, needle and Gnetum stem and leaf	02	
		4	III. Study of fossil slides of Lyginopteris and Bennettites	01	
02	February	5	IV. Detailed morphological study of types of root, stem and leaf with its modifications	04	07
6	V. Forms of corolla	01			
7	VI. Types of placentation	01			
8	VII. Morphology of fruits	01			
03	March	9	VIII. Morphology of plant parts used and medicinal plants prescribed in syllabi	03	06
		10	IX. Utilization of plants: Spices, fiber yielding plants and food plants prescribed in syllabi	03	
		11	Botanical excursion		
04	March	12	Practical Examination		

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Class: B.Sc. II		Sem III		Subject: Botany	
ANGIOSPERM SYSTEMATICS, ANATOMY & EMBRYOLOGY					
Sr. No.	Month	Unit No.	Topic Name	Period Required	Total Period
01	July	UNIT-I	Angiosperm Systematics and Biodiversity		15
			1.1 Angiosperms: Origin and Evolution (Pteridospermean and Bennititalean Theory)	02	
			1.2 Botanical Nomenclature: Principles of rules, Taxonomic Ranks, Type concept, Valid publication.	03	
			1.3 Herbarium – Concept & significance, Royal Botanical Garden, Kolkata.	04	
			1.4 Concept of biodiversity, Ex situ and In situ conservation	04	
			1.5 Concept & importance of Biodiversity.	02	
02	August	UNIT-II	Angiosperm Systematics		15
			2.1 Systems of Classification: Bentham and Hooker’s System, Engler and Prantle’s system.	03	
			2.2 Systematic studies & economic importance of following Families: Dicotyledons (Polypetalae) : Malvaceae, Brassicaceae, Leguminosae, Apiaceae,	12	
03	Aug- Sept	UNIT-III	Angiosperm Systematics		15
			3.1 Systematic studies & economic importance of following Families: Dicotyledons (Gamopetalae): Asteraceae, Asclepiadaceae, Apocynaceae, Solanaceae, Verbenaceae, Lamiaceae.	10	
			3.2 Dicotyledons ( Monoclamydeae): Euphorbiaceae.	02	
			3.3 Monocotyledons: Liliaceae, Poaceae.	03	
04	Sept	Unit-IV	Anatomy		15
			4.1 Types of Tissues: Meristematic – Types of meristems Permanent – Simple and complex.	04	
			4.2 Characteristics of growth rings, Sapwood and heartwood.	04	
			4.3 Anatomy of root: Primary structure in dicot and monocot root, normal secondary growth in dicot root.	07	
05	Sept-Oct	Unit-V	Anatomy		15
			5.1 Anatomy of stem: Primary structure in monocot and dicot stem, normal	06	

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			secondary growth in dicot stem.		
			5.2 Anomalies in primary structure in <i>Boerhavia</i> stem, secondary structure in <i>Bignonia</i> and <i>Dracaena</i> stem.	<b>06</b>	
			5.3 Leaf Anatomy: Internal structure in <i>Nerium</i> and <i>Maize</i> leaf.	<b>03</b>	
<b>06</b>	<b>Oct</b>	<b>Unit-VI</b>	<b>Embryology</b>		<b>15</b>
			5.1 Microsporangium, microsporogenesis, development of male gametophyte.	<b>04</b>	
			5.2 Megasporangium, types of ovules, megasporogenesis, development of female gametophyte monosporic, Bisporic & tetrasporic).	<b>04</b>	
			5.3 Double fertilization and triple fusion.	<b>02</b>	
			5.4 Embryo – Classification of embryo.	<b>02</b>	
			5.5 Endosperm types & significance, Suspended animation	<b>03</b>	

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Class: B.Sc. II		Sem III		Subject: Botany			
ANGIOSPERM SYSTEMATICS, ANATOMY & EMBRYOLOGY							
LABORATORY EXERCISE (PRACTICALS)							
Sr. No.	Month	Practical No.	Practical Name	Practical Required	Total Practical		
01	July		<b>Anatomy of angiosperms</b> : Preparation of double stained slides of root, stem and leaves of angiosperms mentioned in the syllabus		03		
		1	Anatomy of root in Dicot & Monocot	01			
		2	Anatomy of stem in Dicot & Monocot	01			
		3	Anatomy of Leaf in Dicot & Monocot	01			
02			<b>Taxonomy</b> : Description of ten plants belonging to different families in technical language and identification up to family level.		15		
		4	Brassicaceae	01			
	August	5	Malvaceae	01			
		6	Fabaceae	01			
		7	Caesalpinoidae	01			
		8	Mimosoidae	01			
		9	Apiaceae	01			
		10	Apocynaceae	01			
		11	Asclepiadaceae	01			
		12	Solanaceae	01			
		13	Euphorbiaceae	01			
		September	14	Lamiaceae		01	
			15	Asteraceae		01	
	16		Verbanaceae	01			
	17		Liliaceae	01			
	18		Poaceae	01			
	03			<b>Embryology of Angiosperms</b>			03
			19	Observation of wide range of flowers available in the locality and methods of their pollination.		01	
20			Study through permanent slides of T.S. of anthers, microsporogenesis, L.S. of ovule, types of endosperms and embryo of Capsella	01			
October		21	Mounting of T.S. of anthers, Pollen grains and pollinia.	01			
04			<b>Long and short excursion tour</b>				



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Class: B.Sc. II		Sem IV		Subject: Botany	
CELL BIOLOGY, GENETICS AND BIOCHEMISTRY					
Sr. No.	Month	Unit No.	Topic Name	Period Required	Total Period
01	Dec- January	UNIT-I	Unit – I : Cell Biology		15
			1.1 Cell concept – Prokaryotic and Eukaryotic cell	02	
			1.2 Cell wall –Structure and Functions	03	
			1.3 Plasma membrane –Structure (models) and Functions	04	
			1.4 Nucleus – Ultra structure (nuclear membrane, nuclear pore complex and nucleolus) and functions	04	
			1.5 Chloroplast- Structure and Functions	02	
02	Jan- Feb	UNIT-II	Unit–II : Cell Biology Structure and functions of-		15
			2.1 Endoplasmic Reticulum	03	
			2.2 Golgi complex	02	
			2.3 Vacuole	02	
			2.4 Ribosome	02	
			2.5 Perixysome	02	
			2.6 Mitochondria	02	
			2.7 Cell cycle: Mitosis and Meiosis	02	
03	February	UNIT-III	Unit – III : Genetics		15
			3.1 Chromosome- Morphology, Types, Centromere & Telomere	04	
			3.2 Chromosomal aberrations –		
			3.2.1 Structural aberrations: Deletion, Duplication, Inversion and Translocation	05	
			3.2.2 Numerical aberrations: Euploidy and aneuploidy	06	
04	Feb- March	Unit-IV	Unit–IV: Genetics		15
			4.1 Mendellism: Mendel’s law of Dominance, Segregations and Independent assortment, Incomplete dominance	05	
			4.2 Interaction of genes- Complimentary, Supplementary and Epistasis	05	
			4.3 Problems based on Mendelism and Interaction of Genes	05	
05	Feb- March	Unit-V	Unit – V Genetics		15
			5.1 Linkage – Concept, Types and theories	03	
			5.2 Crossing over: Concept, Types and theories	04	

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			5.3 Gene mutations- Spontaneous and Induced	<b>04</b>	
			5.4 Extra-nuclear Genome- Mitochondrial DNA and Chloroplast DNA	<b>04</b>	
<b>06</b>	<b>March</b>	<b>Unit-VI</b>	<b>Unit – VI Biochemistry</b>		
			6.1 Nomenclature of Enzymes	<b>03</b>	
			6.2 Characteristics of Enzymes	<b>03</b>	
			6.3 Concept of holoenzymes, coenzymes and cofactor	<b>03</b>	
			6.4 Theories for Mechanism of action of Enzymes	<b>03</b>	
			6.5 Structure and functions Carbohydrates: Monosaccharides (Glucose), Disaccharides (Galactose) and Polysaccharides (Starch)	<b>03</b>	<b>15</b>
<b>07</b>			<b>Subject related Project &amp; Seminar</b>		

Class: B.Sc. II					
Sem IV					
Subject: Botany					
CELL BIOLOGY, GENETICS AND BIOCHEMISTRY					
LABORATORY EXERCISE (PRACTICALS)					
Sr. No.	Month	Practical No.	Practical Name	Practical Required	Total Practical
01	January		I Cell Biology (Any Two)		04
		1	Squash preparation for the study of various stages of mitosis	02	
		2	Smear preparation for the study of various stages of meiosis.	02	
02	February		II Genetics		03
		3	1. To prove Mendel’s Monohybrid ratio.	01	
		4	2. To prove Mendel’s Dihybrid ratio	01	
		5	3. Problems based on Interaction of genes	01	
03	Feb-March		III Biochemistry		03
		6	1. To study the enzyme activity of catalase.	01	
		7	2. To demonstrate test for glucose in grapes, & sucrose in cane sugar / beet root.	01	
		8	3. To demonstrate test for protein.	01	
03	March	9	4. To demonstrate the lipid test in oily seeds.	01	03
		10	5. To demonstrate the test for starch / cellulose.	01	
		11	6. To demonstrate the activity of enzyme amylase from germinating Wheat grains	01	
			Practical Examination		

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Class: B.Sc. III		Sem V		Subject: Botany	
PLANT PHYSIOLOGY AND ECOLOGY					
Sr. No.	Month	Unit No.	Topic Name	Period Required	Total Period
01	July	UNIT-I	Plant Water Relations		15
			1.1 Importance of water to plant life. Imbibition , Diffusion,Osmosis, Plasmolysis.	04	
			1.2 Active and passive Absorption of water.	02	
			1.3 Ascent of sap - Root Pressure and Transpiration Pull Theory.	03	
			1.4 Transpiration - Types of transpiration, Stomatal movements, Mechanism of transpiration (Starch ) sugar hypothesis), Significance. Antitranspirant, Guttation.	03	
			1.5 Mineral uptake - Active uptake - Career Concept, Passive uptake Ion Exchange.	03	
02	July-August	UNIT-II	Metabolism-		15
			2.1 Photosynthesis - Introduction, Role of Light, Photosynthetic Apparatus and Pigments, Two Pigment Systems, Photophosphorylation, C3 and C4 cycle, CAM Pathway.	07	
			2.2 Respiration - Introduction, Mitochondria as a Respiratory centre, Types of Respiration - Aerobic and Anaerobic, Mechanism of aerobic respiration- Glycolysis, Krebs cycle, Electron transport system and Chemiosmotic ATP generation, Respiratory Quotient.	08	
03	August	UNIT-III	Metabolism and growth		15
			3.1 Nitrogen Metabolism- Sources of nitrogen, Symbiotic nitrogen fixation, Role of Nitrate reductase.	06	
			3.2 Growth - Phases of growth, Growth curve, Physiological role of growth hormones ( Auxins, Gibberellins, Cytokinins, Absciscic acid, and Ethylene).	06	
			3.3 Physiology of Senescence and Abscission.	03	
04	August-Sept	Unit-IV	Plant responses		15
			4.1 Photoperiodism - Concept of Florigen,	04	

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			Role of Phytochrome,		
			4.2 Vernalization- Concept and Significance.	<b>02</b>	
			4.3 Plant movement- Tropic (Phototropic and Geotropic) and Nastic (Epinasty, Hyponasty and Seismonasty)	<b>05</b>	
			4.4 Stress physiology- Concept, Types of stress, Water and Salinity stress.	<b>04</b>	
<b>05</b>	<b>Sept</b>	<b>Unit-V</b>	<b>Ecology and Environment</b>		<b>15</b>
			5.1 Concept of environment, Concept and scope of ecology.	<b>02</b>	
			5.2 Ecological factors- Climatic- Light, Temperature and Water.	<b>02</b>	
			5.3 Atmosphere and its composition.	<b>03</b>	
			5.4 Edaphic factor- Process of soil formation, soil profile, soil biota and their role.	<b>04</b>	
			5.5 Ecological Adaptations - Morphological and Anatomical adaptation in Hydrophytes, and Xerophytes	<b>04</b>	
<b>06</b>	<b>Oct</b>	<b>Unit-VI</b>	<b>Ecosystem</b>		<b>15</b>
			6.1 Population Ecology- Natalty and Mortality, Community characteristics – Frequency, Density and Abundance	<b>05</b>	
			6.2 Ecological Succession - Hydrosere and Xerosere	<b>03</b>	
			6.3 Ecosystem – Definition, Structure and Function, Food chain, Food web, Energy flow model (Single channel model)	<b>05</b>	
			6.4 Types of Ecosystem- Pond ecosystem, Desert ecosystem.	<b>02</b>	

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Class: B.Sc. III		Sem V		Subject: Botany	
PLANT PHYSIOLOGY AND ECOLOGY					
LABORATORY EXERCISE (PRACTICALS)					
Sr. No.	Month	Practical No.	Practical Name	Practical Required	Total Practical
01	July-August		<b>Plant Physiology Major experiment (Any Seven)</b>		07
		1	To study the effect of temperature and organic solvent on permeability of plasma membrane.	01	
		2	To study osmotic pressure of cell sap by plasmolytic method.	01	
		3	To determine the path of water (ascent of sap)	01	
		4	To determine the rate of transpiration by Ganongs photometer/Screen.	01	
		5	To determine rate of photosynthesis under varying quality of light and CO2 concentration.	01	
		6	Separation of chloroplast pigments by paper chromatography/solvent extraction method.	01	
		7	To determine R.Q. using different substrates.	01	
02	August		<b>Plant Physiology Minor experiment (Any Three)</b>		03
		8	To demonstrate fermentation.	01	
		9	To demonstrate exo and endosmosis	01	
		10	To demonstrate the phenomenon of nastic movement with help of <i>Mimosa pudica</i> / or <i>Biophytum sensitivum</i> .	01	
03	Aug-Sept		<b>Ecology: Major experiment (Any Three)</b>		05
		11	Study of morphological and anatomical adaptations in hydrophytes – <i>Hydrilla</i> , <i>Eichhornia</i> , <i>Typha</i> , <i>Vallisneria</i> and <i>Nymphaea</i> (any two)	02	
		12	Study of morphological and anatomical adaptations in xerophytes - <i>Asparagus</i> , <i>Nerium</i> , <i>Casuarina</i> , <i>Euphorbia</i> , <i>Cycas</i> , <i>Opuntia</i> (any two)	02	
		13	Study of community characterstics by quadrat method.	01	
04	Sept-Oct		<b>Ecology: Minor experiment (Any Two)</b>		02
		14	Determination of pH of different soils and water samples by pH papers/ pH meter.	01	
		15	Study of meteorological instruments -Rain gauge, Hygrometer, Barometer	01	
05	Oct		<b>Subject related Project &amp; Seminar</b>		

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Class: B.Sc. III		Sem VI		Subject: Botany	
MOLECULAR BIOLOGY AND BIOTECHNOLOGY					
Sr. No.	Month	Unit No.	Topic Name	Period Required	Total Period
01	January	UNIT-I	Unit-I : DNA the genetic material :		15
			1.1 Historical account – Giffith’s Expt, Hershy and Chase Expt.	04	
			1.2 DNA– Chemical composition and Double Helical model,	02	
			1.3 DNA replication in Eukaryotes;	03	
			1.4 DNA Packaging - Nucleosome and Solenoid	03	
			1.5 Satellite, Repetitive DNA and Transposable element in plants (AC-DS system)	03	
02	January	UNIT-II	Unit-II : Gene Structure and Expression -		15
			2.1 Concept of gene, Fine structure of Gene	03	
			2.2 Gene Expression – Central Dogma, Types of RNA, Genetic code, Ribosome as a translation machine	03	
			2.3 Transcription in Eukaryotes – Mechanism of Transcription and RNA Processing	03	
			2.4 Translation in Eukaryotes.	03	
			2.5 Endomembrane system (Flow of Peptide)	03	
03	February	UNIT-III	Unit – III : Regulation of Gene Expression		15
			3.1 Regulation of Gene Expression in Prokaryotes – Operon concept with special reference to Lac Operon	03	
			3.2 Regulation of gene expression of Eukaryotes – Britton Davidson Model	03	
			3.3 Protein Folding Mechanism and Structure (Primary, Secondary, Tertiary and Quaternary)	03	
			3.4 Protein Sorting – Targeting to proteins to organelles	03	
			3.5 Protein Trafficking	03	
04	February	Unit-IV	Unit-IV : Genetic Engineering -		15

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			4.1 Tools and techniques of recombinant DNA technology,	<b>02</b>	
			4.2 Restriction Enzymes – Nomenclature and Types	<b>02</b>	
			4.3 Cloning vectors – Plasmids, Phages, Cosmids	<b>03</b>	
			4.4 Gene Source- Genomic and c-DNA library	<b>03</b>	
			4.5 Gene Transfer Techniques – Direct - (1) Chemical method, (2) Electroporation, (3) Gene gun method Indirect – Agrobacterium mediated gene transfer	<b>03</b>	
			4.6 Gene Amplification - _Polymerase Chain Reaction (PCR	<b>02</b>	
<b>05</b>	<b>Feb-March</b>	<b>Unit-V</b>	<b>Unit-V : Plant Tissue Culture -</b>		
			5.1 Basic aspects of plant tissue culture	<b>03</b>	
			5.2 Laboratory Requirement – Infrastructure, Instruments (laminar air flow, autoclave, growth chamber), Culture Media (MS Media), Growth Hormone (Auxin, Cytokinin and Gibberellins) Sterilization Techniques	<b>06</b>	
			5.3 Tissue Culture Technique - Cellular totipotency, differentiation and morphogenesis; Callus Culture; Micro propagation	<b>06</b>	<b>15</b>
<b>06</b>	<b>March</b>	<b>Unit-VI</b>	<b>Unit-VI : Applications of Biotechnology</b>		
			6.1 Agriculture – Haploid plant production (Anther and Pollen Culture); Protoplast Culture and Somatic Hybridization; Transgenic Plant - BT Cotton, Synthetic seed. Salient achievements of crop biotechnology	<b>04</b>	
			6.2 Industry– Fermentation Technology- Bakery Products and Alcohol Productions.	<b>04</b>	
			6.3 Health Care – Edible Vaccines	<b>03</b>	
			6.4 Conservation – Cryopreservation, Genetically Modified Organisms: - Pros and Cons	<b>04</b>	<b>15</b>
<b>07</b>	<b>March</b>		<b>Subject related Project &amp; Seminar</b>		

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Class: B.Sc. III		Sem VI		Subject: Botany	
MOLECULAR BIOLOGY AND BIOTECHNOLOGY					
LABORATORY EXERCISE (PRACTICALS)					
Sr. No.	Month	Practical No.	Practical Name	Practical Required	Total Practical
01	January		1) Molecular biology (Major) (Any One)		06
		1	1. Isolation of DNA by crude method	02	
			2) Molecular biology (Minor) (Any One)		
		2	1. Demonstration of DNA Electrophoresis	02	
			3) Biotechnology (Any Six)		
		3	1. Working Principle and application of Autoclave	02	
02	February	4	2. Working Principle and application of Laminar Air Flow.	01	05
		5	3. Cleaning and Sterilization of Glassware	01	
		6	4. Sterilization of Explant	01	
		7	6. Demonstration of in vitro culture techniques – anther and pollen culture	02	
03	March	8	9. Demonstration of technique of Micropropogation	02	02
			Visit to molecular biology, biotechnological research institute/ industry		
04				Practical Examination	



**DEPARTMENT OF BOTANY****Teaching Plan 2020-21 (Theory)**

**Note: Due to Covid-19 pandemic situations the teaching plan is for online mode teaching using online platforms like Zoom meeting, Google classroom, Google meet, Eduscoop**

Class: B.Sc. I		Sem I		Subject: Botany	
Sr. No.	Month	Unit No.	Topic Name	Period Required	Total Period
01	Nov	UNIT-I	<b>Plant Diversity (15)</b>		15
			1.1 Introduction to Plant Kingdom: Cryptogams	03	
			1.2 Diversity of plants with respect to habitat, form, nutrition and ecological status	03	
			1.3 General Account of Viruses and structure of TMV and HIV	03	
			1.4 Bacteria: structure, Nutrition and reproduction	03	
			1.5 Role of microbes in Agriculture, Medicine and Industries	03	
02	Dec	UNIT-II	<b>Algae (15)</b>		15
			2.1. Classification according to F. E. Fritsch and G. M. Smith up to classes	02	
			2.2. General characters of algae with reference to Habitat, Thallus organization, Pigmentation, Reserve food and Reproduction	02	
			2.3. General characters of following classes with special reference to examples mentioned	02	
			2.3.1. Chlorophyta - Oedogonium	03	
			2.3.2. Charophyta – Chara (Thallus structure and reproduction)	03	
			2.3.3. Phaeophyta – Sargassum (Thallus structure and reproduction)	02	
			2.3.4. Rhodophyta – Batrachospermum	01	
03		UNIT-III	<b>Fungi (15)</b>		15
			3.1. General characteristics of following classes with special reference to examples mentioned	03	
			3.1.1. Mastigomycotina : Albugo (Cystopus)	03	
			3.1.2. Ascomycotina : Aspergillus	02	
			3.1.3. Basidiomycotina : Puccinia graminis-tritici	02	
			3.1.4. Deuteromycotina : General characters	03	
04	Jan	Unit-IV	<b>Bryophyte (15)</b>		15
			4.1. General characters, thallus organization and life cycle of	03	
			4.1.1. Hepaticopsida – Marchantia	03	
			4.1.2. Bryopsida – Funaria	03	

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			4.2. Affinities of bryophytes with algae and pteridophytes	<b>03</b>	
			4.5. Brief Account on some Indian Bryologist	<b>03</b>	
<b>05</b>	<b>Feb</b>	<b>Unit-V</b>	<b>Pteridophyte (15)</b>		<b>15</b>
			5.1. Pteridophytes as First Vascular Plants.	<b>02</b>	
			5.3. General characters of the following classes with special reference to examples mentioned –	<b>02</b>	
			5.3.1. Sphenopsida – Equisetum	<b>03</b>	
			5.3.2. Filicopsida – Marsilea	<b>03</b>	
			5.4. Stele types in pteridophytes	<b>02</b>	
			5.5 Heterospory and Seed Habit in Pteridophytes	<b>03</b>	
<b>06</b>	<b>Feb</b>	<b>Unit-VI</b>	<b>Application of Microbes Cryptogams (15)</b>		<b>15</b>
			6.1. Economic Importance of Algae with special reference to Food, Industries, Agriculture and Harmful aspects	<b>03</b>	
			6.2. Mycorrhiza – Types and Application	<b>02</b>	
			6.3. Role of Fungi in Industries, Medicine, Food & Agriculture	<b>02</b>	
			6.4. Plant Diseases –	<b>02</b>	
			6.4.1. Viral –TMV	<b>02</b>	
			6.4.2. Bacteria – Black arm of cotton (Xanthomonos malvacearum)	<b>02</b>	
			6.4.3. Fungal – Tikka disease of groundnut (Cercospora sps.)	<b>02</b>	

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Class: B.Sc. I		Sem I		Subject: Botany	
DIVERSITY & APPLICATIONS OF MICROBES AND CRYPTOGRAMS					
LABORATORY EXERCISE (PRACTICALS)					
Sr. No.	Month	Practical No.	Practical Name	Practical Required	Total Practical
01	Dec 20		<b>ALGAE</b> Preparation of temporary mount, identification with reason of following algal materials		07
		1	1. <i>Oedogonium</i> ,	01	
		2	2 <i>Hydrodictyon</i>	01	
		3	3 <i>Chara</i> ,	01	
		4	4 <i>Vaucheria</i>	01	
		5	5 <i>Ectocarpus</i>	01	
		6	6 <i>Sargassum</i>	01	
		7	7. <i>Batrachospermum</i>	01	
02	Dec		<b>FUNGI AND PLANT PATHOLOGY</b>		06
		8	Study of following genera <i>Albugo</i> , <i>Uncinula</i> ,	01	
		9	<i>Penicillium</i> , <i>Agaricus</i> ,	01	
		10	<i>Puccinia</i> , <i>Cercospora</i>	01	
		11	Study of Crustose, Fruticose & Foliose Lichen	01	
		12	Study of symptoms of fungal, viral, bacterial and Mycoplasmal diseases	01	
		13	Demonstration of Mushroom Cultivation Technology	01	
03	Jan 21		<b>BRYOPHYTES</b>		05
		14	Study of external and anatomy features of vegetative and reproductive parts of following genera – <i>Marchantia</i> ,	01	
		15	<i>Anthoceros</i> ,	01	
		16	<i>Funaria</i> ,	01	
		17	<i>Polytrichum</i>	01	
		18	<i>Sphagnum</i>	01	
04	Feb		<b>PTERIDOPHYTES</b> Study of Pteridophyte external and anatomy features of vegetative and reproductive parts of following genera –		07
		19	<i>Lycopodium</i>	01	
		20	<i>Equisetum</i> ,	01	
		21	<i>Osmunda</i> ,	01	
		22	<i>Selaginella</i> ,	01	
		23	<i>Adiantum</i> ,	01	
		24	<i>Marsilea</i>	01	
		25	Any one fossil specimen	01	
05			Botanical excursion		
06			Common algal, fugal, pathological, bryophytic and pteridophytic collection and excursion report must be submitted at the time of practical exam		

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Class: B.Sc. I		Sem II		Subject: Botany	
GYMNOSPERM, MORPHOLOGY OF ANGIOSPERMS AND UTILIZATION OF PLANTS					
01	March 21	UNIT-I	UNIT-I: Palaeobotany (15)		15
			1.1. Process of plant fossilization and types of fossils	03	
			1.2. Geological Time Scale	03	
			1.3. Fossil Gymnosperms	03	
			1.3.1. Pteridospermales: Lyginopteris oldhamia	03	
			1.3.2. Bennettitales: Bennittites	03	
02	March	UNIT-II	UNIT-II : Gymnosperms (15)		15
			2.1. Classification according to D. D. Pant	03	
			2.2. General account: morphology, anatomy, life cycle and taxonomic position of Pinus and Gnetum	04	
			2.3. Affinities with pteridophytes and angiosperms	04	
			2.4. Economic importance of Gymnosperms	04	
03	April	UNIT-III	UNIT-III: Morphology (15)		15
			3.1. Diversity in Plants habits – Annual, biannual, perennials	03	
			3.2. Roots – Types of root : tap and adventitious, modification of root : for food storage, respiration and supports.	04	
			3.3. Stem – Types of Stem, Characteristic features, branching, modification of Stem – Underground and aerial	04	
			3.4. Leaf – Parts of leaf, types of leaves – simple and compound; Phyllotaxy; Venation; Stipule. Modification of leaves	04	
04	April	Unit-IV	UNIT-IV: Morphology (15)		15
			4.1. Inflorescences – Types: Racemose, Cymose and Special	06	
			4.2. Flower – Flower as modified shoot; Structure of flower – Calyx, Corolla, Androecium and Gynoecium. Placentation; Types of Pollination.	09	
05	May	Unit-V	UNIT-V : Morphology and Utilization of Plants (15)		15
			5.1. Fruits – Morphological types	03	
			5.2. Utilization of Plants	03	
			5.2.1. Food Plants – Wheat, Potato –Morphology, varieties and economic importance.	03	
			5.2.2. Fiber Plant – Morphology, varieties and economic importance of Cotton.	03	
			5.2.3. Oil yielding Plant – Morphology, Varieties and economic importance of Ground nut.	03	
06	May	Unit-VI	UNIT-VI: Utilization of Plants (15)		15
			6.1. Spices – General account and economic importance of Black pepper, Clove, Cinnamon and Cardamom	02	
			6.2. General account and sources of firewood, timber and Bamboos.	02	
			6.3. Essential oils – General account, economic importance of Eucalyptus.	02	
			6.4. Pharmacognosy and Phytochemistry with respect to following medicinal plants –		
			6.4.1. Aloe vera	01	
			6.4.2. Adathoda vasica	01	
			6.4.3. Asparagus racemosa	01	

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		6.4.4. Azadirachta indica	<b>01</b>	
		6.4.5. Catharanthus roseus		
		6.4.6. Chlorophytum borivillianum	<b>01</b>	
		6.4.7. Emblica officinalis	<b>01</b>	
		6.4.8. Ocimum sanctum	<b>01</b>	
		6.4.9. Rauwolfia serpentina	<b>01</b>	
		6.4.10. Vitex negundo	<b>01</b>	
		6.4.11. Withania somnifera		

Class: B.Sc. I		Sem II		Subject: Botany	
GYMNOSPERM, MORPHOLOGY OF ANGIOSPERMS AND UTILIZATION OF PLANTS					
LABORATORY EXERCISE (PRACTICALS)					
Sr. No.	Month	Practical No.	Practical Name	Practical Required	Total Practical
01	March 21		I. Gymnosperms: Morphology and anatomy of the following members –		07
		1	a. Pinus: Root, Stem, Leaf	02	
		2	b. Gnetum: Root, Stem, Leaf	02	
		3	II. Preparation of double stained permanent mount of Pinus stem, needle and Gnetum stem and leaf	02	
		4	III. Study of fossil slides of Lyginopteris and Bennettites	01	
02	April	5	IV. Detailed morphological study of types of root, stem and leaf with its modifications	04	07
		6	V. Forms of corolla	01	
		7	VI. Types of placentation	01	
		8	VII. Morphology of fruits	01	
03	May	9	VIII. Morphology of plant parts used and medicinal plants prescribed in syllabi	03	06
		10	IX. Utilization of plants: Spices, fiber yielding plants and food plants prescribed in syllabi	03	
		11	Botanical excursion		
04	May	12	Practical Examination		

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**Note: Due to Covid-19 pandemic situations the teaching plan is for online mode teaching using online platforms like Zoom meeting, Google classroom, Google meet, Eduscoop**

Class: B.Sc. II		Sem III		Subject: Botany	
ANGIOSPERM SYSTEMATICS, ANATOMY & EMBRYOLOGY					
Sr. No.	Month	Unit No.	Topic Name	Period Required	Total Period
01	Nov 20	UNIT-I	Angiosperm Systematics and Biodiversity		15
			1.1 Angiosperms: Origin and Evolution (Pteridospermean and Bennititalean Theory)	02	
			1.2 Botanical Nomenclature: Principles of rules, Taxonomic Ranks, Type concept, Valid publication.	03	
			1.3 Herbarium – Concept & significance, Royal Botanical Garden, Kolkata.	04	
			1.4 Concept of biodiversity, Ex situ and In situ conservation	04	
			1.5 Concept & importance of Biodiversity.	02	
02	Dec	UNIT-II	Angiosperm Systematics		15
			2.1 Systems of Classification: Bentham and Hooker’s System, Engler and Prantle’s system.	03	
			2.2 Systematic studies & economic importance of following Families: Dicotyledons (Polypetalae) : Malvaceae, Brassicaceae, Leguminosae, Apiaceae,	12	
03	Dec	UNIT-III	Angiosperm Systematics		15
			3.1 Systematic studies & economic importance of following Families: Dicotyledons (Gamopetalae): Asteraceae, Asclepiadaceae, Apocynaceae, Solanaceae, Verbenaceae, Lamiaceae.	10	
			3.2 Dicotyledons ( Monoclamydeae): Euphorbiaceae.	02	
			3.3 Monocotyledons: Liliaceae, Poaceae.	03	
04	Jan 21	Unit-IV	Anatomy		15
			4.1 Types of Tissues: Meristematic – Types of meristems Permanent – Simple and complex.	04	
			4.2 Characteristics of growth rings, Sapwood and heartwood.	04	
			4.3 Anatomy of root: Primary structure in	07	

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			dicot and monocot root, normal secondary growth in dicot root.		
<b>05</b>	<b>Jan</b>	<b>Unit-V</b>	<b>Anatomy</b>		<b>15</b>
			5.1 Anatomy of stem: Primary structure in monocot and dicot stem, normal secondary growth in dicot stem.	<b>06</b>	
			5.2 Anomalies in primary structure in <i>Boerhavia</i> stem, secondary structure in <i>Bignonia</i> and <i>Dracaena</i> stem.	<b>06</b>	
			5.3 Leaf Anatomy: Internal structure in <i>Nerium</i> and <i>Maize</i> leaf.	<b>03</b>	
<b>06</b>	<b>Feb 21</b>	<b>Unit-VI</b>	<b>Embryology</b>		<b>15</b>
			5.1 Microsporangium, microsporogenesis, development of male gametophyte.	<b>04</b>	
			5.2 Megasporangium, types of ovules, megasporogenesis, development of female gametophyte monosporic, Bisporic & tetrasporic).	<b>04</b>	
			5.3 Double fertilization and triple fusion.	<b>02</b>	
			5.4 Embryo – Classification of embryo.	<b>02</b>	
			5.5 Endosperm types & significance, Suspended animation	<b>03</b>	

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Class: B.Sc. II		Sem III		Subject: Botany			
ANGIOSPERM SYSTEMATICS, ANATOMY & EMBRYOLOGY							
LABORATORY EXERCISE (PRACTICALS)							
Sr. No.	Month	Practical No.	Practical Name	Practical Required	Total Practical		
01	Dec 20		<b>Anatomy of angiosperms</b> : Preparation of double stained slides of root, stem and leaves of angiosperms mentioned in the syllabus		03		
		1	Anatomy of root in Dicot & Monocot	01			
		2	Anatomy of stem in Dicot & Monocot	01			
		3	Anatomy of Leaf in Dicot & Monocot	01			
02			<b>Taxonomy</b> : Description of ten plants belonging to different families in technical language and identification up to family level.		15		
		4	Brassicaceae	01			
		5	Malvaceae	01			
	Jan 21	6	Fabaceae	01			
		7	Caesalpinoidae	01			
		8	Mimosoidae	01			
		9	Apiaceae	01			
		10	Apocynaceae	01			
		11	Asclepiadaceae	01			
		12	Solanaceae	01			
		13	Euphorbiaceae	01			
		Jan	14	Lamiaceae		01	
			15	Asteraceae		01	
	16		Verbanaceae	01			
	17		Liliaceae	01			
	18		Poaceae	01			
	03			<b>Embryology of Angiosperms</b>			03
			19	Observation of wide range of flowers available in the locality and methods of their pollination.		01	
20			Study through permanent slides of T.S. of anthers, microsporogenesis, L.S. of ovule, types of endosperms and embryo of Capsella	01			
Feb		21	Mounting of T.S. of anthers, Pollen grains and pollinia.	01			
04			<b>Long and short excursion tour</b>				



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Class: B.Sc. II		Sem IV		Subject: Botany	
CELL BIOLOGY, GENETICS AND BIOCHEMISTRY					
Sr. No.	Month	Unit No.	Topic Name	Period Required	Total Period
01	March 21	UNIT-I	Unit – I : Cell Biology		15
			1.1 Cell concept – Prokaryotic and Eukaryotic cell	02	
			1.2 Cell wall –Structure and Functions	03	
			1.3 Plasma membrane –Structure (models) and Functions	04	
			1.4 Nucleus – Ultra structure (nuclear membrane, nuclear pore complex and nucleolus) and functions	04	
			1.5 Chloroplast- Structure and Functions	02	
02	March	UNIT-II	Unit–II : Cell Biology Structure and functions of-		15
			2.1 Endoplasmic Reticulum	03	
			2.2 Golgi complex	02	
			2.3 Vacuole	02	
			2.4 Ribosome	02	
			2.5 Perixysome	02	
			2.6 Mitochondria	02	
			2.7 Cell cycle: Mitosis and Meiosis	02	
03	April	UNIT-III	Unit – III : Genetics		15
			3.1 Chromosome- Morphology, Types, Centromere & Telomere	04	
			3.2 Chromosomal aberrations –		
			3.2.1 Structural aberrations: Deletion, Duplication, Inversion and Translocation	05	
			3.2.2 Numerical aberrations: Euploidy and aneuploidy	06	
04	May	Unit-IV	Unit–IV: Genetics		15
			4.1 Mendellism: Mendel’s law of Dominance, Segregations and Independent assortment, Incomplete dominance	05	
			4.2 Interaction of genes- Complimentary, Supplementary and Epistasis	05	
			4.3 Problems based on Mendelism and Interaction of Genes	05	
05	May	Unit-V	Unit – V Genetics		15
			5.1 Linkage – Concept, Types and theories	03	
			5.2 Crossing over: Concept, Types and theories	04	

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			5.3 Gene mutations- Spontaneous and Induced	<b>04</b>	
			5.4 Extra-nuclear Genome- Mitochondrial DNA and Chloroplast DNA	<b>04</b>	
<b>06</b>	<b>May</b>	<b>Unit-VI</b>	<b>Unit – VI Biochemistry</b>		
			6.1 Nomenclature of Enzymes	<b>03</b>	
			6.2 Characteristics of Enzymes	<b>03</b>	
			6.3 Concept of holoenzymes, coenzymes and cofactor	<b>03</b>	
			6.4 Theories for Mechanism of action of Enzymes	<b>03</b>	
			6.5 Structure and functions Carbohydrates: Monosaccharides (Glucose), Disaccharides (Galactose) and Polysaccharides (Starch)	<b>03</b>	<b>15</b>
<b>07</b>			<b>Subject related Project &amp; Seminar</b>		

Class: B.Sc. II		Sem IV		Subject: Botany	
CELL BIOLOGY, GENETICS AND BIOCHEMISTRY					
LABORATORY EXERCISE (PRACTICALS)					
Sr. No.	Month	Practical No.	Practical Name	Practical Required	Total Practical
01	March		I Cell Biology (Any Two)		04
		1	Squash preparation for the study of various stages of mitosis	02	
		2	Smear preparation for the study of various stages of meiosis.	02	
02	April		II Genetics		03
		3	1. To prove Mendel’s Monohybrid ratio.	01	
		4	2. To prove Mendel’s Dihybrid ratio	01	
		5	3. Problems based on Interaction of genes	01	
03	May		III Biochemistry		03
		6	1. To study the enzyme activity of catalase.	01	
		7	2. To demonstrate test for glucose in grapes, & sucrose in cane sugar / beet root.	01	
		8	3. To demonstrate test for protein.	01	
03	May	9	4. To demonstrate the lipid test in oily seeds.	01	03
		10	5. To demonstrate the test for starch / cellulose.	01	
		11	6. To demonstrate the activity of enzyme amylase from germinating Wheat grains	01	
			Practical Examination		

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Class: B.Sc. III		Sem V		Subject: Botany	
PLANT PHYSIOLOGY AND ECOLOGY					
Sr. No.	Month	Unit No.	Topic Name	Period Required	Total Period
01	Nov 20	UNIT-I	Plant Water Relations		15
			1.1 Importance of water to plant life. Imbibition , Diffusion,Osmosis, Plasmolysis.	04	
			1.2 Active and passive Absorption of water.	02	
			1.3 Ascent of sap - Root Pressure and Transpiration Pull Theory.	03	
			1.4 Transpiration - Types of transpiration, Stomatal movements, Mechanism of transpiration (Starch ) sugar hypothesis), Significance. Antitranspirant, Guttation.	03	
			1.5 Mineral uptake - Active uptake - Career Concept, Passive uptake Ion Exchange.	03	
02	Dec	UNIT-II	Metabolism-		15
			2.1 Photosynthesis - Introduction, Role of Light, Photosynthetic Apparatus and Pigments, Two Pigment Systems, Photophosphorylation, C3 and C4 cycle, CAM Pathway.	07	
			2.2 Respiration - Introduction, Mitochondria as a Respiratory centre, Types of Respiration - Aerobic and Anaerobic, Mechanism of aerobic respiration- Glycolysis, Krebs cycle, Electron transport system and Chemiosmotic ATP generation, Respiratory Quotient.	08	
03	Jan 21	UNIT-III	Metabolism and growth		15
			3.1 Nitrogen Metabolism- Sources of nitrogen, Symbiotic nitrogen fixation, Role of Nitrate reductase.	06	
			3.2 Growth - Phases of growth, Growth curve, Physiological role of growth hormones ( Auxins, Gibberellins, Cytokinins, Absciscic acid, and Ethylene).	06	
			3.3 Physiology of Senescence and Abscission.	03	
04	Jan	Unit-IV	Plant responses		15
			4.1 Photoperiodism - Concept of Florigen,	04	

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			Role of Phytochrome,		
			4.2 Vernalization- Concept and Significance.	<b>02</b>	
			4.3 Plant movement- Tropic (Phototropic and Geotropic) and Nastic (Epinasty, Hyponasty and Seismonasty)	<b>05</b>	
			4.4 Stress physiology- Concept, Types of stress, Water and Salinity stress.	<b>04</b>	
<b>05</b>	<b>Jan</b>	<b>Unit-V</b>	<b>Ecology and Environment</b>		<b>15</b>
			5.1 Concept of environment, Concept and scope of ecology.	<b>02</b>	
			5.2 Ecological factors- Climatic- Light, Temperature and Water.	<b>02</b>	
			5.3 Atmosphere and its composition.	<b>03</b>	
			5.4 Edaphic factor- Process of soil formation, soil profile, soil biota and their role.	<b>04</b>	
			5.5 Ecological Adaptations - Morphological and Anatomical adaptation in Hydrophytes, and Xerophytes	<b>04</b>	
<b>06</b>	<b>Feb</b>	<b>Unit-VI</b>	<b>Ecosystem</b>		<b>15</b>
			6.1 Population Ecology- Natalty and Mortality, Community characteristics – Frequency, Density and Abundance	<b>05</b>	
			6.2 Ecological Succession - Hydrosere and Xerosere	<b>03</b>	
			6.3 Ecosystem – Definition, Structure and Function, Food chain, Food web, Energy flow model (Single channel model)	<b>05</b>	
			6.4 Types of Ecosystem- Pond ecosystem, Desert ecosystem.	<b>02</b>	

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Class: B.Sc. III		Sem V		Subject: Botany	
PLANT PHYSIOLOGY AND ECOLOGY					
LABORATORY EXERCISE (PRACTICALS)					
Sr. No.	Month	Practical No.	Practical Name	Practical Required	Total Practical
01	Nov 20		<b>Plant Physiology Major experiment (Any Seven)</b>		07
		1	To study the effect of temperature and organic solvent on permeability of plasma membrane.	01	
		2	To study osmotic pressure of cell sap by plasmolytic method.	01	
		3	To determine the path of water (ascent of sap)	01	
		4	To determine the rate of transpiration by Ganongs photometer/Screen.	01	
		5	To determine rate of photosynthesis under varying quality of light and CO2 concentration.	01	
		6	Separation of chloroplast pigments by paper chromatography/solvent extraction method.	01	
		7	To determine R.Q. using different substrates.	01	
02	Jan		<b>Plant Physiology Minor experiment (Any Three)</b>		03
		8	To demonstrate fermentation.	01	
		9	To demonstrate exo and endosmosis	01	
		10	To demonstrate the phenomenon of nastic movement with help of <i>Mimosa pudica</i> / or <i>Biophytum sensitivum</i> .	01	
03	Feb		<b>Ecology: Major experiment (Any Three)</b>		05
		11	Study of morphological and anatomical adaptations in hydrophytes – <i>Hydrilla</i> , <i>Eichhornia</i> , <i>Typha</i> , <i>Vallisneria</i> and <i>Nymphaea</i> (any two)	02	
		12	Study of morphological and anatomical adaptations in xerophytes - <i>Asparagus</i> , <i>Nerium</i> , <i>Casuarina</i> , <i>Euphorbia</i> , <i>Cycas</i> , <i>Opuntia</i> (any two)	02	
		13	Study of community characterstics by quadrat method.	01	
04	Feb		<b>Ecology: Minor experiment (Any Two)</b>		02
		14	Determination of pH of different soils and water samples by pH papers/ pH meter.	01	
		15	Study of meteorological instruments -Rain gauge, Hygrometer, Barometer	01	
05	Feb		<b>Subject related Project &amp; Seminar</b>		

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Class: B.Sc. III		Sem VI		Subject: Botany	
MOLECULAR BIOLOGY AND BIOTECHNOLOGY					
Sr. No.	Month	Unit No.	Topic Name	Period Required	Total Period
01	March 21	UNIT-I	Unit-I : DNA the genetic material :		15
			1.1 Historical account – Giffith’s Expt, Hershy and Chase Expt.	04	
			1.2 DNA– Chemical composition and Double Helical model,	02	
			1.3 DNA replication in Eukaryotes;	03	
			1.4 DNA Packaging - Nucleosome and Solenoid	03	
			1.5 Satellite, Repetitive DNA and Transposable element in plants (AC-DS system)	03	
02	April 21	UNIT-II	Unit-II : Gene Structure and Expression -		15
			2.1 Concept of gene, Fine structure of Gene	03	
			2.2 Gene Expression – Central Dogma, Types of RNA, Genetic code, Ribosome as a translation machine	03	
			2.3 Transcription in Eukaryotes – Mechanism of Transcription and RNA Processing	03	
			2.4 Translation in Eukaryotes.	03	
			2.5 Endomembrane system (Flow of Peptide)	03	
03	May 21	UNIT-III	Unit – III : Regulation of Gene Expression		15
			3.1 Regulation of Gene Expression in Prokaryotes – Operon concept with special reference to Lac Operon	03	
			3.2 Regulation of gene expression of Eukaryotes – Britton Davidson Model	03	
			3.3 Protein Folding Mechanism and Structure (Primary, Secondary, Tertiary and Quaternary)	03	
			3.4 Protein Sorting – Targeting to proteins to organelles	03	
			3.5 Protein Trafficking	03	
04	May	Unit-IV	Unit-IV : Genetic Engineering -		15

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			4.1 Tools and techniques of recombinant DNA technology,	<b>02</b>	
			4.2 Restriction Enzymes – Nomenclature and Types	<b>02</b>	
			4.3 Cloning vectors – Plasmids, Phages, Cosmids	<b>03</b>	
			4.4 Gene Source- Genomic and c-DNA library	<b>03</b>	
			4.5 Gene Transfer Techniques – Direct - (1) Chemical method, (2) Electroporation, (3) Gene gun method Indirect – Agrobacterium mediated gene transfer	<b>03</b>	
			4.6 Gene Amplification - _Polymerase Chain Reaction (PCR	<b>02</b>	
<b>05</b>	<b>May</b>	<b>Unit-V</b>	<b>Unit-V : Plant Tissue Culture -</b>		
			5.1 Basic aspects of plant tissue culture	<b>03</b>	
			5.2 Laboratory Requirement – Infrastructure, Instruments (laminar air flow, autoclave, growth chamber), Culture Media (MS Media), Growth Hormone (Auxin, Cytokinin and Gibberellins) Sterilization Techniques	<b>06</b>	
			5.3 Tissue Culture Technique - Cellular totipotency, differentiation and morphogenesis; Callus Culture; Micro propagation	<b>06</b>	<b>15</b>
<b>06</b>	<b>May</b>	<b>Unit-VI</b>	<b>Unit-VI : Applications of Biotechnology</b>		
			6.1 Agriculture – Haploid plant production (Anther and Pollen Culture); Protoplast Culture and Somatic Hybridization; Transgenic Plant - BT Cotton, Synthetic seed. Salient achievements of crop biotechnology	<b>04</b>	
			6.2 Industry– Fermentation Technology- Bakery Products and Alcohol Productions.	<b>04</b>	
			6.3 Health Care – Edible Vaccines	<b>03</b>	
			6.4 Conservation – Cryopreservation, Genetically Modified Organisms: - Pros and Cons	<b>04</b>	<b>15</b>
<b>07</b>	<b>May</b>		<b>Subject related Project &amp; Seminar</b>		

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Class: B.Sc. III		Sem VI		Subject: Botany	
MOLECULAR BIOLOGY AND BIOTECHNOLOGY					
LABORATORY EXERCISE (PRACTICALS)					
Sr. No.	Month	Practical No.	Practical Name	Practical Required	Total Practical
01	April		1) Molecular biology (Major) (Any One)		06
		1	1. Isolation of DNA by crude method	02	
			2) Molecular biology (Minor) (Any One)		
		2	1. Demonstration of DNA Electrophoresis	02	
			3) Biotechnology (Any Six)		
		3	1. Working Principle and application of Autoclave	02	
02	May	4	2. Working Principle and application of Laminar Air Flow.	01	05
		5	3. Cleaning and Sterilization of Glassware	01	
		6	4. Sterilization of Explant	01	
		7	6. Demonstration of in vitro culture techniques – anther and pollen culture	02	
03	May	8	9. Demonstration of technique of Micropropogation	02	02
			Visit to molecular biology, biotechnological research institute/ industry		
04				Practical Examination	



**DEPARTMENT OF BOTANY****Teaching Plan 2021-22 (Theory)**

**Note: Due to Covid-19 pandemic situations the teaching plan is for online mode teaching using online platforms like Zoom meeting, Google classroom, Google meet, Eduscoop**

Class: B.Sc. I		Sem I		Subject: Botany	
Sr. No.	Month	Unit No.	Topic Name	Period Required	Total Period
01	July	UNIT-I	<b>Plant Diversity (15)</b>		15
			1.1 Introduction to Plant Kingdom: Cryptogams	03	
			1.2 Diversity of plants with respect to habitat, form, nutrition and ecological status	03	
			1.3 General Account of Viruses and structure of TMV and HIV	03	
			1.4 Bacteria: structure, Nutrition and reproduction	03	
			1.5 Role of microbes in Agriculture, Medicine and Industries	03	
02	Aug- Sept	UNIT-II	<b>Algae (15)</b>		15
			2.1. Classification according to F. E. Fritsch and G. M. Smith up to classes	02	
			2.2. General characters of algae with reference to Habitat, Thallus organization, Pigmentation, Reserve food and Reproduction	02	
			2.3. General characters of following classes with special reference to examples mentioned	02	
			2.3.1. Chlorophyta - Oedogonium	03	
			2.3.2. Charophyta – Chara (Thallus structure and reproduction)	03	
			2.3.3. Phaeophyta – Sargassum (Thallus structure and reproduction)	02	
			2.3.4. Rhodophyta – Batrachospermum	01	
03		UNIT-III	<b>Fungi (15)</b>		15
			3.1. General characteristics of following classes with special reference to examples mentioned	03	
			3.1.1. Mastigomycotina : Albugo (Cystopus)	03	
			3.1.2. Ascomycotina : Aspergillus	02	
			3.1.3. Basidiomycotina : Puccinia graminis-tritici	02	
			3.1.4. Deuteromycotina : General characters	03	
04	Sept	Unit-IV	<b>Bryophyte (15)</b>		15
			4.1. General characters, thallus organization and life cycle of	03	
			4.1.1. Hepaticopsida – Marchantia	03	
			4.1.2. Bryopsida – Funaria	03	

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			4.2. Affinities of bryophytes with algae and pteridophytes	<b>03</b>	
			4.5. Brief Account on some Indian Bryologist	<b>03</b>	
<b>05</b>	<b>Sept-Oct</b>	<b>Unit-V</b>	<b>Pteridophyte (15)</b>		<b>15</b>
			5.1. Pteridophytes as First Vascular Plants.	<b>02</b>	
			5.3. General characters of the following classes with special reference to examples mentioned –	<b>02</b>	
			5.3.1. Sphenopsida – Equisetum	<b>03</b>	
			5.3.2. Filicopsida – Marsilea	<b>03</b>	
			5.4. Stele types in pteridophytes	<b>02</b>	
			5.5 Heterospory and Seed Habit in Pteridophytes	<b>03</b>	
<b>06</b>	<b>Oct</b>	<b>Unit-VI</b>	<b>Application of Microbes Cryptogams (15)</b>		<b>15</b>
			6.1. Economic Importance of Algae with special reference to Food, Industries, Agriculture and Harmful aspects	<b>03</b>	
			6.2. Mycorrhiza – Types and Application	<b>02</b>	
			6.3. Role of Fungi in Industries, Medicine, Food & Agriculture	<b>02</b>	
			6.4. Plant Diseases –	<b>02</b>	
			6.4.1. Viral –TMV	<b>02</b>	
			6.4.2. Bacteria – Black arm of cotton (Xanthomonos malvacearum)	<b>02</b>	
			6.4.3. Fungal – Tikka disease of groundnut (Cercospora sps.)	<b>02</b>	

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Class: B.Sc. I		Sem I		Subject: Botany	
DIVERSITY & APPLICATIONS OF MICROBES AND CRYPTOGRAMS					
LABORATORY EXERCISE (PRACTICALS)					
Sr. No.	Month	Practical No.	Practical Name	Practical Required	Total Practical
01	July		<b>ALGAE</b> Preparation of temporary mount, identification with reason of following algal materials		07
		1	1. <i>Oedogonium</i> ,	01	
		2	2 <i>Hydrodictyon</i>	01	
		3	3 <i>Chara</i> ,	01	
		4	4 <i>Vaucheria</i>	01	
		5	5 <i>Ectocarpus</i>	01	
		6	6 <i>Sargassum</i>	01	
		7	7. <i>Batrachospermum</i>	01	
02	August		<b>FUNGI AND PLANT PATHOLOGY</b>		06
		8	Study of following genera <i>Albugo</i> , <i>Uncinula</i> ,	01	
		9	<i>Penicillium</i> , <i>Agaricus</i> ,	01	
		10	<i>Puccinia</i> , <i>Cercospora</i>	01	
		11	Study of Crustose, Fruticose & Foliose Lichen	01	
		12	Study of symptoms of fungal, viral, bacterial and Mycoplasmal diseases	01	
		13	Demonstration of Mushroom Cultivation Technology	01	
03	Sept		<b>BRYOPHYTES</b>		05
		14	Study of external and anatomy features of vegetative and reproductive parts of following genera – <i>Marchantia</i> ,	01	
		15	<i>Anthoceros</i> ,	01	
		16	<i>Funaria</i> ,	01	
		17	<i>Polytrichum</i>	01	
		18	<i>Sphagnum</i>	01	
04	Sept-Oct		<b>PTERIDOPHYTES</b> Study of Pteridophyte external and anatomy features of vegetative and reproductive parts of following genera –		07
		19	<i>Lycopodium</i>	01	
		20	<i>Equisetum</i> ,	01	
		21	<i>Osmunda</i> ,	01	
		22	<i>Selaginella</i> ,	01	
		23	<i>Adiantum</i> ,	01	
		24	<i>Marsilea</i>	01	
		25	Any one fossil specimen	01	
05	Oct		Botanical excursion		
06	Oct		Common algal, fugal, pathological, bryophytic and pteridophytic collection and excursion report must be submitted at the time of practical exam		

**DEPARTMENT OF BOTANY****Teaching Plan 2021-22**

**Note: Due to Covid-19 pandemic situations the teaching plan is for online mode teaching using online platforms like Zoom meeting, Google classroom, Google meet, Eduscoop**

Class: B.Sc. I		Sem II		Subject: Botany	
GYMNOSPERM, MORPHOLOGY OF ANGIOSPERMS AND UTILIZATION OF PLANTS					
01	January	UNIT-I	UNIT-I: Palaeobotany (15)		15
			1.1. Process of plant fossilization and types of fossils	03	
			1.2. Geological Time Scale	03	
			1.3. Fossil Gymnosperms	03	
			1.3.1. Pteridospermales: Lyginopteris oldhamia	03	
			1.3.2. Bennettitales: Bennittites	03	
02	Jan-Feb	UNIT-II	UNIT-II : Gymnosperms (15)		15
			2.1. Classification according to D. D. Pant	03	
			2.2. General account: morphology, anatomy, life cycle and taxonomic position of Pinus and Gnetum	04	
			2.3. Affinities with pteridophytes and angiosperms	04	
			2.4. Economic importance of Gymnosperms	04	
03	Feb	UNIT-III	UNIT-III: Morphology (15)		15
			3.1. Diversity in Plants habits – Annual, biannual, perennials	03	
			3.2. Roots – Types of root : tap and adventitious, modification of root : for food storage, respiration and supports.	04	
			3.3. Stem – Types of Stem, Characteristic features, branching, modification of Stem – Underground and aerial	04	
			3.4. Leaf – Parts of leaf, types of leaves – simple and compound; Phyllotaxy; Venation; Stipule. Modification of leaves	04	
04	Feb	Unit-IV	UNIT-IV: Morphology (15)		15
			4.1. Inflorescences – Types: Racemose, Cymose and Special	06	
			4.2. Flower – Flower as modified shoot; Structure of flower – Calyx, Corolla, Androecium and Gynoecium. Placentation; Types of Pollination.	09	
05	March	Unit-V	UNIT-V : Morphology and Utilization of Plants (15)		15
			5.1. Fruits – Morphological types	03	
			5.2. Utilization of Plants	03	
			5.2.1. Food Plants – Wheat, Potato –Morphology, varieties and economic importance.	03	
			5.2.2. Fiber Plant – Morphology, varieties and economic importance of Cotton.	03	
			5.2.3. Oil yielding Plant – Morphology, Varieties and economic importance of Ground nut.	03	
06	March	Unit-VI	UNIT-VI: Utilization of Plants (15)		15
			6.1. Spices – General account and economic importance of Black pepper, Clove, Cinnamon and Cardamom	02	

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		6.2. General account and sources of firewood, timber and Bamboos.	<b>02</b>	
		6.3. Essential oils – General account, economic importance of Eucalyptus.	<b>02</b>	
		6.4. Pharmacognosy and Phytochemistry with respect to following medicinal plants –		
		6.4.1. Aloe vera	<b>01</b>	
		6.4.2. Adathoda vasica	<b>01</b>	
		6.4.3. Asparagus racemosa	<b>01</b>	
		6.4.4. Azadirachta indica	<b>01</b>	
		6.4.5. Catharanthus roseus		
		6.4.6. Chlorophytum borivillanum	<b>01</b>	
		6.4.7. Emblica officinalis	<b>01</b>	
		6.4.8. Ocimum sanctum	<b>01</b>	
		6.4.9. Rauwolfia serpentina	<b>01</b>	
		6.4.10. Vitex negundo	<b>01</b>	
		6.4.11. Withania somnifera		

Class: B.Sc. I		Sem II		Subject: Botany	
GYMNOSPERM, MORPHOLOGY OF ANGIOSPERMS AND UTILIZATION OF PLANTS					
LABORATORY EXERCISE (PRACTICALS)					
Sr. No.	Month	Practical No.	Practical Name	Practical Required	Total Practical
01	January		I. Gymnosperms: Morphology and anatomy of the following members –		07
		1	a. Pinus: Root, Stem, Leaf	02	
		2	b. Gnetum: Root, Stem, Leaf	02	
		3	II. Preparation of double stained permanent mount of Pinus stem, needle and Gnetum stem and leaf	02	
		4	III. Study of fossil slides of Lyginopteris and Bennettites	01	
02	February	5	IV. Detailed morphological study of types of root, stem and leaf with its modifications	04	07
		6	V. Forms of corolla	01	
		7	VI. Types of placentation	01	
		8	VII. Morphology of fruits	01	
03	March	9	VIII. Morphology of plant parts used and medicinal plants prescribed in syllabi	03	06
		10	IX. Utilization of plants: Spices, fiber yielding plants and food plants prescribed in syllabi	03	
		11	Botanical excursion		
04	March	12	Practical Examination		

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Class: B.Sc. II		Sem III		Subject: Botany	
ANGIOSPERM SYSTEMATICS, ANATOMY & EMBRYOLOGY					
Sr. No.	Month	Unit No.	Topic Name	Period Required	Total Period
01	July	UNIT-I	Angiosperm Systematics and Biodiversity		15
			1.1 Angiosperms: Origin and Evolution (Pteridospermean and Bennititalean Theory)	02	
			1.2 Botanical Nomenclature: Principles of rules, Taxonomic Ranks, Type concept, Valid publication.	03	
			1.3 Herbarium – Concept & significance, Royal Botanical Garden, Kolkata.	04	
			1.4 Concept of biodiversity, Ex situ and In situ conservation	04	
			1.5 Concept & importance of Biodiversity.	02	
02	August	UNIT-II	Angiosperm Systematics		15
			2.1 Systems of Classification: Bentham and Hooker’s System, Engler and Prantle’s system.	03	
			2.2 Systematic studies & economic importance of following Families: Dicotyledons (Polypetalae) : Malvaceae, Brassicaceae, Leguminosae, Apiaceae,	12	
03	Aug- Sept	UNIT-III	Angiosperm Systematics		15
			3.1 Systematic studies & economic importance of following Families: Dicotyledons (Gamopetalae): Asteraceae, Asclepiadaceae, Apocynaceae, Solanaceae, Verbenaceae, Lamiaceae.	10	
			3.2 Dicotyledons ( Monoclamydeae): Euphorbiaceae.	02	
			3.3 Monocotyledons: Liliaceae, Poaceae.	03	
04	Sept	Unit-IV	Anatomy		15
			4.1 Types of Tissues: Meristematic – Types of meristems Permanent – Simple and complex.	04	
			4.2 Characteristics of growth rings, Sapwood and heartwood.	04	

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			4.3 Anatomy of root: Primary structure in dicot and monocot root, normal secondary growth in dicot root.	<b>07</b>	
<b>05</b>	<b>Sept-Oct</b>	<b>Unit-V</b>	<b>Anatomy</b>		<b>15</b>
			5.1 Anatomy of stem: Primary structure in monocot and dicot stem, normal secondary growth in dicot stem.	<b>06</b>	
			5.2 Anomalies in primary structure in <i>Boerhavia</i> stem, secondary structure in <i>Bignonia</i> and <i>Dracaena</i> stem.	<b>06</b>	
			5.3 Leaf Anatomy: Internal structure in <i>Nerium</i> and <i>Maize</i> leaf.	<b>03</b>	
<b>06</b>	<b>Oct</b>	<b>Unit-VI</b>	<b>Embryology</b>		<b>15</b>
			5.1 Microsporangium, microsporogenesis, development of male gametophyte.	<b>04</b>	
			5.2 Megasporangium, types of ovules, megasporogenesis, development of female gametophyte monosporic, Bisporic & tetrasporic).	<b>04</b>	
			5.3 Double fertilization and triple fusion.	<b>02</b>	
			5.4 Embryo – Classification of embryo.	<b>02</b>	
			5.5 Endosperm types & significance, Suspended animation	<b>03</b>	

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ANGIOSPERM SYSTEMATICS, ANATOMY & EMBRYOLOGY							
LABORATORY EXERCISE (PRACTICALS)							
Sr. No.	Month	Practical No.	Practical Name	Practical Required	Total Practical		
01	July		<b>Anatomy of angiosperms</b> : Preparation of double stained slides of root, stem and leaves of angiosperms mentioned in the syllabus		03		
		1	Anatomy of root in Dicot & Monocot	01			
		2	Anatomy of stem in Dicot & Monocot	01			
		3	Anatomy of Leaf in Dicot & Monocot	01			
02			<b>Taxonomy</b> : Description of ten plants belonging to different families in technical language and identification up to family level.		15		
		4	Brassicaceae	01			
	August	5	Malvaceae	01			
		6	Fabaceae	01			
		7	Caesalpinoidae	01			
		8	Mimosoidae	01			
		9	Apiaceae	01			
		10	Apocynaceae	01			
		11	Asclepiadaceae	01			
		12	Solanaceae	01			
		13	Euphorbiaceae	01			
		September	14	Lamiaceae		01	
			15	Asteraceae		01	
	16		Verbanaceae	01			
	17		Liliaceae	01			
	18		Poaceae	01			
	03			<b>Embryology of Angiosperms</b>			03
			19	Observation of wide range of flowers available in the locality and methods of their pollination.		01	
20			Study through permanent slides of T.S. of anthers, microsporogenesis, L.S. of ovule, types of endosperms and embryo of Capsella	01			
October		21	Mounting of T.S. of anthers, Pollen grains and pollinia.	01			
04			<b>Long and short excursion tour</b>				



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Class: B.Sc. II		Sem IV		Subject: Botany	
CELL BIOLOGY, GENETICS AND BIOCHEMISTRY					
Sr. No.	Month	Unit No.	Topic Name	Period Required	Total Period
01	Dec- January	UNIT-I	Unit – I : Cell Biology		15
			1.1 Cell concept – Prokaryotic and Eukaryotic cell	02	
			1.2 Cell wall –Structure and Functions	03	
			1.3 Plasma membrane –Structure (models) and Functions	04	
			1.4 Nucleus – Ultra structure (nuclear membrane, nuclear pore complex and nucleolus) and functions	04	
			1.5 Chloroplast- Structure and Functions	02	
02	Jan- Feb	UNIT-II	Unit–II : Cell Biology Structure and functions of-		15
			2.1 Endoplasmic Reticulum	03	
			2.2 Golgi complex	02	
			2.3 Vacuole	02	
			2.4 Ribosome	02	
			2.5 Perixysome	02	
			2.6 Mitochondria	02	
			2.7 Cell cycle: Mitosis and Meiosis	02	
03	February	UNIT-III	Unit – III : Genetics		15
			3.1 Chromosome- Morphology, Types, Centromere & Telomere	04	
			3.2 Chromosomal aberrations –		
			3.2.1 Structural aberrations: Deletion, Duplication, Inversion and Translocation	05	
			3.2.2 Numerical aberrations: Euploidy and aneuploidy	06	
04	Feb- March	Unit-IV	Unit–IV: Genetics		15
			4.1 Mendellism: Mendel’s law of Dominance, Segregations and Independent assortment, Incomplete dominance	05	
			4.2 Interaction of genes- Complimentary, Supplementary and Epistasis	05	
			4.3 Problems based on Mendelism and Interaction of Genes	05	
05	Feb- March	Unit-V	Unit – V Genetics		15

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			5.1 Linkage – Concept, Types and theories	<b>03</b>	
			5.2 Crossing over: Concept, Types and theories	<b>04</b>	
			5.3 Gene mutations- Spontaneous and Induced	<b>04</b>	
			5.4 Extra-nuclear Genome- Mitchondrial DNA and Chloroplast DNA	<b>04</b>	
<b>06</b>	<b>March</b>	<b>Unit-VI</b>	<b>Unit – VI Biochemistry</b>		
			6.1 Nomenclature of Enzymes	<b>03</b>	
			6.2 Characteristics of Enzymes	<b>03</b>	
			6.3 Concept of holoenzymes, coenzymes and cofactor	<b>03</b>	
			6.4 Theories for Mechanism of action of Enzymes	<b>03</b>	
			6.5 Structure and functions Carbohydrates: Monosaccharides (Glucose), Disaccharides (Galactose) and Polysaccharides (Starch)	<b>03</b>	
					<b>15</b>
<b>07</b>			<b>Subject related Project &amp; Seminar</b>		

Class: B.Sc. II		Sem IV		Subject: Botany	
CELL BIOLOGY, GENETICS AND BIOCHEMISTRY					
LABORATORY EXERCISE (PRACTICALS)					
Sr. No.	Month	Practical No.	Practical Name	Practical Required	Total Practical
01	January		I Cell Biology (Any Two)		04
		1	Squash preparation for the study of various stages of mitosis	02	
		2	Smear preparation for the study of various stages of meiosis.	02	
02	February		II Genetics		03
		3	1. To prove Mendel's Monohybrid ratio.	01	
		4	2. To prove Mendel's Dihybrid ratio	01	
		5	3. Problems based on Interaction of genes	01	
03	Feb-March		III Biochemistry		03
		6	1. To study the enzyme activity of catalase.	01	
		7	2. To demonstrate test for glucose in grapes, & sucrose in cane sugar / beet root.	01	
		8	3. To demonstrate test for protein.	01	
03	March	9	4. To demonstrate the lipid test in oily seeds.	01	03
		10	5. To demonstrate the test for starch / cellulose.	01	
		11	6. To demonstrate the activity of enzyme	01	

Amrut Sevabhavi Sanstha Parbhani's

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			amylase from germinating Wheat grains		
			<b>Practical Examination</b>		

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Class: B.Sc. III		Sem V		Subject: Botany	
PLANT PHYSIOLOGY AND ECOLOGY					
Sr. No.	Month	Unit No.	Topic Name	Period Required	Total Period
01	July	UNIT-I	Plant Water Relations		15
			1.1 Importance of water to plant life. Imbibition , Diffusion,Osmosis, Plasmolysis.	04	
			1.2 Active and passive Absorption of water.	02	
			1.3 Ascent of sap - Root Pressure and Transpiration Pull Theory.	03	
			1.4 Transpiration - Types of transpiration, Stomatal movements, Mechanism of transpiration (Starch ) sugar hypothesis), Significance. Antitranspirant, Guttation.	03	
			1.5 Mineral uptake - Active uptake - Career Concept, Passive uptake Ion Exchange.	03	
02	July-August	UNIT-II	Metabolism-		15
			2.1 Photosynthesis - Introduction, Role of Light, Photosynthetic Apparatus and Pigments, Two Pigment Systems, Photophosphorylation, C3 and C4 cycle, CAM Pathway.	07	
			2.2 Respiration - Introduction, Mitochondria as a Respiratory centre, Types of Respiration - Aerobic and Anaerobic, Mechanism of aerobic respiration- Glycolysis, Kreb cycle, Electron transport system and Chemiosmotic ATP generation, Respiratory Quotient.	08	
03	August	UNIT-III	Metabolism and growth		15
			3.1 Nitrogen Metabolism- Sources of nitrogen, Symbiotic nitrogen fixation, Role of Nitrate reductase.	06	
			3.2 Growth - Phases of growth, Growth curve, Physiological role of growth hormones ( Auxins, Gibberellins, Cytokinins, Absciscic acid, and Ethylene).	06	

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			3.3 Physiology of Senescence and Abscission.	<b>03</b>	
<b>04</b>	<b>August-Sept</b>	<b>Unit-IV</b>	<b>Plant responses</b>		<b>15</b>
			4.1 Photoperiodism - Concept of Florigen, Role of Phytochrome,	<b>04</b>	
			4.2 Vernalization- Concept and Significance.	<b>02</b>	
			4.3 Plant movement- Tropic (Phototropic and Geotropic) and Nastic (Epinasty, Hyponasty and Seismonasty)	<b>05</b>	
			4.4 Stress physiology- Concept, Types of stress, Water and Salinity stress.	<b>04</b>	
<b>05</b>	<b>Sept</b>	<b>Unit-V</b>	<b>Ecology and Environment</b>		<b>15</b>
			5.1 Concept of environment, Concept and scope of ecology.	<b>02</b>	
			5.2 Ecological factors- Climatic- Light, Temperature and Water.	<b>02</b>	
			5.3 Atmosphere and its composition.	<b>03</b>	
			5.4 Edaphic factor- Process of soil formation, soil profile, soil biota and their role.	<b>04</b>	
			5.5 Ecological Adaptations - Morphological and Anatomical adaptation in Hydrophytes, and Xerophytes	<b>04</b>	
<b>06</b>	<b>Oct</b>	<b>Unit-VI</b>	<b>Ecosystem</b>		<b>15</b>
			6.1 Population Ecology- Natality and Mortality, Community characteristics – Frequency, Density and Abundance	<b>05</b>	
			6.2 Ecological Succession - Hydrosere and Xerosere	<b>03</b>	
			6.3 Ecosystem – Definition, Structure and Function, Food chain, Food web, Energy flow model (Single channel model)	<b>05</b>	
			6.4 Types of Ecosystem- Pond ecosystem, Desert ecosystem.	<b>02</b>	

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Class: B.Sc. III		Sem V		Subject: Botany	
PLANT PHYSIOLOGY AND ECOLOGY					
LABORATORY EXERCISE (PRACTICALS)					
Sr. No.	Month	Practical No.	Practical Name	Practical Required	Total Practical
01	July-August		<b>Plant Physiology Major experiment (Any Seven)</b>		07
		1	To study the effect of temperature and organic solvent on permeability of plasma membrane.	01	
		2	To study osmotic pressure of cell sap by plasmolytic method.	01	
		3	To determine the path of water (ascent of sap)	01	
		4	To determine the rate of transpiration by Ganongs photometer/Screen.	01	
		5	To determine rate of photosynthesis under varying quality of light and CO2 concentration.	01	
		6	Separation of chloroplast pigments by paper chromatography/solvent extraction method.	01	
		7	To determine R.Q. using different substrates.	01	
02	August		<b>Plant Physiology Minor experiment (Any Three)</b>		03
		8	To demonstrate fermentation.	01	
		9	To demonstrate exo and endosmosis	01	
		10	To demonstrate the phenomenon of nastic movement with help of <i>Mimosa pudica</i> / or <i>Biophytum sensitivum</i> .	01	
03	Aug-Sept		<b>Ecology: Major experiment (Any Three)</b>		05
		11	Study of morphological and anatomical adaptations in hydrophytes – <i>Hydrilla</i> , <i>Eichhornia</i> , <i>Typha</i> , <i>Vallisneria</i> and <i>Nymphaea</i> (any two)	02	
		12	Study of morphological and anatomical adaptations in xerophytes - <i>Asparagus</i> , <i>Nerium</i> , <i>Casuarina</i> , <i>Euphorbia</i> , <i>Cycas</i> , <i>Opuntia</i> (any two)	02	
		13	Study of community characterstics by quadrat method.	01	
04	Sept-Oct		<b>Ecology: Minor experiment (Any Two)</b>		02
		14	Determination of pH of different soils and water samples by pH papers/ pH meter.	01	
		15	Study of meteorological instruments -Rain	01	

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			gauge, Hygrometer, Barometer		
<b>05</b>	<b>Oct</b>		<b>Subject related Project &amp; Seminar</b>		

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Class: B.Sc. III		Sem VI		Subject: Botany	
MOLECULAR BIOLOGY AND BIOTECHNOLOGY					
Sr. No.	Month	Unit No.	Topic Name	Period Required	Total Period
01	January	UNIT-I	Unit-I : DNA the genetic material :		15
			1.1 Historical account – Giffith’s Expt, Hershy and Chase Expt.	04	
			1.2 DNA– Chemical composition and Double Helical model,	02	
			1.3 DNA replication in Eukaryotes;	03	
			1.4 DNA Packaging - Nucleosome and Solenoid	03	
			1.5 Satellite, Repetitive DNA and Transposable element in plants (AC-DS system)	03	
02	January	UNIT-II	Unit-II : Gene Structure and Expression -		15
			2.1 Concept of gene, Fine structure of Gene	03	
			2.2 Gene Expression – Central Dogma, Types of RNA, Genetic code, Ribosome as a translation machine	03	
			2.3 Transcription in Eukaryotes – Mechanism of Transcription and RNA Processing	03	
			2.4 Translation in Eukaryotes.	03	
			2.5 Endomembrane system (Flow of Peptide)	03	
03	February	UNIT-III	Unit – III : Regulation of Gene Expression		15
			3.1 Regulation of Gene Expression in Prokaryotes – Operon concept with special reference to Lac Operon	03	
			3.2 Regulation of gene expression of Eukaryotes – Britton Davidson Model	03	
			3.3 Protein Folding Mechanism and Structure (Primary, Secondary, Tertiary and Quaternary)	03	

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			3.4 Protein Sorting – Targeting to proteins to organelles	03	
			3.5 Protein Trafficking	03	
04	February	Unit-IV	<b>Unit-IV : Genetic Engineering -</b>		
			4.1 Tools and techniques of recombinant DNA technology,	02	
			4.2 Restriction Enzymes – Nomenclature and Types	02	
			4.3 Cloning vectors – Plasmids, Phages, Cosmids	03	
			4.4 Gene Source- Genomic and c-DNA library	03	
			4.5 Gene Transfer Techniques – Direct - (1) Chemical method, (2) Electroporation, (3) Gene gun method Indirect – Agrobacterium mediated gene transfer	03	
			4.6 Gene Amplification - _Polymerase Chain Reaction (PCR	02	15
05	Feb-March	Unit-V	<b>Unit-V : Plant Tissue Culture -</b>		
			5.1 Basic aspects of plant tissue culture	03	
			5.2 Laboratory Requirement – Infrastructure, Instruments (laminar air flow, autoclave, growth chamber), Culture Media (MS Media), Growth Hormone (Auxin, Cytokinin and Gibberellins) Sterilization Techniques	06	
			5.3 Tissue Culture Technique - Cellular totipotency, differentiation and morphogenesis; Callus Culture; Micro propagation	06	15
06	March	Unit-VI	<b>Unit-VI : Applications of Biotechnology</b>		
			6.1 Agriculture – Haploid plant production (Anther and Pollen Culture); Protoplast Culture and Somatic Hybridization; Transgenic Plant - BT Cotton, Synthetic seed. Salient achievements of crop biotechnology	04	
			6.2 Industry– Fermentation Technology- Bakery Products and Alcohol Productions.	04	
			6.3 Health Care – Edible Vaccines	03	
			6.4 Conservation – Cryopreservation, Genetically Modified Organisms: - Pros and Cons	04	15
07	March		<b>Subject related Project &amp; Seminar</b>		



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Class: B.Sc. III		Sem VI		Subject: Botany	
MOLECULAR BIOLOGY AND BIOTECHNOLOGY					
LABORATORY EXERCISE (PRACTICALS)					
Sr. No.	Month	Practical No.	Practical Name	Practical Required	Total Practical
01	January		1) Molecular biology (Major) (Any One)		06
		1	1. Isolation of DNA by crude method	02	
			2) Molecular biology (Minor) (Any One)		
		2	1. Demonstration of DNA Electrophoresis	02	
			3) Biotechnology (Any Six)		
		3	1. Working Principle and application of Autoclave	02	
02	February	4	2. Working Principle and application of Laminar Air Flow.	01	05
		5	3. Cleaning and Sterilization of Glassware	01	
		6	4. Sterilization of Explant	01	
		7	6. Demonstration of in vitro culture techniques – anther and pollen culture	02	
03	March	8	9. Demonstration of technique of Micropropogation	02	02
			Visit to molecular biology, biotechnological research institute/ industry		
04				Practical Examination	