

## **D.B.F. Dayanand College of Arts and Science, Solapur**

### **Program Outcome [B.Sc. Botany]**

- Students have scope in forestry
- Students can build their tissue culture lab
- Students can start to grow plants for nursery
- Students can apply for various examinations of MPSC & UPSC
- Students can build up their research carrier in field of Botany
- Students can build up their research carrier in field of Taxonomy of plants
- Students can build up their research carrier in field of plant breeding
- Students can be able to follow new methodology for plant growth and propagation.
- Students can apply new methodologies in farm for better yield.
- Students can prepare pesticides, perfumes, herbal medicines, cosmetics by using various plant sources.
- Students get basic knowledge about algae, bryophytes, fungi, pteridophytes and gymnospermic plants.
- Students will get criteria of plant classification, identification and nomenclature of plants.
- Students will get appropriate knowledge about concepts in enzymology, biomolecules and cell biology.
- Students will get knowledge about bioinstrumentation
- Students will get detail knowledge about applications of different instruments in industry.
- Students will get detail knowledge about ethenobotany of plants.
- Students get basic knowledge about basic concepts in biostat.
- Students get basic knowledge about medical and human genetics.

### **Program Outcome [M.Sc. Botany]**

- Students have scope in forestry
- Students can build their tissue culture lab
- Students can start to grow plants for nursery
- Students can apply for various examinations of MPSC & UPSC
- Students can build up their research carrier in field of Botany
- Students can build up their research carrier in field of Taxonomy of plants
- Students can build up their research carrier in field of plant breeding
- Students can be able to follow new methodology for plant growth and propagation.
- Students can apply new methodologies in farm for better yield.
- Students can prepare pesticides, perfumes, herbal medicines, cosmetics by using various plant sources.
- Students get basic knowledge about algae, bryophytes, fungi, Pteridophytes and gymnosperm plants.
- Students will get criteria of plant classification, identification and nomenclature of plants.
- Students will get knowledge about bioinstrumentation
- Students will get detail knowledge about applications of different instruments in industry.
- Students will give information to the farmers about cultivation of plants.

# D.B.F. Dayanand College of Arts and Science, Solapur

## COURSE OUTCOME

Name of Department - Botany

<b>B.A. / B.Sc. / M.A. / M.Sc. – B.Sc.</b>		
<b>NAME OF SUBJECT - Botany</b>		
<b>SEM I / II / III / IV / V / VI- I</b>		
<b>COURSE NUMBER ( PAPER NUMBER) - I</b>		
<b>TITLE OF COURSE (NAME OF PAPER)- Microbiology and Phycology</b>		
<b>COURSE CONTENT</b>	<b>OBJECTIVES</b>	<b>OUTCOME</b>
<b>Unit 1 :</b> Introduction of Microbiology	To get the knowledge about the basic concepts in microbiology.	The student can understand the basic concept of microbiology.
<b>Unit 2:</b> Viruses: General characters, structure, classification (plant, animal and bacterial viruses) and economic importance of viruses.	To get the knowledge about the characters, structure and economic importance of viruses.	The student can understand in detail about the viruses.
<b>Unit 3:</b> Bacteria: Characteristics of bacteria, size, forms (Shapes), ultra structure of bacterial cell, Economic importance.(Useful and harmful).	To get the knowledge about the forms, size and diversity of bacteria.	The student can understand in detail about the bacteria.
<b>Unit 4 :</b> Mycoplasma: (Phytoplasma and Spiroplasma) Characters, Structure, classification and significance	To get the knowledge about the Mycoplasma	The student can understand in detail about the Mycoplasma
<b>Unit 5 :</b> Algae: 5.1 General characters and classification of algae (As per Smith-	To get the knowledge about the characters, classification and reproduction of algae.	The student can understand in detail about the algae

1955) up to class. 5.2 Range of thallus organization 5.3 Methods of reproduction		
<b>Unit 6</b> 6.1: Cyanophyta: General Characters of Cyanophyta 6.2 Study of <i>Nostoc</i> – Occurrence, Classification, thallus structure and reproduction	To get the knowledge about the Characters, occurrence & reproduction of Cyanophyta division of algae	The student can understand in detail about the division Cyanophyta
<b>Unit 7</b> 7.1 : Chlorophyta: General Characters of Chlorophyta 7.2 Study of <i>Spirogyra</i> - Occurrence, Classification, thallus structure and reproduction	To get the knowledge about the Characters, occurrence & reproduction Chlorophyta division of algae	The student can understand in detail about the division Chlorophyta
<b>Unit 8</b> 8.1: Phaeophyta: General Characters of Phaeophyta 8.2 Study of <i>Sargassum</i> - Occurrence, Classification, thallus structure and reproduction (excluding developmental details of sex organs and sporophyte)	To get the knowledge about the Characters, occurrence & reproduction in Phaeophyta division of algae	The student can understand in detail about the division Phaeophyta
<b>Unit 9</b> 9.1 : Applied Phycology: Role of algae in the environment, agriculture, biotechnology and industry	To get the knowledge about the application of algae in various field.	The student can understand in detail about the importance & uses of algae.

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NAME OF SUBJECT - <b>Botany</b>		
SEM I / II / III / IV / V / VI- I		
COURSE NUMBER ( PAPER NUMBER) - <b>II</b>		
TITLE OF COURSE (NAME OF PAPER)- <b>BIOMOLECULES AND CELL BIOLOGY</b>		
COURSE CONTENT	OBJECTIVES	OUTCOME
<b>Unit 1: Biomolecules</b> 1.1 Types and significance of chemical bonds; Structure and properties of water; pH and buffers. 1.2 Carbohydrates: Definition, classification, occurrence, General, Physical and chemical properties of monosaccharides (glucose), Oligosaccharides (sucrose) and polysaccharides (starch). 1.3 Nucleic acids: Definition, Structure of - RNA; DNA.	To get the knowledge about the basic concepts of Biomolecules	The student can understand in detail about the structure and properties of different Biomolecules.
<b>Unit 2: Enzymes</b> 2.1 Definition and physicochemical structure of enzymes. 2.2 Properties of enzymes, Coenzymes, Co-factors and Isoenzymes. 2.3 Mechanism of enzyme action-Lock and key hypothesis.	To get the knowledge about the Enzymes.	The student can understand in detail about the enzymes.
<b>Unit 3: The cell</b> 3.1 Definition and Ultra Structure of Prokaryotic and Eukaryotic cell	To get the knowledge about the Plant Cell	The student can understand in detail about the cell.

<b>Unit 4 : Cell wall</b> 4.1 Origin and Ultra structure of cell wall. 4.2 Chemical composition and functions of cell wall.	To get the knowledge about the Cell wall	The student can understand in detail about the cell wall.
<b>Unit 5: Cell membrane</b> 5.1 Ultra structure of cell membrane 5.2 Model of cell membrane (Singer – Nicholson’s Fluid – Mosaic Model) 5.3 Chemical composition of cell membrane.	To get the knowledge about the Cell membrane	The student can understand in detail about the cell membrane.
<b>Unit 6 Microbodies</b> 6.1 Study of Microbodies with respect to Occurrence, Structure and functions of: 6.2 Peroxisomes 6.3 Glyoxysomes	To get the knowledge about the Microbodies in the cell.	The student can understand in detail about the Microbodies.
<b>Unit 7 Cell division</b> 7.1 Mitosis – Definition, Various stages of mitosis and its significance.	To get the knowledge about the cell division in plants.	The student can understand in detail about the cell division.

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NAME OF SUBJECT - <b>Botany</b>		
SEM I / II / III / IV / V / VI- II		
COURSE NUMBER ( PAPER NUMBER) - <b>III</b>		
TITLE OF COURSE (NAME OF PAPER)- MYCOLOGY AND PHYTOPATHOLOGY		
COURSE CONTENT	OBJECTIVES	OUTCOME
<b>Unit 1: Introduction to true fungi</b> Definition, General characteristics; Thallus organization; Cell wall composition; Nutrition; classification of fungi up to class (as per Ainsworth).	To get the knowledge about the True fungi.	The student can understand about the general introduction of true fungi.
<b>Unit 2: Zygomycotina</b> 2.1: General characteristics of Zygomycotina, classification, Occurrence Thallus organization and study of life cycle of <i>Mucor</i> .	To get the knowledge about the fungal division Zygomycotina.	The student can understand about division of Zygomycotina.
<b>Unit 3: Ascomycotina</b> 3.1: General characteristics of Ascomycotina, classification, Occurrence; thallus structure and reproduction in <i>Saccharomyces</i> .	To get the knowledge about the fungal division Ascomycotina.	The student can understand about the division of Ascomycotina.
<b>Unit 4: Oomycetes</b> 4.1: General characteristic of Oomycetes, Occurrence; Classification, thallus structure and	To get the knowledge about the fungal division Oomycetes.	The student can understand about the division Oomycetes.

reproduction in <i>Albugo</i> .		
<b>Unit 5: Symbiotic associations</b> 5.1: <b>Lichens</b> - General Characters, types (Crustose, Fruticose and foliose), morphology, anatomy and economic importance. 5.2: <b>Mycorrhiza:</b> Ectomycorrhiza, Endomycorrhiza and their significance.	To get the knowledge about the Lichens and Mycorrhiza.	The student can understand about characters, types and importance of lichens and about Mycorrhiza.
<b>Unit 6 Applied Mycology</b> 6.1 : Role of fungi in biotechnology, 6.2 : Role of fungi in Agriculture-Biofertilizers (Mycorrhizae, Mycopesticides and Mycoweedicides)	To get the knowledge about role of fungi in various field.	The student can understand about the role of fungi in various field.
<b>Unit 7 Phytopathology</b> 7.1 : Terms and concepts 7.2 : Classification of plant diseases based on symptoms and mode of transmissions 7.3: Study of plants diseases with respect to symptoms, causal organisms and control measures. a. Phytoplasma – Little leaf of Brinjal b. Viral disease –Yellow vein Mosaic of Bhendi, c. Bacterial disease – Citrus canker, d. Fungal disease – Grain smut of Jowar.	To get the knowledge about the various diseases on plants.	The student can understand about the various diseases on plants.

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NAME OF SUBJECT - <b>Botany</b>		
SEM I / II / III / IV / V / VI- <b>II</b>		
COURSE NUMBER ( PAPER NUMBER) - <b>IV</b>		
TITLE OF COURSE (NAME OF PAPER)- <b>ARCHEGONIATE (Bryophytes, Pteridophytes, Gymnosperms)</b>		
COURSE CONTENT	OBJECTIVES	OUTCOME
<b>Unit 1: Introduction</b> 1.1 Unifying characters of archegoniates and Alternation of generations.	To get the knowledge about the general introduction of Archegoniates.	The student can understand about the general introduction of Archegoniates.
<b>Unit 2: Bryophytes</b> 2.1 General characteristics and Classification (As per G. M. Smith); 2.2 Study of <i>Riccia</i> with respect to occurrence, classification, thallus structure and reproduction ( without developmental stages) 2.3 Economic importance	To get the knowledge about the Bryophytes with suitable example.	The student can understand about the Bryophytes and life cycle of <i>Riccia</i> .
<b>Unit 3: Pteridophytes</b> 3.1 General characteristics and classification, up to class (as per smith). 3.2 Study of <i>Selaginella</i> with respect to occurrence, classification morphology of sporophyte, anatomy (stem) and reproduction (without developmental stages) 3.3 Economic importance	To get the knowledge about the Pteridophytes with suitable example.	The student can understand about the Pteridophytes and life cycle of <i>Selaginella</i> .
<b>Unit 4: Gymnosperms</b> 4.1: General	To get the knowledge about the Gymnosperms	The student can understand about the

<p>characteristics and classification (Sporne)  4.2: Study of <i>Cycas</i> with respect to occurrence, classification, morphology, sporophyte and Corolloid roots.  Anatomy of Leaf and corolloid root and reproduction-structure of male cone and megasporophyll (without developmental stages)  4.3 : Economic importance</p>	<p>with suitable example.</p>	<p>Gymnosperms and life cycle of <i>Cycas</i>.</p>
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Name of Department - Botany

B.A. / B.Sc. / M.A. / M.Sc. : <b>B.Sc.</b>		
NAME OF SUBJECT : <b>Botany</b>		
SEM I / II / III / IV / V / VI : <b>III</b>		
COURSE NUMBER ( PAPER NUMBER) : <b>V</b>		
TITLE OF COURSE (NAME OF PAPER) : <b>Anatomy &amp; Taxonomy of Angiosperms</b>		
COURSE CONTENT	OBJECTIVES	OUTCOME
<b>Unit 1: Apical meristem:</b> Introduction & Classification of meristems , Functions of meristem , Theories of structural development- The Apical cell theory Histogen theory Tunica corpus theory	To get the knowledge about the meristem in plants.	The student can understand about the Meristamatic tissue in plants.
<b>Unit 2 : Permanent tissues:</b> Structure and functions of simple tissues, Structure and functions of complex tissues, Types of vascular bundles.	To get the knowledge about the permanent tissues in plants.	The student can understand about the permanent tissue in plants.
<b>Unit 3 : Tissue system and their functions:</b> Epidermal tissue System , Secretary Tissue System, Mechanical tissue System	To get the knowledge about the tissue system and their function in plants.	The student can understand about the tissue system in plants.

<p><b>Unit 4 : Secondary body of the plant:</b>  Normal secondary growth in Dicot root and Stem.  Periderm, Lenticels and annual rings.  Basic structure of wood and its types.</p>	<p>To get the knowledge about the Secondary body of the plant.</p>	<p>The student can understand about the Secondary body plants.</p>
<p><b>Unit 5: Taxonomy of Angiosperms:</b>  Morphology of Inflorescence, Flower, Fruit.  Study of Angiosperm families with respect to classification, morphology of vegetative &amp; reproductive parts, floral formula, floral diagram, diagnostic features and economic importance.  1.Combretaceae  2.Asclepidaceae  3.Amaranthaceae  4.Liliaceae</p>	<p>To get the knowledge about the Taxonomy of angiosperms.</p>	<p>The student can understand about the taxonomy of angiosperms.</p>

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NAME OF SUBJECT : <b>Botany</b>		
SEM I / II / III / IV / V / VI : <b>III</b>		
COURSE NUMBER ( PAPER NUMBER) : <b>VI</b>		
TITLE OF COURSE (NAME OF PAPER) : <b>PLANT ECOLOGY</b>		
COURSE CONTENT	OBJECTIVES	OUTCOME
Unit-1 - <b>Introduction</b> 1.1) Climatic factors 1.2) Edaphic factors	To get the knowledge about the climatic and Edaphic factors of environment.	The student can understand about the Climatic and Edaphic factors of environment.
Unit-2 <b>Community Ecology-</b> 2.1) Form and structure of communities 2.2) Classification and Physiognomy. 2.3) Community characteristics	To get the knowledge about the Community ecology.	The student can understand about the Community ecology.
Unit-3 <b>Ecosystems</b> 3.1) Concept and types 3.2) Components and Organization of ecosystem 3.3) Ecological pyramids, Food chains and food webs. 3.4) Energy flow in ecosystem. 3.5) Biogeochemical cycles – Nitrogen, Oxygen, Carbon	To get the knowledge about the ecosystem.	The student can understand about the Concept , types, various ecological pyramids and various biogeochemical cycles.

<p><b>Unit-4 Ecological Succession</b>  4.1) Concept and process  4.2) Primary and Secondary succession  4.3) Hydrosere and xerosere</p>	<p>To get the knowledge about the Ecological succession.</p>	<p>The student can understand about the Ecological succession.</p>
<p><b>Unit-5 Ecological adaptations</b>  5.1) Concept  5.2) Xeric, Hydric and Mesic adaptations</p>	<p>To get the knowledge about the Ecological adaptations.</p>	<p>The student can understand about the Ecological adaptations in plants.</p>
<p><b>Unit-VI-Pollution :-</b>  6.1)Introduction  6.2) Air pollution-Sources of air pollutants, their effects and control measures.  6.3) Water pollution- Sources of water pollutants, their effects and control measures.</p>	<p>To get the knowledge about the air pollution and water pollution.</p>	<p>The student can understand about the Air and water pollution.1</p>

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**COURSE OUTCOME**

<b>B.A. / B.Sc. / M.A. / M.Sc. : B.Sc.</b>		
<b>NAME OF SUBJECT : Botany</b>		
<b>SEM I / II / III / IV / V / VI : IV</b>		
<b>COURSE NUMBER ( PAPER NUMBER) : VII</b>		
<b>TITLE OF COURSE (NAME OF PAPER): Plant Physiology and Cytogenetic.</b>		
<b>COURSE CONTENT</b>	<b>OBJECTIVES</b>	<b>OUTCOME</b>
<b>Unit 1: Photosynthesis:</b> 1.1 Introduction and significance 1.2 Photosynthetic apparatus 1.3 Photosynthetic pigments, accessory pigments Photosystems – reaction center complexes 1.4 Light reaction-cyclic and non-cyclic 1.5 Dark reactions Calvin cycle, C4 cycle CAM.	To get the knowledge about the photosynthesis.	The student can understand about the How photosynthesis process carry out in plants.
<b>Unit 2: Nitrogen metabolism</b> 2.1 Introduction 2.2 Nitrogen cycle 2.3 Biological N <sub>2</sub> fixation – Definition, types & organisms involved 2.4 Mechanism of Biological Nitrogen fixation 2.5 Significance of Biological Nitrogen fixation.	To get the knowledge about the Nitrogen metabolism.	The student can understand about the Nitrogen metabolism.

<p><b>Unit 3: Genetics-</b>  3.1: Introduction, terminology  3.2: Mendelism- History  3.3: Principles of inheritance-  Low of dominance,  Law of purity of gametes, Law  of independent assortment.  3.4: Gene interaction-  Definition, types-  complementary,  supplementary and inhibitory  genes.</p>	<p>To get the  knowledge  about the basic  concepts and  principles of  genetics.</p>	<p>The student can  understand about the  Basic concepts and  principles of  genetics.</p>
<p><b>Unit 4: Classical genetics</b>  4.1: Linkage-Definition, kinds  of linkage-complete,  incomplete and linkage  groups, Significance of  linkage.  4.2: Crossing over-definition,  Mechanism of crossing over,  Break and exchange theory,  Significance of crossing over.</p>	<p>To get the  knowledge  about the  linkage and  crossing over.</p>	<p>The student can  understand about the  Linkage and crossing  over.</p>
<p><b>Unit 5: Multiple allelism-</b>  5.5: Introduction and  definition  5.2: Eye color in Drosophila  5.3: Blood groups in man  5.4: Self incompatibility in  plant.</p>	<p>To get the  knowledge  about the  multiple alleles.</p>	<p>The student can  understand about the  Multiple alleles.</p>

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B.A. / B.Sc. / M.A. / M.Sc. : <b>B.Sc.</b>		
NAME OF SUBJECT : <b>Botany</b>		
SEM I / II / III / IV / V / VI : <b>IV</b>		
COURSE NUMBER ( PAPER NUMBER) : <b>VIII</b>		
TITLE OF COURSE (NAME OF PAPER) : <b>Economic Botany</b>		
<b>COURSE CONTENT</b>	<b>OBJECTIVES</b>	<b>OUTCOME</b>
<b>Unit 1: Botanical names, Morphology, source and economic importance of followings-Legumes-Pulse crops- chickpea (Bengal gram), red gram and fodder legumes – Lucerne and Sesbania.</b>	To get the knowledge about the legumes and fodder legumes.	The student can understand about the Legumes and fodder legumes.
<b>Unit 2: Plant Fibers- Morphology, source and economic importance of followings-cotton and coir</b>	To get the knowledge about the plants used as fibers.	The student can understand about the Plant fibers.
<b>Unit 3: Vegetable oil sources</b> 3.1 Botanical name, source and economic importance of – Groundnut, Soybean. 3.2 Brief account of cultural practices of Groundnut & Soybean	To get the knowledge about the oil yielding plants.	The student can understand about the Oil yielding plants.
<b>Unit 4: Medicinal plants- A brief account of plant drugs and their chief constituents used in Indigenous and</b>	To get the knowledge about the different medicinal plants.	The student can understand about the different medicinal plants.

<p>allopathic systems in –</p> <p>A) <b>Rhizome</b> – <i>Zingiber officinale</i></p> <p>B) <b>Root</b> –, <i>Withania somnifera</i></p> <p>C) <b>Stem</b> – <i>Tinospora cordifolia</i></p> <p>D) <b>Leaf</b> – <i>Adhatoda zeylanica</i></p> <p>E) <b>Floral bud</b> – <i>Syzigium aromaticum</i></p> <p>F) <b>Fruit</b> – <i>Embllica officinalis</i></p>		
<p><b>Unit 5: Natural Products-</b></p> <p>5.1: Rubber-Introduction, properties of rubber, source, morphological characters, extraction method and economic importance.</p> <p>5.2: Botanical pesticides- Introduction- Botanical name, morphological characters, source and importance of Neem, Tobacco, Custard apple.</p> <p>5.3: Plant Dyes- Botanical name, source and economic importance.</p> <p>a) Wood-Logwood, Kutch</p> <p>b) Bark- Oak, Teak</p> <p>c) Root and rhizome- manjista, turmeric</p>	<p>To get the knowledge about the natural product rubber.</p>	<p>The student can understand about the natural product rubber.</p>

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## COURSE OUTCOME

B.A. / B.Sc. / M.A. / M.Sc. – B.Sc.		
NAME OF SUBJECT - <b>Botany</b>		
SEM I / II / III / IV / V / VI- V		
COURSE NUMBER ( PAPER NUMBER) - <b>IX</b>		
TITLE OF COURSE (NAME OF PAPER)- <b>Reproductive Biology of Angiosperms</b>		
COURSE CONTENT	OBJECTIVES	OUTCOME
<b>Unit 1: Reproductive development</b> 1.1: Induction of flowering. 1.2: Flower as a modified determinate shoot.	To get the knowledge about the flower development	The student can understand about the development of flower.
<b>Unit 2: Anther and pollen biology</b> 2.1: Anther wall: Structure and functions. 2.2: Microsporogenesis. 2.3: Callose deposition and its significance. 2.4: Male Gametophyte Development. 2.5: NPC system (in brief). 2.6: Palynology and scope (a brief account of Melisopalynology).	To get the knowledge about the anther and pollen biology.	The student can understand about anther and pollen biology.
<b>Unit 3: Ovule</b> 3.1: Structure; Types of ovule. 3.2: Megasporogenesis, Female gametophyte (Embryo sac). 3.3: Female gametophyte development - Monosporic, Bisporic and Tetrasporic.	To get the knowledge about the structure, types and development of embryo sac in ovule	The student can understand about the ovule.

<b>Unit 4: Pollination and fertilization</b> 4.1: Introduction. 4.2: Pollination types and significance. 4.3: Structure of stigma and style. 4.4: Path of pollen tube in pistil. 4.5: Double fertilization.	To get the knowledge about the pollination and fertilization in plants.	The student can understand about the pollination and fertilization.
<b>Unit 5: Embryo, Endosperm</b> 5.1: Introduction. 5.2: Structure and types of endosperm. 5.3: Structure of monocot and dicot seed. 5.4. Seed dispersal.	To get the knowledge about the structure of embryo and endosperm	The student can understand about the embryo and endosperm.

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<b>NAME OF SUBJECT - Botany</b>		
<b>SEM I / II / III / IV / V / VI- V</b>		
<b>COURSE NUMBER ( PAPER NUMBER) - X</b>		
<b>TITLE OF COURSE (NAME OF PAPER)- GENETICS</b>		
<b>COURSE CONTENT</b>	<b>OBJECTIVES</b>	<b>OUTCOME</b>
<b>Unit 1: Sex Determination</b> 1.1: Autosomes and sex chromosomes. 1.2: Mechanism of sex determination. 1.3: Sex chromosomes in <i>Drosophila</i> . 1.4: Sex chromosomes in man. 1.5: Balance concept of sex determination in <i>Drosophila</i> .—Bridge's Experiment. 1.6: Sex linked inheritance in man: a) Colour blindness. b) Haemophilia. c) Holandric genes.	To get the knowledge about the Sex determination in <i>Drosophila</i> and sex linked inheritance in man.	The student can understand about the Sex determination in <i>Drosophila</i> and sex linked inheritance in man.
<b>Unit 2: Quantitative inheritance</b> 2.1: Polygene theory. 2.2: Population genetics. Gene pool, Hardy – Weinberg's law.	To get the knowledge about the quantitative inheritance.	The student can understand about the Quantitative inheritance.
<b>Unit 3: Extra chromosomal inheritance</b> 3.1: Mendelian versus extra chromosomal inheritance. 3.2: Examples of maternal inheritance.	To get the knowledge about the extra chromosomal inheritance in plants.	The student can understand about the extra chromosomal inheritance in plants

a) Mitochondrial inheritance. b) Plastid inheritance.		
<b>Unit 4: Alteration in the genetic make-up and its significance</b> 4.1: Introduction. 4.2: Numerical and Structural Changes in chromosomes.	To get the knowledge about the chromosomal aberrations.	The student can understand about the Chromosomal aberrations.
<b>Unit 5: Gene mutations</b> 5.1: Introduction. 5.2: Types of mutations; Molecular basis of Mutations. 5.3: Mutagens – physical and chemical (Base analogs, deaminating, alkylating and intercalating agents).	To get the knowledge about the gene mutation and mutagens.	The student can understand about the Gene mutation and mutagens.

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NAME OF SUBJECT - <b>Botany</b>		
SEM I / II/ III/ IV / V / VI- V		
COURSE NUMBER ( PAPER NUMBER) - <b>XI</b>		
TITLE OF COURSE (NAME OF PAPER)- <b>Plant Physiology</b>		
COURSE CONTENT	OBJECTIVES	OUTCOME
<b>Unit 1: Plant-water relations:</b> 1.1: Introduction. 1.2: Water Potential and its components. 1.3: Water absorption- root pressure and guttation. 1.4: Ascent of sap– cohesion-tension theory. 1.5: Transpiration- mechanism and factors affecting on transpiration.	To get the knowledge about the plant- water relation.	The student can understand about the Plant –water relation.
<b>Unit 2: Mineral nutrition:</b> 2.1: Introduction. 2.2: Macro and Micronutrients. 2.3: Mineral deficiency symptoms and roles of Macro (N, P, K, Ca, Mg) elements. 2.4: Mineral deficiency symptoms and roles of Micro (B, Cu, Mn, Mo)	To get the knowledge about the mineral nutrition in plants.	The student can understand about the mineral nutrition in plants.
<b>Unit 3: Nutrient Uptake:</b> 3.1: Introduction. 3.2: Soil as a nutrient reservoir. 3.3: Types of Absorption - Passive absorption and Active absorption	To get the knowledge about the nutrient uptake in plant.	The student can understand about the nutrient uptake in plant..
<b>Unit 4: Phloem Transport:</b> 4.1: Introduction.	To get the knowledge about the phloem	The student can understand about the

<p>4.2: Site of Phloem transport.  4.3: Phloem loading and unloading and its mechanism (Munch Hypothesis).  4.4: Source–sink relationship.</p>	<p>transport.</p>	<p>phloem transport.</p>
<p><b>Unit 5: Plant growth regulators:</b>  5.1: Introduction.  5.2: Types of growth regulators.  5.3: Chemical structure.  5.4: Physiological roles and practical applications of Auxin, Gibberellins, Cytokinin, Abscisic acid, Ethylene, CCC.</p>	<p>To get the knowledge about the plant growth regulators.</p>	<p>The student can understand about the plant growth regulators.</p>

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## COURSE OUTCOME

<b>B.A. / B.Sc. / M.A. / M.Sc. – B.Sc.</b>		
<b>NAME OF SUBJECT - Botany</b>		
<b>SEM I / II / III / IV / V / VI- V</b>		
<b>COURSE NUMBER ( PAPER NUMBER) - XII</b>		
<b>TITLE OF COURSE (NAME OF PAPER)- Plant Breeding</b>		
<b>COURSE CONTENT</b>	<b>OBJECTIVES</b>	<b>OUTCOME</b>
<b>Unit 1: Plant Breeding:</b> 1.1: Introduction. 1.2: Aim and objectives. 1.3 Scope of plant breeding.	To get the knowledge about the introduction, aim and objectives of plant breeding	The student can understand about the introduction, aim and objectives of plant breeding.
<b>Unit 2: Methods of crop improvement:</b> 2.1: Introduction. 2.2: Methods of crop improvement. 2.3: Centres of origin and domestication of crop plants. 2.4: Plant genetic resources. 2.5: Introduction and acclimatization. 2.6: Selection methods: Pure line, Mass and Clonal selection. 2.7: Hybridization: Procedure. 2.8: Hybridization in self pollinated crop plants. 2.9: Hybridization in cross pollinated crop plants.	To get the knowledge about the methods of crop improvement.	The student can understand about the methods of crop improvement.
<b>Unit 3: Quantitative inheritance:</b> 3.1: Introduction. 3.2: Concept and mechanism.	To get the knowledge about the quantitative inheritance	The student can understand about the quantitative inheritance

<p>3.3: Example of inheritance of Kernel colour in wheat. 3.4: Monogenic vs polygenic Inheritance.</p>		
<p><b>Unit 4: Mutation and Plant breeding:</b> 4.1: Role of mutations. 4.2: Role of Polyploidy. 4.3: Role of biotechnology in crop improvement. 4.4: Distant hybridization.</p>	<p>To get the knowledge about the mutation and plant breeding.</p>	<p>The student can understand about mutation and plant breeding..</p>

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<b>B.A. / B.Sc. / M.A. / M.Sc. – B.Sc.</b>		
<b>NAME OF SUBJECT - Botany</b>		
<b>SEM I / II / III / IV / V / VI- VI</b>		
<b>COURSE NUMBER ( PAPER NUMBER) - XIII</b>		
<b>TITLE OF COURSE (NAME OF PAPER)- Molecular Biology</b>		
<b>COURSE CONTENT</b>	<b>OBJECTIVES</b>	<b>OUTCOME</b>
<b>Unit 1: Nucleic acids</b> 1.1: Introduction. 1.2: Historical perspective. 1.3: DNA as the carrier of genetic information (Griffith's, Hershey & Chase expt).	To get the knowledge about the nucleic acids.	The student can understand about mutation and plant breeding.
<b>Unit 2: The Structures of Genetic Material</b> 2.1: Introduction. 2.2: Structure of DNA: Watson and Crick model 2.3: Salient features of double helix. 2.4: Types of DNA. 2.5: Denaturation and renaturation of DNA. 2.6: Organization of DNA in Prokaryotes and Eukaryotes. 2.7: Structure of RNA. 2.8: Types of RNA.	To get the knowledge about the structure of DNA and RNA.	The student can understand about structure of DNA and RNA.
<b>Unit 3: Replication of DNA</b> 3.1: Introduction. 3.2: Synthesis of DNA (Kornberg's discovery). 3.3: Replication of DNA in prokaryotes and eukaryotes. 3.4: Enzymes involved in DNA replication	To get the knowledge about the replication of DNA.	The student can understand about replication of DNA.

<p><b>Unit 4: Transcription</b>  4.1: Introduction.  4.2: Transcription in prokaryotes and eukaryotes.  4.3: Principles of transcriptional regulation.  4.4: Prokaryotes: Regulation of lactose metabolism in <i>E.coli</i>.  4.5: Eukaryotes: transcription factors, heat shock proteins, steroids and peptide hormones.</p>	<p>To get the knowledge about the transcription.</p>	<p>The student can understand about transcription.</p>
<p><b>Unit 5: Translation</b>  5.1: Introduction.  5.2: Structure of Ribosome.  5.3: Assembling of Ribosome and mRNA.  5.4: Charging of tRNA and aminoacyl tRNA synthetases.  5.5: Steps in protein synthesis  5.6: Proteins involved in initiation, elongation and termination of polypeptides.  5.7: Post-translational modifications of proteins.</p>	<p>To get the knowledge about the translation.</p>	<p>The student can understand about translation.</p>

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NAME OF SUBJECT - <b>Botany</b>		
SEM I / II / III / IV / V / VI- VI		
COURSE NUMBER ( PAPER NUMBER) - <b>XIV</b>		
TITLE OF COURSE (NAME OF PAPER)- <b>Plant Biotechnology</b>		
COURSE CONTENT	OBJECTIVES	OUTCOME
<b>Unit 1: Recombinant DNA Technology</b> 1.1: Introduction and principles. 1.2: Enzymes involved in recombinant DNA Technology. 1.3: Vectors. 1.4: Southern and northern blotting technique. 1.5: DNA finger printing. 1.6: PCR. 1.7 : DNA libraries.	To get the knowledge about the recombinant DNA technology.	The student can understand about recombinant DNA technology.
<b>Unit 2: Methods of Gene transfer</b> 2.1: Introduction. 2.2: Marker and Reporter genes. 2.3: Methods of gene delivery-Physical, Chemical and Biological (Agrobacterium mediated gene transfer). 2.4: Transgenic plants. 2.5: Achievements in plant Biotechnology.	To get the knowledge about the methods of gene transfer.	The student can understand about methods of gene transfer.
<b>Unit 3: Gene Cloning:</b> 3.1: Introduction. 3.2: Recombinant DNA. 3.3: Bacterial Transformation and selection of recombinant clones.	To get the knowledge about the gene cloning.	The student can understand about gene cloning.

<p>3.4: PCR- mediated gene cloning. 3.5: Complementation, colony hybridization.</p>		
<p><b>Unit 4: Plant Tissue culture</b>  4.1: Introduction.  4.2: Terminology in tissue culture.  4.3: Techniques of tissue culture.  4.4: Micro propagation.  4.5: Anther culture.  4.6: Protoplast isolation and culture.  4.7: Somatic Hybridization.</p>	<p>To get the knowledge about the plant tissue culture technique.</p>	<p>The student can understand about plant tissue culture technique.</p>
<p><b>Unit 5: Applications of Biotechnology:</b>  5.1: Introduction.  5.2: Pest resistant (Bt-cotton), herbicide resistant plant (Round Up Ready soybean),  5. 3: Transgenic crops with improved quality traits (Flavr Saver tomato, Golden rice</p>	<p>To get the knowledge about the application of biotechnology in plants.</p>	<p>The student can understand about application of biotechnology in plants.</p>

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NAME OF SUBJECT - <b>Botany</b>		
SEM I / II / III / IV / V / VI- VI		
COURSE NUMBER ( PAPER NUMBER) - <b>XV</b>		
TITLE OF COURSE (NAME OF PAPER)- : <b>Plant Metabolism</b>		
COURSE CONTENT	OBJECTIVES	OUTCOME
<b>Unit 1: ATP-Synthesis</b> 1.1: Introduction. 1.2: Structure of ATP molecule. 1.3: Mechanism of ATP synthesis. (Oxidative and photophosphorylation). 1.4: ATP synthase, Boyers conformational model, Racker's experiment, Jagendorf's experiment.	To get the knowledge about the ATP synthesis in plants.	The student can understand about ATP synthesis in plants.
<b>Unit 2: Carbon Oxidation</b> 2.1: Introduction. 2.2: Glycolysis. 2.3: Pentose phosphate pathway. 2.4: oxidative decarboxylation of pyruvate. 2.5: Regulation of PDH, NADH shuttle. 2.6: TCA cycle. 2.7: Mitochondrial electron transport. 2.8: oxidative phosphorylation. 2.9: cyanide-resistant respiration.	To get the knowledge about the carbon oxidation.	The student can understand about carbon oxidation
<b>Unit 3: Carbohydrate Metabolism</b> 3.1: Introduction and broad classification. 3.2: Monosaccharides: Properties and Examples: Trioses, Tetroses, Pentoses and Hexoses.	To get the knowledge about the carbohydrate metabolism.	The student can understand about carbohydrate metabolism.

<p>3.3: Oligosaccharides: Properties and Examples: Sucrose, Maltose and Lactose. 3.4: Polysaccharides— Properties and Examples— Starch and Cellulose. 3.5: Isomers, enantiomers and epimers. 3.6: Biosynthesis of sucrose and starch. 3.7: Degradation of sucrose and starch.</p>		
<p><b>Unit 4: Lipid Metabolism</b> 4.1: Introduction and classification. 4.2: Saturated fatty acids— properties and examples— Stearic and palmitic acids. 4.3: Unsaturated fatty acids— Properties and Examples— Linoleic and linolenic acids. 4.4: General outline of fatty acid biosynthesis. 4.5: Beta oxidation of fatty acids. 4.6: Gluconeogenesis of fatty acids during germination. 4.7: Properties and significance of lipids.</p>	<p>To get the knowledge about the lipid metabolism</p>	<p>The student can understand about lipid metabolism</p>

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<b>NAME OF SUBJECT - Botany</b>		
<b>SEM I / II / III / IV / V / VI- VI</b>		
<b>COURSE NUMBER ( PAPER NUMBER) - XVI</b>		
<b>TITLE OF COURSE (NAME OF PAPER)- Biostatistics</b>		
<b>COURSE CONTENT</b>	<b>OBJECTIVES</b>	<b>OUTCOME</b>
<b>Unit 1: Introduction</b> 1.1: Definition. 1.2: Basic principles. 1.3: Statistical methods. 1.4: Variables - measurements, functions, limitations and uses of statistics.	To get the knowledge about the introduction of biostatic.	The student can understand about basic concept of biostatic.
<b>Unit 2: Collection of primary and secondary data</b> 2.1: Introduction. 2.2: Types of data. 2.3: Methods of data collection. 2.4: Merits and demerits. 2.5: Classification of data. 2.6: Tabulation and presentation of data. 2.7: sampling methods..	To get the knowledge about the collection of primary and secondary data their types, merits and demerits.	The student can understand about collection of primary and secondary data their types, merits and demerits.
<b>Unit 3: Measures of central tendency</b> 3.1: Introduction. 3.2: Mean median and mode, merits & demerits. 3.3: Measures of dispersion- range, standard deviation and mean deviation, merits & demerits. 3.4: Co- efficient of variations.	To get the knowledge about the measures of central tendency.	The student can understand about measures of central tendency.
<b>Unit 4: Probability</b> 4.1: Introduction.	To get the knowledge about the probability.	The student can understand about

4.2: Basic Concepts. 4.3: Kinds of Probabilities. 4.4: Measures of Probability.		probability.
<b>Unit 5: Statistical inference</b> 4.1: Introduction. 4.2: Hypothesis - Student 't' test and chi square test and its significance.	To get the knowledge about the statistical inference.	The student can understand about statistical inference.

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