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

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

<table>
<tr><td colspan="3">B.A. / B.Sc. / M.A. / M.Sc. –M.Sc.</td></tr>
<tr><td colspan="3">NAME OF SUBJECT – Botany</td></tr>
<tr><td colspan="3">SEM I /II/ III/IV/V/VI – I</td></tr>
<tr><td colspan="3">COURSE NUMBER (PAPER NUMBER) -I</td></tr>
<tr><td colspan="3">TITLE OF COURSE (NAME OF PAPER) -Biology and diversity of fungi, Bacteria, Viruses and Lichens.</td></tr>
<tr><td>COURSE CONTENT</td><td>OBJECTIVES</td><td>OUTCOME</td></tr>
<tr><td>Unit-1- Fungi :-General characters and recent trends in classification, Cell ultrastructure and Cell wall composition, nutrition (saprobic, biotrophic,symbiotic), reproduction (vegetative , asexual and sexual), fructification and Spore forming structures, heterothallism, heterokaryosis parasexuality.
Economic importance of fungi : - Fungi in industry , medicine and food , Mushroom cultivation , Mycorrhizae , fungi as biocontrol agents , fungal as allergens and human pathogens.</td><td>To understand about the characters, recent trends & importance of fungi in various field</td><td>Student get knowledge about the characters, recent trends & importance of fungi in various field</td></tr>
<tr><td>Unit-2-Taxonomical groups to understand life cycle patterns , growth, reproduction and phylogeny with respect to following major classes upto the level of order (Ainsworth`s 1973 system to be followed)
<table>
<tr><th>Division</th><th>Class</th><th>Order</th></tr>
<tr><td>Myxomycota</td><td>1) Myxomycetes
2)Plasmodiophoromycetes</td><td>Stemonitales</td></tr>
<tr><td>B) EumycotaSub division
1)Mastigomycotina</td><td>1)Chytridiomycet
2) Oomycetes</td><td>Chytridiales
Peronosporales</td></tr>
<tr><td>2) Zygomycotina</td><td>1) Zygomycetes</td><td>Mucorales</td></tr>
<tr><td>3) Ascomycotina</td><td>1)Hemiascomycetes
2) Plectomycetes
3)Pyrenomycetes.
4)Disomycetes
5) Loculoascomycetes</td><td>TaphrinalesEurotialesMelioles, Xylariales, Claricepitales.
Pezizales
Dothideales</td></tr>
<tr><td>4)Basidiomycotina</td><td>1)Teliomycetes
2)Hymenomycetes</td><td>Ustilaginales
Uridinales, ,
Polyporales, Agaricales</td></tr>
</table></td><td>To understand about the life cycle patterns , growth, reproduction and phylogeny with respect to various orders of fungi</td><td>Student get knowledge about the life cycle patterns , growth, reproduction and phylogeny with respect to various orders of fungi</td></tr>
</table>

	3)Gastromycetes	Lycoperlales ,Nidullariales		
5)Deuteromycoyina	1)Hyphomycetes 2)Coelomycetes	Hypomycetales, TubercularialsSphaeropsidales , Melanconials		
Unit-3- Archaebacteriaand Eubacteria: - General account , ultrastructure , nutrition and reproduction , nitrogen fixing bacteria and industrial uses.			To understand about the Archaebacteriaand Eubacteria	Student get knowledge about the Archaebacteriaand Eubacteria
Unit-4-Viruses : - Characteristics , ultrastructure , nutrition isolation and purification ,chemical nature , replication , transmission and economic importance.			To understand about the Viruses	Student get knowledge about the Viruses
Unit-5-Lichens-Distribution, in Forms, Biology and Economic importance.			To understand about the Lichens-	Student get knowledge about the Lichens-

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COURSE OUTCOME

Name of Department - Botany

B.A. / B.Sc. / M.A. / M.Sc. –**M.Sc.**		
NAME OF SUBJECT – **Botany**		
SEM I / II / III / IV / V / VI – **I**		
COURSE NUMBER (PAPER NUMBER) - **II**		
TITLE OF COURSE (NAME OF PAPER) -**Biology and diversity of Algae , Bryophytes and Pteridophytes**		
COURSE CONTENT	OBJECTIVES	OUTCOME
Unit-1 Phycology :- Algae in diversified habitats (terrestrial , fresh water, marine), thallus organization , cell ultrastructure , reproduction (vegetative , asexual and sexual) , modern trends in classification of algae – criteria – pigments , reserve food , flagella etc. and Systems	To understand about the habitat, thallus organization , cell ultrastructure , reproduction & classification of algae	The student get knowledge about habitat, thallus organization , cell ultrastructure , reproduction & classification of algae
Unit-2 Salient features , inter-relationship and phylogeny of the following classes of algae – Cyanophyceae , Chlorophyceae , Xanthophyceae , Bacillariophyceae , Phaeophyceae , Rhodophyceae	To understand about the inter-relationship and phylogeny of the following of algae	The student get knowledge about inter-relationship and phylogeny of the following of algae
Unit-3- Bryology :- Diversity in Bryophytes with respect to thallus structure, reproduction , life cycle , modern classification . Salient features , phylogeny and inter-relationship of the following orders– Marchantiales , Jungermanniales , Anthocerotales , Sphagnales , Buxbaumiales , funariales and Polytrichales	To understand about the Diversity in Bryophytes	The student get knowledge about Diversity in Bryophytes
Unit-4- Pteridology : - Diversity in Pteridophytes with respect to morphology, anatomy, reproduction and modern trends in classification, Telome conceptand stellar evolution.	To understand about the Diversity in Pteridophytes	The student get knowledge about Diversity in Pteridophytes

Salient features , phylogeny and inter-relationship of the following classes – Psilopsida – Psilotum, Mesipteris, Lycopsida - Lycopodium, Selaginella , Isoetes , Sphenopsida – Equisetum, Pteropsida – Ophioglossum, Angiopteris, Gleichenia , Pteris, Salvinia, Azzola.		
Unit-5- Isolation, culture, cultivation and preservation of algae Economic importance of Bryophytes . Current trends of Research in Pteridophytes.	To understand about the culture of algae, importance of bryophytes and current trends in Pteridophytes.	The student get knowledge about culture of algae, importance of bryophytes and current trends in Pteridophytes.

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Name of Department - Botany

B.A. / B.Sc. / M.A. / M.Sc. –**M.Sc.**		
NAME OF SUBJECT – **Botany**		
SEM I / II / III / IV / V / VI – **I**		
COURSE NUMBER (PAPER NUMBER) - **III**		
TITLE OF COURSE (NAME OF PAPER) -**Plant Ecology**		
COURSE CONTENT	OBJECTIVES	OUTCOME
Unit-1- Types of ecosystem, Marine and fresh water ecosystems, structural components, relationship between structure and function. **Succession: -** Allogenic and autogenic succession, climatic climax, models of plant succession.	To understand about the various types of ecosystem and ecological succession.	The student get the knowledge about various types of ecosystem and ecological succession
Unit-2- Wetlands and their characteristics, examples – mangroves and lake EIA , MAB , Biosphere reserves , IUCN , Environmental awareness programmes,Carbon credit**.**	To understand about the wetlands in India and biosphere reserve	The student get the knowledge about wetlands in India and biosphere reserve
Unit-3-General information on remote sensing technique and its applications particularly in vegetation analysis and wild life management.	To understand about the general information of remote sensing technique	The student get the knowledge about general information of remote sensing technique
Unit-4-Pollution ecology :-Effect of air pollution on vegetation, water pollution and water hyacinth , land pollution due to pesticide residue and their effects on soil . **Climate change** : - Greenhouse gases (CO2 , CH4 , H 2 O , CFC s) , Ozone layer and depletion, consequences of climate changes (CO 2 fertilization ,	To understand about the pollution ecology and climate change	The student get the knowledge about pollution ecology and climate change

global warming , sea level rise and UV radiation)		
Unit-5- Environmental toxicology :- Definition , toxic chemicals, factors affecting toxicity , Routes & rate of administration , Biotransformation of toxicants , Bio- accumulation of pollutants / Xenobiotics. **Phytoremediation / Bioremediation: -** Definition, Mechanism, Phytoextraction, Rhizofiltration, Phytostabilization, Phytovolatization.	To understand about the environmental toxicology and various methods of phytoremidation	The student get the knowledge about environmental toxicology and various methods of phytoremidation

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Name of Department - Botany

B.A. / B.Sc. / M.A. / M.Sc. –**M.Sc.**		
NAME OF SUBJECT – **Botany**		
SEM I / II / III / IV / V / VI – **I**		
COURSE NUMBER (PAPER NUMBER) - **IV**		
TITLE OF COURSE (NAME OF PAPER) -**Tools and Techniques in Botany**		
COURSE CONTENT	OBJECTIVES	OUTCOME
Unit-1- Preparatory techniques :- Standard units of expression , pH and buffers **Biostatistics :-** Coefficient of variation , confidence limits , probability, binomial distributions , test of statistical significance , simple correlation and regression , Analysis of variance. Applications of computer in life sciences, Analysis and presentation of biological data with the help of computer software's used in Biology**.**	To understand about the preparatory techniques and biostatistics.	The student get the knowledge about preparatory techniques and biostatistics.
Unit-2-Microscopy: - Principles and applications of phase contrast, fluorescence, Scanning and transmission electron microscopes, Cytophotometry, Immuno fluorescence microscopy and photomicrography. Separation Techniques :- Principles and application of gel filtration , ion exchange and affinity chromatography , gas chromatography , HPLC, Gel electrophoresis , isoelectric focusing , ultracentrifugation .	To understand about the principles and applications of different microscope and different techniques of separation	The student get the knowledge about principles and applications of different microscope and different techniques of separation
Unit-3- Principles and applications of Colorimetry and spectrophotometry :- Visible , UV , fluorescence , NMR ,ESR spectroscopy , atomic absorption and flame spectrophotometry . Cytological techniques :- Fixatives , treatments , stains , permanent preparation , banding – O – banding	To understand about the principles and applications of different instruments and cytological techniques.	The student get the knowledge about principles and applications of different instruments and cytological techniques.

Unit-4- Tracer techniques :- Principles and applications in biology , Dosimetry , radioisotopes , half – life of radioisotopes , effect of radiation on biological systems , radioactivity counting systems	To understand about the principles and applications of tracer techniques.	The student get the knowledge about principles and applications of tracer techniques
Unit-5-Collection and preservation of plant materials :-Herbarium technique preparation significance , important herbaria in India. Herbarium - A brief account of principles & methodology.	To understand about the	The student get the knowledge about

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Name of Department - Botany

B.A. / B.Sc. / M.A. / M.Sc. –**M.Sc.**		
NAME OF SUBJECT – **Botany**		
SEM I / II / III / IV / V / VI – **II**		
COURSE NUMBER (PAPER NUMBER) - **V**		
TITLE OF COURSE (NAME OF PAPER) -**Biology and Diversity of Gymnosperms and Palaeobotany**		
COURSE CONTENT	OBJECTIVES	OUTCOME
Unit-1-Diversity of Gymnosperms with respect to morphology, anatomy, reproduction,	To understand about the diversity of gymnosperms.	The student get knowledge about diversity of gymnosperms
Unit-2-Modern trends in classification of Gymnosperms and Economic importance	To understand about the modern trends and economic importance of Gymnosperms.	The student get knowledge about modern trends and economic importance of Gymnosperms
Unit-3- Salient features, phylogeny, affinities and inter- relationships of the following orders – Cycadales, Coniferales, Ginkgales, Taxales, Ephedrals and Welwitschiales	To understand about the phylogeny, affinities and inter- relationships of orders of gymnosperms.	The student get knowledge about phylogeny, affinities and inter- relationships of orders of gymnosperms.
Unit-4- Process of fossilization, types of fossils, techniques used in fossil studies. Indian fossil flora**.**	To understand about the fossilization process, types of fossils and Indian fossil flora	The student get knowledge about fossilization process, types of fossils and Indian fossil flora

Unit-5-Studies of morphology, anatomy, and evolutionary trends of following groups of plants – Psilophytales, Filicales, Pteridospermales, Benettitales, Cycadales, Cordaitales, Coniferales and Angiosperms**.**	To understand about the morphology, anatomy and evolutionary trends in different group of fossil plants.	The students get knowledge about morphology, anatomy and evolutionary trends in different group of fossil plants.

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Name of Department - Botany

B.A. / B.Sc. / M.A. / M.Sc. –**M.Sc.**		
NAME OF SUBJECT – **Botany**		
SEM I / II / III / IV / V / VI – **II**		
COURSE NUMBER (PAPER NUMBER) - **VI**		
TITLE OF COURSE (NAME OF PAPER) -**Taxonomy of Angiosperms**		
COURSE CONTENT	OBJECTIVES	OUTCOME
Unit-1- Taxonomy-Aims, principles and functions. **Types of Taxonomy-** numerical, chemotaxonomy, alpha Taxonomy, omega taxonomy.	To understand about the basic concepts in taxonomy	The students get knowledge about basic concepts in taxonomy
Unit-2-General evolutionary trends-Habitat and habit, vegetative and reproductive structures of flowering plants **Species concept** – classical , modern, typological, non-dimensional, multidimensional	To understand about the evolutionary trends of angiosperm and species concept.	The students get knowledge about evolutionary trends of angiosperm and species concept.
Unit-3 Nomenclature –ICBN – principles, rules, recommendations, articles, typification,principle of priority, effective and valid publications, citation of authority, transference, rejection of names, synonyms and homonyms. Systems of classifications- Principles, outlines, merits and demerits of Bessey's and Cronquist's systems**.**	To understand about the nomenclature system, typification and system of classification of plants.	The students get knowledge about nomenclature system, typification and system of classification of plants.
Unit-4 Biodiversity- Characterization, generation, maintenance, loss, magnitude and distribution, economic value, conservation strategies, floristic diversity of India, hotspots, endemic and genetic	To understand about the Biodiversity of Angiosperm and floristic work in	The students get knowledge about Biodiversity of Angiosperm and

diversity of plants, floristic works in Maharashatra.	Maharashtra.	floristic work in Maharashtra.
Unit-5- Salient features **,**morphological diversity interrelationships in following sub classes of Magnoliophyta and studies of plant families as per Cronquist's system of classification. **Class: Magnoliopsida**Subclass: Magnolidae- Magnoliaceae, Piperaceae Subclass: Hamamelidae- Casuarinaceae, Urticaceae Subclass; Caryophyllidae- Caryophyllaceae,Polygonaceae Subclass: Dillenidae- Tiliaceae, Sapotaceae Subclass: Rosidae- Myrtaceae, Geraniaceae Subclass: Asteridae- Scrophulariaceae, Gentianaceae **Class: Liliopsida** Subclass: Alismatidae, Hydrocharitaceae Subclass: Arecidae- Araceae Subclass: Commelinadae- Commelinaceae Subclass: Zingiberidae- Zingiberaceae Subclass: Lilidae- Oichidaceae	To understand about the detail study of classes of Magnoliophyta as per Cronquist's system of classification.	The students get knowledge about Classes of Magnoliophyta as per Cronquist's system of classification.

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NAME OF SUBJECT – **Botany**		
SEM I / II / III / IV / V / VI – **II**		
COURSE NUMBER (PAPER NUMBER) - **VII**		
TITLE OF COURSE (NAME OF PAPER) -**Cell and Molecular Biology of plants**		
COURSE CONTENT	OBJECTIVES	OUTCOME
Unit-1- Plasma membrane - structure, composition, models, function, sites for ATPases, Ion carriers, channels and pumps, receptors. **Plasmodesmata -** structure, role in movement of molecules and macromolecules, comparison with gap junctions.	To understand about the Plasma membrane and Plasmodesmata.	The students get knowledge about Plasma membrane and Plasmodesmata
Unit-2-Plant vacuole-Tonoplast, ATPases, transporters, as storage organelle. Microtubules and microfilaments, endoplasmic reticulum, **Golgi bodies**. - Structure and function	To understand about the Plant vacuole and Golgi bodies.	The students get knowledge about Plant vacuole and Golgi bodies.
Unit-3- Mitochondrion- ultrastructure, genome organization, biogenesis. **Chloroplast**- ultrastructure, genome organization, gene expression, RNA editing, nucleochloroplastic interactions..	To understand about the Ultrastructure, genome organization of Mitochondrion and Chloroplast.	The students get knowledge about Ultrastructure, genome organization of Mitochondrion and Chloroplast.
Unit-4- Chromosomal organization, nucleosome organization, models of DNA replications, damage and repair of DNA, Satellite DNA, selfish DNA, promiscuous DNA, mini and micro satellite DNA-structure, function and methods of detection	To understand about the chromosomal organization, nucleosome organization, different types of DNA and	The students get knowledge about chromosomal organization, nucleosome organization,

Genetic code-Discovery, concept, properties, contribution of Nirenberg and Khorana.	methods of detection.	different types of DNA and methods of detection
Unit-5- Cell cycle and apoptosis- control mechanisms, role of cyclins and cyclin depedent kinases, retinoblastoma and E2F proteins, cytokinesis and cell plate formation, mechanisms of programmed cell death,P53 protein /gene caspases - Types Techniques in cell Biology- Immunotechniques, in situ hybridization to locate transcripts in cell types, FISH,GISH and confocal microscopy.	To understand about the cell cycle and apoptosis.	The students get knowledge about cell cycle and apoptosis.

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NAME OF SUBJECT – **Botany**		
SEM I / II / III / IV / V / VI – **II**		
COURSE NUMBER (PAPER NUMBER) - **VIII**		
TITLE OF COURSE (NAME OF PAPER) -**Advances in Plant Pathology**		
COURSE CONTENT	OBJECTIVES	OUTCOME
Unit-1- Introduction, plant diseases- concept and classification of plant diseases, plant pathogens concept and classification. Importance of plant diseases. Methods of diagnosis of plant diseases. **Epidemiology**- slow and rapid epiphytotics, Disease forecasting,assessment of disease incidence and crop loss	To understand about the introduction and basic concepts of plant diseases and epidemiology.	The students get knowledge about introduction and basic concepts of plant diseases and epidemiology
Unit-2-Principles of plant disease control- Prophylaxis – Exclusion, Eradication, Protection, Immunization- Chemical control, genetic resistance.	To understand about the principles and control of plant diseases.	The students get knowledge about principles and control of plant diseases.
Unit-3- MLO: classification, morphology, characteristics and Identification Techniques Mechanism of infection – Prepenetration, penetration, post penetration and colonization. Defense mechanism against pathogen- structrural,physiological, genetical and chemical,systematic acquired resistance Role of environmental factors on disease development	To understand about the Mycoplasma	The students get knowledge about Mycoplasma
Unit-4- Plant diseases and disorders- a brief idea of following important diseases. Viral diseases- TMV,BMV	To understand about the different plant diseases.	The students get knowledge about different plant diseases.

Phytoplasma diseases-Little leaf, GSD Bacterial diseases- Canker, Blight, Leafspot MLO Disease - Nematodes- Root knot of vegetables Algal diseases- Red rust		
Unit-5- Fungal diseases- club root, white rust, Downy mildew, powdery mildew Rusts, smuts Ergot, Leaf spot, fruit rot , study of seed borne pathogens. Phanerogamic diseases- Total and partial stem and root parasites	To understand about the Fungal diseases.	The students get knowledge about Fungal diseases.

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B.A. / B.Sc. / M.A. / M.Sc. – **M.Sc.**		
NAME OF SUBJECT - **Botany**		
SEM I / II / III / IV / V / VI- **III**		
COURSE NUMBER (PAPER NUMBER) - **IX**		
TITLE OF COURSE (NAME OF PAPER)- **Plant Embryology and Palynology**		
COURSE CONTENT	OBJECTIVES	OUTCOME
Unit-1Gametophytes in Angiosperms- Brief outline of development of Male and Female Gametophyte. **Ultrastructure of Male Gametophyte**- Vegetative Cell, Generative Cell, Pollen Wall, Pollen Tube; Abnormal Male Gametophytes and their Features. **Ultrastructures of Female Gametophyte**- Synergids, Egg, Antipodals, Central Cell. **Pollen- Pistil Interaction and Control of Fertilization-** Structure of Stigma and Style, Pollen Tube Growth, Chemotropism, Incompatibility, Pollen Wall Proteins, Stigma Surface Proteins, Post Pollination Events, Fertilization, Methods to Overcome Incompatibility, Significance of Pollen Pistil Interaction.	To get the knowledge about the Ultrastructure, development of angiospermic Male and Female Gametophyte. Pollination methodology	The student can understand about Ultrastructure, development of angiospermic Male and Female Gametophyte. Pollination methodology

Unit-2:-Experimental Embryology- Techniques for Anther, Ovary, Nucellus, Endosperm, and Embryo Culture and their Significance. **Apomixis**- Diplospory, Apospory, Causes, Consequences and Significance of Apomixes. Polyembryony- Classification, Causes, Experimental Induction and Practical importance	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.
Unit 3:-Palynology- Scope and Branches with Special Reference to:- **Palynotaxonomy**- Pollen Morphology and Plant Taxonomy with reference to Gymnosperms and Angiosperms. **Melittopalynology**- Bee colony, foraging behaviuor of bees, unifloral & Multifloral honey, application in crop productivity	To understand about the Palynology, Palynotaxonomy and Melittopalynology.	The students get knowledge about Palynology, Palynotaxonomy and Melittopalynology.
Unit 4;- Aeropalynology- Principles, techniques, pollen analysis, pollen and spore Allergy, plants causing pollen allergy, allergic properties of pollen, pollen calendar and importance	To understand about the Aeropalynology.	The students get knowledge about Aeropalynology.
Unit: 5:-Palaeopalynology- Principles, microfossil recovery, theory and techniques, Microfossils and oil exploration. **Agropalynology**- Pollen storage, viability and pollen germination and their Significance.	To understand about the Palaeopalynology, Agropalynology	The students get knowledge about Palaeopalynology, Agropalynology

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NAME OF SUBJECT - **Botany**		
SEM I / II / III / IV / V / VI- **III**		
COURSE NUMBER (PAPER NUMBER) - X		
TITLE OF COURSE (NAME OF PAPER)- **Cytogenetics, Plant Breeding And Genetic Engineering**		
COURSE CONTENT	OBJECTIVES	OUTCOME
Unit; 1:-Genome organization in prokaryotes and eukaryotes- size and structure of genome in viruses, plasmids, bacteria, yeast and higher organisms. Variation in genome size and its organization in prokaryotes, eukaryotes and organelles. Architectural differences of the genome. **Organization of gene in prokaryotes and eukaryotes**- structure and organization of the gene in plasmid, viruses, bacteria and eukaryotes. Gene conversion, amplification, mobile genetic elements and their significance. Gene families.	To understand about the genome organization and gene organization in prokaryotes and eukaryotes.	The students get knowledge about genome organization and gene organization in prokaryotes and eukaryotes
Unit 2:-Genetic Recombination and Genetic Mapping- Independent Assortment and Crossing Over, Recombination, Molecular Mechanism of Recombination, Role of Rec A and Rec B,C,D Enzymes. Proteins Involved in Eukaryotic Recombination,	To understand about the Genetic Recombination and Genetic Mapping	The students get knowledge about Genetic Recombination and Genetic Mapping

Recombination Nodules, Site Specific Recombination, Chromosome Mapping, Linkage Groups, Genetic Markers-Conventional and Molecular Markers Used in Construction of Molecular Maps. Correlation of Genetic and physical maps, somatic cell genetic-an alternative approach to gene mapping.		
Unit 3:-Modern methods of plant breeding- Somaclonal variations, Somatic hybridization-protoplast isolation, fusion and regeneration, hybrids. Hybridoma technology .	To understand about the Modern methods of plant breeding-	The students get knowledge about Modern methods of plant breeding
Unit 4: IPR (Intellectual property right) - concept, importance, ecological risk and ethical concerns ,application form for patenting	To understand about the IPR (Intellectual property right)	The students get knowledge about IPR (Intellectual property right)
Unit 5: -Bioinformatics : A) Introduction to Bioinformatics. Use of bioinformatics in major research areas B) Major Bioinformatics Resources on Internet: National Centre for Biotechnology Information (NCBI) i.The knowledge of various databases and bioinformatics tools available at NCBI resource ii.The major content of the NCBI databases iii.Purpose and applications in life sciences C) Protein data bank (PDB) and Nucleic acid sequence database (GenBank) D) The Basic Local Alignment Search Tool (BLAST)	To understand about the Bioinformatics.	The students get knowledge about Bioinformatics.

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COURSE OUTCOME

B.A. / B.Sc. / M.A. / M.Sc. – **M.Sc.**		
NAME OF SUBJECT - **Botany**		
SEM I / II / III / IV / V / VI- **III**		
COURSE NUMBER (PAPER NUMBER) - XI		
TITLE OF COURSE (NAME OF PAPER)- **Advances in Plant Metabolism and Biochemistry**		
COURSE CONTENT	OBJECTIVES	OUTCOME
. **Unit:1** Integration of major metabolic pathways in plants, an overview	To understand about the Integration of major metabolic pathways	The students get knowledge about Integration of major metabolic pathways
Unit 2:-Photosynthesis – ultrastruture of chloroplast and light harvesting complexes , Energy transduction in photosynthesis , photosynthetic electron transport , ATP synthesis , photosynthetic pathway C3 , C4 and CAM and their subgroups , C3 & C4 intermediates, regulation of Rubisco, PEP case and PCR cycle ,photorespiration and its significance. photosynthetic carbon partitioning, regulation of sugar and starch Biosynthesis.	To understand about the different pathways of and reaction in photosynthesis	The students get knowledge about different pathways of and reaction in photosynthesis
Unit : 3- Respiration – regulation of glycolysis, pentose phosphate pathway and TCA cycle, modern concept of electron transport chain in plant mitochondria, alternate oxidase,	To understand about the process and different cycles of respiration.	The students get knowledge about process and different cycles of respiration.

respiratory inhibitors, **Gluconeogenesis.** **Organic acid metabolism –** metabolism and role of malic acid, oxalic acid and ascorbic acid.		
Unit: 4-Secondary metabolism – photosynthetic carbon partitioning ,overview of Secondary metabolism and Secondary metabolites, Shikimic acid pathway, biosynthesis of aromatic amino acids	To understand about the Secondary metabolism.	The students get knowledge about Secondary metabolism.
Unit 5: Phosphorus metabolism – Forms of phosphate in soil and plants, mechanism of P uptake, factors controlling P uptake, role of pyrophosphates in plant metabolism.Vam and P nutrition. **Sulphur metabolism-** Forms of Sulphur in soil and plants, sulphate uptake and reduction, biosynthesis of Sulphur containing amino acids and their role - cystein, methionine, and glutathione.	To understand about the phosphorus and sulphur metabolism.	The students get knowledge about phosphorus and sulphur metabolism.

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COURSE OUTCOME

B.A. / B.Sc. / M.A. / M.Sc. – **M.Sc.**		
NAME OF SUBJECT - **Botany**		
SEM I / II / III / IV / V / VI- **III**		
COURSE NUMBER (PAPER NUMBER) - XII		
TITLE OF COURSE (NAME OF PAPER)- **Physiology of plant growth and development**		
COURSE CONTENT	OBJECTIVES	OUTCOME
Unit: 1-Growth and Photomorphogenesis- Phtyochrome & cryptochrome- discovery, properties, role and mechanism of action.	To understand about the Growth and Photomorphogenesis	The students get knowledge about Growth and Photomorphogenesis
Unit: 2:-Senescence of leaves and petals- mechanism, biochemical changes and Programmed cell death.	To understand about the mechanism of senescence of leaves and petals	The students get knowledge about mechanism of senescence of leaves and petals
Unit: 3:-A brief outline of physiology of seed development & seed germination. -Post harvest physiology- ripening of fruits and its regulation, metabolism of stored seeds and leafy vegetables	To understand about the physiology of seed development and seed germination.	The students get knowledge about physiology of seed development and seed germination.
Unit: 4:-Plant growth regulators- a brief idea about discovery and possible mechanism of action of triacontanol, Brassinosteroids, salicylic acid, jasmonates, polyamines & morphactins A brief idea about role of growth retardants- CCC, Paclobutrazol, Maleic hydrazide and TIBA	To understand about the plant growth regulators.	The students get knowledge about plant growth regulators
. **Unit: 5**:-Secondary messengers and signaling in plants cells. A brief idea about role of mutants in physiological studies with references to Arabidopsis thaliana .	To understand about the secondary messenger and signalling in plant cells.	The students get knowledge about secondary messenger and signalling in plant cells.

Signature of HOD

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

COURSE OUTCOME

Name of Department - Botany

B.A. / B.Sc. / M.A. / M.Sc. –**M.Sc.**		
NAME OF SUBJECT – **Botany**		
SEM I / II / III / IV / V / VI – **IV**		
COURSE NUMBER (PAPER NUMBER) - XIII		
TITLE OF COURSE (NAME OF PAPER) -**Phytogeography and Conservation Biology**		
COURSE CONTENT	OBJECTIVES	OUTCOME
Unit 1: Phytogeography Principles; Continental drift; Theory of tolerance; Endemism; Brief description of major terrestrial biomes (one each from tropical, temperate & tundra); Phytogeographical division ofIndia; Local Vegetation.	To understand about the principles, theory and biomes of various vegetation and Phytogeographical division of India.	Students get knowledge about principles, theory and biomes of various vegetation &Phytogeographical division of India.
Unit 2:-Biodiversity-Age and area hypothesis, endemism, RET plants, hotspots, Western ghat vegetation, mangrove vegetation of India.	To understand about the biodiversity of plants, vegetation of Western ghat and mangrove vegetation of India	Students get knowledge about biodiversity of plants, vegetation of Western ghat and mangrove vegetation of India
Unit 3:-Ex-situ conservation of biodiversity-concept, need and methods –polyhouse, seed banks, gene banks, cryopreservation and biotechnology.NBPGR	To understand about the ex-situ conservation of plants.	Students get knowledge about ex-situ conservation of plants

Unit 4; In situ conservation- Afforestation, Social forestry, Agroforestry, Botanical gardens, Biosphere reserves, National Parks, Sanctuaries, Sacred Groves and Sthalvrikshas	To understand about thein-situ conservation of plants.	Students get knowledge about various methods of in-situ conservation of plants.
Unit:5:-Intensification of agriculture and forest policies.- , biological diversity act 2002, forest conservation act, wildlife protection act with recent amendments , international conventionsWashington convention on trade of flora and fauna(1933), international biodiversity year 2010, role of NGO's in conservation of Biodiversity.	To understand about the different acts of agriculture and forest policies of India.	Students get knowledge about different acts of agriculture and forest policies of India.

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COURSE OUTCOME

Name of Department - Botany

B.A. / B.Sc. / M.A. / M.Sc. –**M.Sc.**		
NAME OF SUBJECT – **Botany**		
SEM I / II / III / IV / V / VI – **IV**		
COURSE NUMBER (PAPER NUMBER) - XIV		
TITLE OF COURSE (NAME OF PAPER) -**Plant Tissue Culture, Green House Technology and Hydroponics**		
COURSE CONTENT	OBJECTIVES	OUTCOME
Unit: 1:-Plant tissue culture- Objectives and goals of plant tissue culture, laboratory design and development, operation and management. **-Tissue nutrition-** Basic principles of in vitro culture, factors influencing **-Media preparation and handling-** Sterilization methods, equipment's And apparatus, procedures of media preparation and stock solutions**.**	To understand about the different concept of plant tissue culture, laboratory maintenance, media preparation and handling of equipment and apparatus.	Student get knowledge about Different concept of plant tissue culture, laboratory maintenance, media preparation and handling of equipment and apparatus.
Unit: 2:-Plant regeneration and plant propagation – Meristem culture/ axillary Bud culture, Protocols and schedules of observation. **-Callus culture-** somatic embryogeny, cell suspension culture, cell line and bioreactors	To understand about the meristem culture and callus culture technique in plant tissue culture.	Studentsget knowledge aboutmeristem culture and callus culture technique in plant tissue culture.
Unit: 3:-Organ culture- Anther culture, Isolation of haploids & its significance. Embryo culture, embryo rescue. **-Synthetic seed-** Concept method and applications.	To understand about the different organ culture in plants and formation of synthetic seed.	Students get knowledge about different organ culture in plants and formation of synthetic seed.
Unit: 4:-Greenhouse technology- Construction, operation, maintenance	To understand about	Students get

and Management. **Management-** light, temperature, Fertilization, humidity, pest and disease control.	the greenhouse technology and maintenance of greenhouse.	knowledge about greenhouse technology and maintenance of greenhouse.
Unit: 5:-Hydroponics- Definition, technique, applications.	To understand about the hydroponic technique.	Students get knowledge about hydroponic technique.

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COURSE OUTCOME

Name of Department - Botany

B.A. / B.Sc. / M.A. / M.Sc. –**M.Sc.**		
NAME OF SUBJECT – **Botany**		
SEM I / II / III / IV / V / VI – **IV**		
COURSE NUMBER (PAPER NUMBER) - **XV**		
TITLE OF COURSE (NAME OF PAPER) -**Environmental Plant Physiology**		
COURSE CONTENT	OBJECTIVES	OUTCOME
Unit: 1:-Introduction- Concept of stress & types of stress, plastic strain & elastic strain, stress injury, avoidance, resistance, endurance, & escape.	To understand about the basic concept about stress in plant.	Students get knowledge about basic concept about stress in plant.
Unit :2:-Water stress- Effect of water stress on plant metabolism, drought restiance mechanisms in Plants, role of pralines and other osmolites, induction of drought resistance. **Salt stress-** Salinity and sod city, types of salinity, causes of soil salinization, a brief account of distribution of salt affected soils in India, effect of salt stress on plant Metabolism, mechanism of salt tolerance in higher plants, reclamation of saline soils. **Water logging-** Causes of water logging, nature of water logging injury, mechanism of flooding tolerance.	To understand about theeffect of water stress, salt stress and water logging on plant metabolism.	Students get knowledge about effect of water stress, salt stress and water logging on plant metabolism.
Unit: 3:-Ion stress- Heavy metal toxicity - iron, manganese and zinc, effects of soil acidity on Plants& phytoremidation**.** **High and low temperature stress-** Effect of high and low temperatures on plants Metabolism, mechanisms of heat and cold tolerance. **Radiation stress-** Effect of ultraviolet radiations on plants, photo inhibition and Mechanisms of UV tolerance.	To understand about theeffect of heavy metal stress, temperature stress and radiation stress on plant metabolism.	Students get knowledge about heavy metal stress, temperature stress and radiation stress on plant metabolism.
Unit: 4:-Pollution stress- Effect of air	To understand about	Students get

pollutants (SO2, NOx and Ozone) on plant metabolism. **-Oxygen toxicity in plants-** Free radicals and their scavenging. **Effect of elevated CO2 concentration on plant metabolism & productivity.**	the effect of air pollution stress, oxidative stress and CO_2 conc. On plant metabolism.	knowledge about air pollution stress, oxidative stress and CO_2 conc. On plant metabolism.
Unit: 5:-Biotic stress- Effect of fungal infection on plant metabolism and mechanism of Disease resistance, allelopathy- concept, plant-plant interactions, auto toxicity & allelochemicals.	To understand about the biotic stress in plants and resistance against biotic stress of plants.	Students get knowledge about Biotic stress in plants and resistance against biotic stress of plants.

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COURSE OUTCOME

Name of Department - Botany

B.A. / B.Sc. / M.A. / M.Sc. –**M.Sc.**		
NAME OF SUBJECT – **Botany**		
SEM I / II / III / IV / V / VI – **IV**		
COURSE NUMBER (PAPER NUMBER) - **XVI**		
TITLE OF COURSE (NAME OF PAPER) -**Crop Physiology**		
COURSE CONTENT	OBJECTIVES	OUTCOME
Unit: 1:-Crop growth- Crop growth analysis and its applications, crop productivity, harvest Index, water use efficiency and N- use efficiency, plant growth regulators in agriculture and antitranspirants **Reproductive development-** Photoperiodism and vernalization **Fertilizers**- Types, application through soil, foliar application, organic farming and its importance.	To understand about the different parameters of crop growth analysis, Photoperiodism and about fertilizers.	Students get knowledge about different parameters of crop growth analysis, Photoperiodism and about fertilizers
Unit: 2:- Crop- weed interactions- Common weedicides and their mode of action. **Source- sink relationship-** Phloem transport.-vegetative and reproductive phase and factors affecting source sink relationship.	To understand about the crop-weed interaction and transport of minerals through phloem.	Students get knowledge about crop-weed interaction and transport of minerals through phloem
UNIT3:-A brief idea of physiological basis of yield in sugar cane, Jowar, cotton, groundnut& wheat	To understand about the physiological basis of yield in various crops.	Students get knowledge about Physiological basis of yield in various crops.

UNIT 4 - Physiology of crops with reference to following aspects- i) Mineral nutrition of groundnut. ii) Nitrogen fixation in chickpea. iii) Fruit physiology of Ber, Pomegranate, Mango, lemon and grape. [any 2] iv) Post harvest technology of grapes/ Ber/ and pomegranate w.r.t. market strategy- from.	To understand about the physiology of groundnut and chickpea and various fruits.	Students get knowledge about Physiology of groundnut and chickpea and various fruits.
Unit: 5: -A brief idea of crop physiological stations in India ICRISAT, IARIT, CIMAP Luck now, central soil salinity research lab Karnal, CAZRI Jodhpur, BARC, UAS, Bangalore.	To understand about the various research station of India and other country.	Students get knowledge about various crop research stations.

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