



Dnyanopasak Shikshan Mandal's
College of Arts, Commerce and Science, Parbhani

Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Dr. B.M.Kareppa

Department: Botany

Program: MSc FY (Sem-I)

Subject: Botany

Course Code:

Paper Title: Biology and Diversity and Microbes- I

Unit Number	Unit Name	Topics	Unit-wise Outcome
Unit -I	BACTERIA	Bacteria: General characters, Classification based on Bergey's manual, Ultra Structure, Structure of Endospore, Nutrition (Autotrophic, Heterotrophic and Symbiotic), Reproduction (Binary fission, Transformation, Transduction and Conjugation), Differential staining of bacteria- Gram Staining. Symptoms of Bacterial diseases of plants, Bacterial Diseases: Citrus canker, Black arm of cotton and Soft rot of Potato. Economic importance of bacteria	To know the structure and importance of viruses and bacteria with typical examples
Unit-II	VIRUSES AND MYCOPLASMA	Viruses: General characters, classification, chemical composition, Ultra structure of plant viruses (TMV), Virus multiplication, transmission of plant viruses, Symptoms of viral diseases of plants. Viral Disease: Bean Mosaic Virus, Leaf curl of Papaya and Yellow Vein Mosaic of Bhendi. Economic importance of viruses. Mycoplasma: General characters, Ultra structure, Symptoms of Mycoplasma diseases of plants, Mycoplasmal Diseases: Grassy shoot disease, Sessamum phyllody and Little leaf of brinjal. Economic importance of Mycoplasma.	To learn structure and disease cycle of different examples of algae
Unit-III	INTRODUCTORY MYCOLOGY	Fungi: General characters, Classification (As per Ainsworth, 1973; Alexopoulos and Mims, 1979), Ultra structure of fungal cell, Thallus organization, Nutrition (Saprotrophs, Biotrophs, Necrotrophs, Symbiotrophs) and reproduction (Asexual and Sexual). A comparative account of vegetative and reproductive structures, Life cycle patterns and Phylogeny of different fungal	To study ecology structure and life cycle of fungi

		groups- Gymnomycota, Mastigomycota and Amastigomycota: Zygomycotina, Ascomycotina, Basidiomycotina and Deteuromycotina. Fungal Diseases: Early Blight of tomato, Downy mildew of grape and yellow rust of wheat. Lichens: General characters, types and economic importance.	
Unit-IV	APPLIED MYCOLOGY	Fungi as food and feeds: Mushrooms – Types, cultivation, nutritional and medicinal value. Role of fungi in food processing. Fungi in industry: Production of alcohol, medicine, organic acids and enzymes. Fungi in agriculture and forestry: Role of fungi in humus formation, formation of mycorrhizal association with plants; Role of fungi in biological control of pests, Fungi as bio fertilizers: Mycorrhizae Types (Ecto and endo). Fungi in destruction of articles in daily use: Wood destruction, spoilage of house hold articles	To study different types of lichens and mycorniza as well as its importance

Specify Course Outcome : Learn the life cycles of individuals belonging to Bacteria, Fungi, Algae Lichens & Mycorrhiza.

Specify Program Outcome: The student knowledge motivates the various educational institute and universities for conservation of plant Microbes cryptogamic Botany.

Signature of Teacher

Dr. B.M.Kareppa



**Dnyanopasak Shikshan Mandal's
College of Arts, Commerce and Science, Parbhani**

Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Miss. Khan Rumana Sadaf

Department: Botany

Program: MSc FY (Sem-I)

Subject: Botany

Course Code:

Paper Title: BIOLOGY AND DIVERSITY OF CRYPTOGAMS- II

Unit Number	Unit Name	Topics	Unit-wise Outcome
Unit-I	ALGAE-I	Introduction: Algal habitats, Thallus organization, evolutionary trends and classification of algae as per F.E. Fritsch (1944) and G.M. Smith (1955). Criteria used in algal classification (Pigments, reserve food materials), flagella, cell wall, ultra cell structure, algal blooms, Reproduction (vegetative, asexual and sexual) and Economic importance	Understand the structure and importance of the various algae.
Unit-II	ALGAE-II	Study of algal groups: Chlorophyta, Euglenophyta, Pyrrophyta, Chrysophyta, Phaeophyta, Cyanophyta and Rhodophyta (General characters, Morphology and life history are expected)	Understand the morphology and characteristic features of various algal groups.
Unit-III	BRYOPHYTA	Introduction: Habitat, Habit, distribution and outline of classification of Bryophytes as per Smith (1955) and Proskauer (1957). Study of Morphology, anatomy and reproductive structures: Marchantiales, Jungermanniales, Anthocerotales, Sphagnales, Funariales and Polytrichales,	Understand the morphology, anatomy and structure of different Bryophytes.

		Structure and evolution of gametophytes and sporophytes in Bryophytes.	
Unit-IV	PTERIDOPHYTA AND PALAEOBOTANY	<p>Pteridophyta: General characters and classification (based on the classification proposed by Smith, 1955; Bold, 1957 and Zimmermann, 1959). Comparative account of morphology and anatomy of gametophyte and sporophytes in Psilotales, Lycopodiales, Equisetales, Filicales and Marsileales. Stellar evolution in Pteridophytes; Heterospory and its biological advantages; Origin of seed habit and Economic importance of Pteridophytes .</p> <p>Palaeobotany: Principles of palaeobotany, importance of fossil plants, General account of Lepidodendrales, Calamitales and Sphenophylalas.</p>	Understand the morphology, anatomy and structure of different Pteridiphytes.

Specify Course Outcome: Learn the life cycles of individuals Bryophytes, Pteridophytes, Gymnosperms and Paleobotany

Specify Program Outcome: Understand the Classification, morphology, anatomy and reproduction and Learn about process of fossil formation and fossils plants.

Signature of Teacher

Miss. Khan Rumana Sadaf



Dnyanopasak Shikshan Mandal's

College of Arts, Commerce and Science, Parbhani

Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Dr. D.P. Ghorband

Department: Botany

Program: MSc FY (Sem-I)

Subject: Botany

Course Code:

Paper Title:: TAXONOMY OF ANGIOSPERMS AND GYMNOSPERMS-III

Unit Number	Unit Name	Topics	Unit-wise Outcome
Unit-I	GYMNOSPERMS & PALAEOBOTANY	<p>General characters and classification Gymnosperms as proposed by Professor Birbal Sahni (1920), Sporne (1965), S.P. Bhatnagar and Alok Moitra (1996). Comparative account of sporophyte and gametophyte of Cycadales, Ginkgoales, Coniferales and Gnetales. General account of Pteridospermales, Pentoxylales and Cordiatales. Economic importance of Gymnosperms.</p> <p>Palaeobotany: Principles of palaeobotany, Fossilization: Process, types, methods of preservation. Geological time scale and importance of fossil plants</p>	<p>Differentiate between various groups of Gymnosperms and fossil plants.</p> <p>Learn the characters of taxa belonging to Gymnosperms and fossil plants.</p>
Unit-II	GENERAL PRINCIPLES OF TAXONOMY	<p>Aims and Principles of taxonomy, taxonomic structure, Origin of Angiosperms: Theories, cradle of angiosperms, abominable mystery, Continental drift theory. Plant Speciation: Allopathic, Abrupt, Sympatric, Hybrid, Apomictic speciation, Isolating mechanisms. Concept of species: Typological, Evolutionary and Biological. International Code of Botanical Nomenclature: Salient features, Principles,</p>	<p>Understand the morphology, structure and importance of the various principles.</p>

		Important Rules and Recommendations, Provisions, Appendices.	
Unit-III	PLANT SYSTEMATICS	Comparative account of various systems of classification of angiosperms proposed by Linnaeus, Bentham and Hooker, Engler and Prantl, Cronquist and APG	Learn the characters of taxa belonging to, Angiosperms Differentiate between various groups of, Angiosperms
Unit-IV	MODERN TRENDS IN ANGIOSPERM TAXONOMY	Taxonomic evidences and techniques used in Chemotaxonomy: Origin of chemotaxonomy, classes of compounds and their taxonomical significance, techniques Numerical taxonomy: Principles, Operational taxonomic Units (OTU), construction of taxonomic groups, cluster analysis and applications. Molecular Systematics: Molecular techniques, restriction fragment length polymorphism (RFLP's), Random amplified polymorphic DNA (RAPD), applications of molecular systematics. Biosystematics: steps, categories and importance of bio systematic studies.	Applying acquired knowledge facts, evidences and technic

Specify Course Outcome: Develop new situations by applying acquired knowledge techniques and rules in different way.

Specify Program Outcome:

Signature of Teacher



**Dnyanopasak Shikshan Mandal's
College of Arts, Commerce and Science, Parbhani**

Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Miss. N.B. Pawar
Program: MSc FY (Sem-I)

Subject: Botany

Department: Botany
Course Code:

Paper Title: PLANT STRUCTURE AND DEVELOPMENTAL BIOLOGY- IV

Unit Number	Unit Name	Topics	Unit-wise Outcome
Unit-I	ROOT AND SHOOT DEVELOPMENT	Introduction, importance and scope of histology and anatomy of plants. Organization of root apical meristem (RAM), Vascular tissue differentiation, Lateral root and root hairs. organization of shoot apical meristem (SAM). Types of vegetative shoot apex. Cytological and molecular aspects of SAM. Vascular tissue differentiation- Xylem and phloem. Wood development in relation to environmental factors. Significance of study of three dimensional structure of wood	Understand the anatomy.
Unit-II	LEAF AND FLORAL DEVELOPMENT	Development, types and phyllotaxy of leaf, Leaf structure with reference to C3 and C4 plants, Kranz anatomy and CAM syndrome, Structure and types of stomata and trichomes. Floral meristem and floral development in Arabidopsis and Antirrhinum, Vascular anatomy of flower, Inferior ovary, transition to flowering, Role of floral anatomy in taxonomy	Understand the anatomy.
Unit-III	CONCEPT OF PLANT DEVELOPMENT	Potency, Commitments, specification, induction competence determination and differentiation, morphogenetic gradients, cell fate and cell lineages, stem cell, genomic equivalence and cytoplasmic determinants, imprinting mutants and transgenic in the analysis of development. Development of male	Learn embryology and anatomy.

		and female gametophytes, pollination, fertilization, development and function of endosperm, Patterns of embryo development, Polyembryony and apomixes, experimental embryology, pollen storage and fertilization.	
Unit-IV	PALYNOLOGY	Palynology - Importance and scope of palynology, Application of palynology in oil exploration and forensic science. Pollen morphology, Palynotaxonomy - Role of palynology in taxonomy, Palaeopalynology- Principles, microfossil groups, Aeropalynology - Principles, techniques of pollen analysis, pollen calendar its importance, spore allergy, allergic properties of pollen, Agropalynology- pollen viability, pollen germination, pollen storage and their significance.	Learn Palynology and anatomy.

Specify Course Outcome: Develop new situations by applying acquired knowledge about different concept of plant development and palynology.

Specify Program Outcome: Understand the anatomy and concept of plant development and cell lineages, stem cell, genomic equivalence and cytoplasmic.

Signature of Teacher

Miss. N.B. Pawar



Dnyanopasak Shikshan Mandal's

College of Arts, Commerce and Science, Parbhani

Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Miss. Khan Rumana Sadaf

Department: Botany

Program: MSc/FY

Subject: Botany

Course Code:

Paper Title: BIOINSTRUMENTATION AND METHODS IN BIOLOGY -VI

Unit Number	Unit Name	Topics	Unit-wise Outcome
Unit-I	Microscopic and Staining Techniques	Introduction: Safe use of laboratory equipments, Personal protection, Hazards and waste disposal. Microscopy-Working and application of simple microscope, compound microscope, Dark field microscope, phase contrast microscope, fluorescence microscope, scanning and transmission electron microscope, Micrometry, flow cytometry, Microtomy material selection, block designing, fixation, cutting and staining.	Understand the actual working and applications of different techniques.
Unit-II	Chromatographic and sterilization Techniques	Principle and applications of Paper chromatography, Thin layer chromatography and Column chromatography. Gel filtration, Ion exchange, affinity chromatography, Gas chromatography, HPLC, HPTLC. Principles, working and applications of Laminar air flow, Autoclave, Hot air oven, Incubator and pH Meter. Sterilization by filtration methods.	Understand the principle working and applications of different laboratory equipments.
Unit-III	Spectroscopic and Radioactive Techniques	Beer-Lamberts Law, Principles and techniques of colorimeter, UV-Visible spectrophotometer, fluorescence spectroscopy, NMR, Atomic absorption Spectrometry and plasma emission spectroscopy. X-ray diffraction, Radioactive isotopes and half life of isotopes, autoradiography, effect of radiations on biological systems, units of radioactivity, uses of radioisotopes in life sciences	Learn the various techniques used in life sciences and their utility.

		& biotechnology, detection and measurement techniques, liquid scintillation counting, solid state counting- Geiger counter - Radiation hazard & laboratory handling methods.	
Unit-IV	Electrophoretic and Centrifugation techniques	Electrophoresis: Principle and applications, Types- paper, gel- agarose, PAGE, pulsed field, capillary, isoelectric focusing, 2 D Electrophoresis, RFLP, RAPD and AFLP techniques. Blotting techniques: western, southern & northern, methods and applications in life sciences. Centrifugation: Principle and Applications of centrifugation techniques, Designs of rotors, Bench top, Low speed, High speed, Cooling, Ultracentrifuge.	Learn the various techniques used in electrophoretic and Centrifugation .

Specify Course Outcome: To know working hazards and safety measures in laboratory and principles and applications of various laboratory equipments.

Specify Program Outcome: To know working hazards and safety measures in laboratory and techniques used in life sciences and their utility.

Signature of Teacher

Miss. Khan Rumana Sadaf



Dnyanopasak Shikshan Mandal's

College of Arts, Commerce and Science, Parbhani

Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Dr. A.P. Jadhav

Department: Botany

Program: MSc/FY

Subject: Botany

Course Code:

Paper Title: CELL BIOLOGY, GENETICS AND PLANT BREEDING -VII

Unit Number	Unit Name	Topics	Unit-wise Outcome
Unit-I	CELL BIOLOGY-I	Structure and function of prokaryotic and eukaryotic cells, Structural organization and function of Cell wall, Mitochondria, Vacuoles, Chloroplast, ER, Golgi Complex, Lysosome and Nucleus. Chromosome- structure and function; Heterochromatin and Euchromatin. Cell division and cell cycle- Mitosis, Meiosis, regulation and control of cell cycle. Structure and function of cytoskeleton. Membrane structure and function- lipid bilayer and membrane protein. Cell signaling and cell receptors, G-Protein Coupled Receptor, signal transduction.	Understand the structural organization and functions of cell and cell organelles.
Unit-II	GENETICS-I	Introduction to pre Mendelian, Mendelian and Post Mendelian genetics. Complementary, epistasis, inhibitory, Duplicate, Polymeric, Lethal and additive interaction of genes. Crossing over- Types, mechanism and significance. Linkage – Types of linkage, deletion of linkage, Linkage map, linkage groups, map distance, gene order, interference and coincidence, Sex linked inheritance, sex determination and molecular basis of sex differentiation. Chromosome: physical or cytological mapping, Characters of multiple	Able to understand Gene structure, linkage groups, Genetic inheritance and extra chromosomal inheritance in plants.

		alleles; examples: A, B, AB and O blood groups in humans, Rh factor.	
Unit-III	GENETICS-II	Gene structure and regulation of gene expression, Extra chromosomal inheritance (Episomes, Mitochondria and Chloroplasts), Transposons, Karyotype. Chromosomal aberrations deletions, duplication, inversion, translocation, variation in chromosome morphology. Dosage Compensation, Population genetics: Concepts of a population and gene pool, HardyWeinberg law and its application in calculating gene frequencies in a population, Factors affecting Hardy Weinberg equilibrium (selection, mutation, migration and genetic drift) Cvalue paradox, B chromosomes.	Able to understand Gene structure, linkage groups, Genetic inheritance and extra chromosomal inheritance in plants.
Unit -IV	PLANT BREEDING	Pre and post Mendelian development, objectives, Genetic basis of breeding, Plant breeding in India. Sexual reproduction (Cross and self pollination), asexual reproduction, Incompatibility and Male sterility, their types, mechanisms and applications in plant breeding. Hybridization and its role, Inter-varietal and wide crosses. Principles of combination breeding and its application. Hybrid breeding in self and cross pollinated crops. Heterosis, Inbreeding depression. Concepts, types of mutation, physical and chemical mutagens, their mechanism of action, molecular basis of gene mutations, Role of mutations in Plant Breeding.	Understand basic techniques of hybridization and principles of plant breeding.

Specify Course Outcome: To understand basic aspects of cell, cell organelles.

Specify Program Outcome: To know various basic aspects and techniques used in genetics and plant breeding.

Signature of Teacher

Dr. A.P. Jadhav



Dnyanopasak Shikshan Mandal's

College of Arts, Commerce and Science, Parbhani

Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Dr. D.P. Ghorband

Department: Botany

Program: MSc/FY

Subject: Botany

Course Code:

Paper Title: PLANT RESOURCE UTILIZATION & BIODIVERSITY CONSERVATION -
VIII

Unit Number	Unit Name	Topics	Unit-wise Outcome
Unit-I	PLANT RESOURCE UTILIZATION	Domestication and introduction of plants, origin of cultivated plants, Vavilov's centers of origin. Plants as source of food, fodder, fibre, spices, beverages, edible oils, drugs, narcotics, insecticides, timber, gums, resins, dyes, latex, cellulose, starch, Medicinal and Aromatic plants. Plants as source of renewable energy. Role of biotechnology in agriculture, medicine, industry and green house technology.	Study of origin, cultivation and economic importances of various plant wealth
Unit-II	BIODIVERSITY	Concept of Biodiversity: Species diversity, Genetic diversity, Ecosystem diversity. Origin, values and Threats to Biodiversity. Biodiversity and agriculture; Biodiversity and food diversity. Bioprospecting. Biodiversity in India, Endemism: Concept and types, endemic and endangered species of India, Hot spots- Global and Indian. IUCN categories, Red data book, Convention on Biological Diversity (CBD).	Study of Concept of Biodiversity and importance.
Unit-III	CONSERVATION-I	Green revolution- Benefits and adverse consequences, Principles of conservation, major approaches to conservation and current practices in conservation of genetic diversity, species diversity, ecosystem diversity. Conservation strategies – In-situ conservation, Project tiger, biosphere reserves, sanctuaries, National parks, Mangroves, on-farm and	Learn the Principles of conservation and motivation of students for its conservation.

		home garden conservation. Indian case studies on conservation strategies.	
<u>Unit -IV</u>	CONSERVATION-II	Conservation strategies – Ex-situ conservation, principles and practices, germ plasm collections, Botanic gardens, seed banks, test tube gene banks, pollen banks, cryobanks, exsitu conservation of microbes. Social approaches to conservation- sacred groves, sthalavrikshas. Peoples movement for biodiversity conservation- Chipko movement, river dam and tribal campaign. Role of universities and other educational institutions in biodiversity conservation. Role of BSI, NBPGR, ICAR, CSIR and Department of Biotechnology in sustainable development.	Learn the conservation and motivation of students for its conservation

Specify Course Outcome: To know economic importance of plant wealth and principles and strategies of Biodiversity and its conservation.

Specify Program Outcome: To study role of various organization in sustainable development.

Signature of Teacher

Dr. D.P. Ghorband



Dnyanopasak Shikshan Mandal's

College of Arts, Commerce and Science, Parbhani

Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Miss. N.B. Pawar

Department: Botany

Program: MSc/FY

Subject: Botany

Course Code:

**Paper Title: PLANT ECOLOGY, ENVIRONMENTAL BIOLOGY AND
PHYTOGEOGRAPHY (ELECTIVE)- IX**

Unit Number	Unit Name	Topics	Unit-wise Outcome
Unit-I	ECOLOGY	Introduction- Scope and importance of ecology in India, Ecological tools and techniques, Sampling techniques of population, methods of estimating primary production and consumer production. Ecosystems - Concepts of ecosystem, Function of Ecosystem – Energy flow and mineral cycling (C, N, P), Structure and function of some Indian ecosystems – Terrestrial ecosystem (Grassland and Forest ecosystem), Aquatic ecosystem (Fresh water, marine and estuarine ecosystem), Food chains, Food webs and ecological pyramids.	Able to scope of ecology and there ecological factors
Unit-II	POPULATION ECOLOGY	Characterization of a population, population growth curves, population regulation, life history strategies (Y and K selection), Concepts of metapopulation- demes and dispersal, interdemic extinctions, age structured populations. Community ecology- Nature of communities, community structure, levels of species diversity and its measurement, edges and ecotones. Ecological succession – Types, mechanism, changes involved in succession, concept of climax.	To learn structure and types of Ecosystem and there Energy flow ,food chain, food web, Ecological pyramids in Ecosystem
Unit-III	ENVIRONMENTAL BIOLOGY	The Environment – Physical and biotic environment, biotic and abiotic interactions. Environmental pollution – Causes, effects and control measures of air, water, soil and thermal pollution, Nuclear hazards,	To understand Factors affecting the environment and

		phytoremediation, Global warming and climate change, acid rains, ozone layer, ozone hole. Social issues and the environment – EPA 1986, Urban problems related to energy, wa	their control measures.
<u>Unit -IV</u>	PHYTOGEOGRAPHY	Introduction, concept, Climate and Vegetation of the world, Phytogeographical regions of World, Botanical provinces of India and their characteristic vegetation. Forest types of India. Ecological importance of forests, aforestation, deforestation, social forestry. Geological time scale and geographical history, Continental Drift, Land Bridges, shifting of poles, theories of differentiation and natural selection, types and areas of natural distribution, centre of origin, theory of tolerance.	To study biological region of india and there Environmental pollution.

Specify Course Outcome: Able to scope of ecology and there ecological factors adoptions and Phytogeography and Environmental Biology.

Specify Program Outcome: : Enviornmental factors and their knowledge motivates the various educational institute and universities for conservation of plant.

Signature of Teacher

Miss. N.B. Pawar



**Dnyanopasak Shikshan Mandal's
College of Arts, Commerce and Science, Parbhani**

Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Dr. A.P. Jadhav

Department: Botany

Program: MSc SY (Sem-III)

Subject: Botany

Course Code:

Paper Title: PLANT PHYSIOLOGY AND METABOLISM- XI

Unit Number	Unit Name	Topics	Unit-wise Outcome
Unit-I	PLANT WATER RELATIONS AND BIOENERGETICS	Scope and Importance of Plant Physiology; Bioenergetics - concept of free energy, enthalpy, entropy, basic laws of thermodynamics; Ultra structure and chemistry of plant cell; Molecular Structure and Physico-chemical properties of water, pH, buffers; Solutions, Suspensions, Colloidal System, Diffusion, Osmosis, Imbibitions, DPD and Concept of Water Potential, Water absorption, Transportation, Transpiration and heat transfer; Phloem transports across the plant, Mechanism of Phloem Loading and Unloading source and sink relationship.	Understand the Bioenergetics, structure of plant cell and plant water relation.
Unit-II	HORMONAL PHYSIOLOGY AND PHOTOBIOLOGY	Introduction of various plant growth Hormones, Mode of actions, mechanism of biosynthesis and practical applications of Auxins, Gibberellins, Cytokinins, Abscisic acid, ethylene, Brassinosteroides, Salicylic acid Jasmonic Acid .Effect of phytohormones on growth and differentiation of plant; Effect of hormones on seed germination, causes and methods of breaking seed dormancy; Phytochromes, discovery and properties of Phytochromes, red and far red pigment system; Effect of	Learn the various plant growth Hormones and photobiology.

		Phytochromes on plant development; Phenomenon of Photoperiodism and Vernalization	
Unit-III	STRESS PHYSIOLOGY, SENESCENCE AND RIPENING	Stress physiology: Plant responses to abiotic stresses, mechanisms of abiotic stress tolerance, water deficit and drought tolerance, salinity stress, metal toxicity, freezing and heat stress; Senescence and PCD: Mechanism, physiology of senescence; role of hormones, biochemical aspects of senescence; Fruit ripening- Climacteric and non climacteric fruit, biochemical and molecular changes during ripening, Mechanism of ripening, role of hormone in fruit ripening.	Learn the plant Stress physiology.
Unit-IV	METABOLISM	Nitrogen Metabolism: Role of nitrogen in plants, sources of nitrogen, nitrogen fixation, Range of nitrogen fixing organisms - Legume - Rhizobium symbiosis, biochemistry and physiology of Nitrogenase, characteristics and functions of Leghaemoglobin; Nitrate reduction, assimilation of ammonia. Mechanism of non-biological and biological nitrogen fixation; Sulphur Metabolism: role of sulphur in plants, Sulphur chemistry and fixation, uptake and transport, reductive sulphate assimilation pathways, synthesis and function of glutathione and its derivatives. Phosphorous metabolism: Role of phosphorous in plants Sources of phosphorous, uptake transport and mechanism of phosphorous metabolism in plants	Learn the plant metabolism.

Specify Course Outcome: Understand Importance of Plant Water Relations , Mineral Nutrition And Biomolecules And Secondary Metabolites

Specify Program Outcome: Learn about Bio molecules And Secondary Metabolites and Motivate the student

Signature of Teacher

Dr. A.P. Jadhav



Dnyanopasak Shikshan Mandal's

College of Arts, Commerce and Science, Parbhani

Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Mr. Shaikh Irshad S.N

Department: Botany

Program: MSc SY (Sem-III)

Subject : Botany

Course Code:

Paper Title: MOLECULAR BIOLOGY AND PLANT BIOTECHNOLOGY -XII

Unit Number	Unit Name	Topics	Unit-wise Outcome
Unit-I	MOLECULAR CYTOGENETICS	Basic Discoveries in molecular cytogenetics; Structure and chemical, physical, spectroscopic and thermal properties of nucleic acids (Buoyant density, melting temperature, effect of acid and alkali, UV absorption, hypo and hyperchromicity); Nuclear DNA content, Dissociation and reassociation kinetics of DNA, Cot curves, Cot ½ values and its significance. Unique, moderately repetitive and highly repetitive DNA, forms of DNA; Prokaryotic Transcription; Transcription unit; Promoters, Regulatory elements; Initiation; Attenuation; Termination-Rho-dependent and independent; Transcriptional regulation-Positive and negative; Processing of RNA ,Eukaryotic transcription and regulation; RNA polymerase structure and assembly.	Learn basic molecular cytogenetic
Unit-II	GENOME ORGANIZATION AND REGULATION OF GENE EXPRESSION	Organization and structure of prokaryotic and eukaryotic genes; structure and role of promoters, exons, introns, terminators and enhancers. Mechanism of prokaryotic and eukaryotic DNA replication, Enzymes of DNA replications and their role, Models of replication, replication apparatus, Origins of replication, priming and DNA polymerases. Enzymes of DNA replications and their role; Regulation of	Learn about organization and structure of cell and there concepts.

		gene expression in pro-and eukaryotes, Attenuation and antitermination, Operon concept and types, DNA methylation, Heterochromatization, Regulatory sequences and transcription factors, Environmental regulation of gene expression.	
Unit-III	PROTEIN SYNTHESIS, BACTERIAL AND PHAGE GENETICS	Processing of tRNA, rRNA; 5'-Cap formation; 3'-end processing and polyadenylation; Splicing; RNA editing; Translation machinery; Ribosomes; Composition and assembly; Genetic Code; Mechanism of initiation, elongation and termination; Post-translational modifications; Mobile DNA - conjugative and non-conjugative plasmids, insertional sequences and transposons, antibiotic resistance cassettes, multiple antibiotic resistant bacteria, genetic transformation, conjugation and transduction in bacteria, genetic recombination, mapping of bacterial genome. Plaque formation, phage mutants, Lytic and lysogenic cycles. specialized transduction, site specific recombination, mapping the bacteriophage genome, genetic map of Lambda (λ) phage.	Learn about synthesis of protein Distribution of genetic material of bacteria and understanding the phage genetics.
Unit-IV	BIOTECHNOLOGY	Scope and importance of Biotechnology, basic principles of Biotechnology; Plant cell and tissue culture: General introduction, history, scope, concept of cellular differentiation, totipotency Organogenesis and adventives embryogenesis, Fundamental aspect of morphogenesis, somatic embryogenesis, mechanisms, technique and utility of cell and tissue culture in plants, Primary culture, Cell line, Cell clones, Callus cultures, Somaclonal variation, Micropropagation, Haploidy, Protoplast isolation, fusion and culture, hybrid selection and regeneration, somatic hybridization, Cybrids, Gene transfer methods in plants and in animals, Transgenic plants, Allopheny, Artificial seeds, Hybridoma technology	Learn scope and importance of biotechnology The basic principles of biotechnology and there techniques.

Specify Course Outcome: Learn about molecular cytogenetics and different types of Enzymes required in Genetic Engineering

Specify Program Outcome: Understand knowledge motivates the various educational institute and universities for Tissue culture.

Signature of Teacher

Mr. Shaikh Irshad S.N



**Dnyanopasak Shikshan Mandal's
College of Arts, Commerce and Science, Parbhani**

Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Mr. Pawar. N.S

Department: Botany

Program: MSc/SY

Subject: Botany

Course Code:

Paper Title: PRINCIPLES OF PLANT PATHOLOGY- XIII

Unit Number	Unit Name	Topics	Unit-wise Outcome
Unit-I	INTRODUCTION TO PLANT PATHOLOGY	Scope and Importance of Plant Pathology; Contributions of E.F .Smith E. C.S takman, S. D. Garrett, E. J. Butler, K.C.Mehta, M.J. Thirumalachar, in the field of plant pathology.Development of Plant Pathology as a Profession , Careers in Plant Pathology The Practice and Practitioners of Plant Pathology .Certification of Professional Plant Pathologists .Plant Pathology as a Part of Plant Medicine; the Doctor of Plant Medicine Program. Aerobiology : Scope and applications of aerobiology. Airborne pathogens, Methods for detection of aerospora,	Learn about various work of plant pathologist .
Unit-II	THE PATHOGENESIS	Process of infection - Pre penetration activity of the pathogen on the host surface, Penetration Mode of entry through Epidermis, stomata, lenticels, hydathodes, wounds, buds and hairs, Rhizosphere and phyllosphere population in relation to infection, Effect of Environment on Pathogenesis : Effect of temperature, humidity, wind, light, rainfall, soil reaction(pH),plant nutrition. The biotic environment: Antagonistic association, phenomenon of fungistatis, symbiotic association, synergistic association, Dispersal of plant pathogens : Dispersal by air, water, insects, animals and man	Examine description and identification for further studies

Unit-III	EPIDEMIOLOGY AND PLANT DISEASE FORECASTING	Epidemiology: Concepts of epidemiology. Slow and rapid epidemics, favourable factors for development of epidemics, conditions for decline of epidemics, Role of environment and meteorological factors in the development of plant disease epidemics, Disease Forecasting: General account of Plant Disease Forecast Systems with examples, Methods of Plant disease forecasting: Forecasts Based on Amount of Initial Inoculum - On Weather Conditions Favouring Development of Secondary Inoculum - On Amounts of Initial and Secondary Inoculum.	Applying the information to parts identifying plant diseases forecasting
Unit-IV	Defence mechanism in plants	Pre existing and post inflectional Structural defence in host plants, Pre existing Biochemical defence, Post inflectional biochemical defence, defence through detoxification of pathogen toxins, Defence through the Hypersensitive Response, Defence through Lack of Essential Substances for the Pathogen. Defence through Genetically Engineering Disease-Resistant Plants. Phytoalexins : Synthesis, characteristics and role, elicitors of phytoalexins.	Understanding of facts ideas giving description about defence mechanisms in plants

Specify Course Outcome: Learn the various work of plant pathologist and different diseases and defence mechanisms in plants.

Specify Program Outcome: Understand knowledge motivates the various educational institute and agricultural universities for plant pathology.

Signature of Teacher

Mr. Pawar. N.S



**Dnyanopasak Shikshan Mandal's
College of Arts, Commerce and Science, Parbhani**

Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Miss. Baig Zeba. R

Department: Botany

Program: MSc /SY

Subject: : Botany

Course Code:

Paper Title: TAXONOMY AND SYSTEMATICS-I

Unit Number	Unit Name	Topics	Unit-wise Outcome
Unit-I	TAXONOMY-I	General Evolutionary Trends in Angiosperms: i) Habitat and growth habit ii) Leaf structure: Simple and compound; phyllotaxy, iii) Evolution of inflorescence; iv) Concept of primitive flower v) Primitive stamen, vi) Primitive carpel, vii) Nature of inferior ovary: Foliar (Appendicular) and receptacular (Axial) theories; ix) Evolution of fruit; Origin of Angiosperms: Bennettitalean and Pteridosperm theory, Monophyletic and Polyphyletic origin of angiosperms.	Understand the evolutionary trends in angiosperms.
Unit-II	TAXONOMY-II	Comparative account of Pre-Darwinian Classification: Andrea Cesalpino, John Ray, B. de Jussieu and A. P. de Candolle; Comparative account of Post Darwinian Classification: Charles E. Bessey, Armen L. Takhtajan, R. M. T. Dahlgren, Robert Thorne and, APG III (2009) classification	Understand Comparative account of Darwinian Classification.
Unit-III	SYSTEMATICS-I	Comparative account of floral morphology, interrelationship of plant families belonging to following orders as per Engler and Prantl's system of classification.	Learn various families belonging to different orders.

		<p>1. Rhoeadales :(Papaveraceae, Capparidaceae, Cruciferae and Moringaceae),</p> <p>2. Malvales :(Elaeocarpaceae, Tiliaceae, Malvaceae, Bombacaceae, Sturculiaceae)</p> <p>3. Contortae: (Oleaceae, Loganiaceae, Gentianaceae, Apocyanaceae, Asclepiadaceae)</p> <p>4. Geraniales: (Geraniaceae, Oxalidaceae, Zygophyllaceae, Rutaceae, Meliaceae, Malphigiaceae)</p>	
Unit-IV	SYSTEMATICS-II	<p>Comparative account of floral morphology, interrelationship of plant families belonging to following orders as per Engler and Prantl's system of classification</p> <p>1. Pandanales: (Typhaceae and Pandanaceae)</p> <p>2. Glumiflorae: (Gramineae, Cyperaceae)</p> <p>3. Liliflorae: (Juncaceae, Liliaceae, Amaryllidaceae, Dioscoriaceae, Iridaceae)</p> <p>4. Microspermae: (Burmanniaceae, Orchidaceae)</p>	Learn various families belonging to different orders.

Specify Course Outcome: Develop about the knowledge of different Angiospermic plant families, taxonomic tools and the origin of Angiosperm

Specify Program Outcome: Awareness of Plant Biodiversity for teaching and learning of students, Universities, and educational institutes.

Signature of Teacher

Miss. Baig Zeba. R



**Dnyanopasak Shikshan Mandal's
College of Arts, Commerce and Science, Parbhani**

Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Miss. M.M. Dombe

Department: Botany

Program: MSc/SY

Subject: Botany

Course Code:

Paper Title: BASIC PLANT PATHOLOGY AND PLANT DISEASES -XIVA

Unit Number	Unit Name	Topics	Unit-wise Outcome
Unit-I	INTRODUCTION	<p>History of Plant Pathology with special reference to Indian works. Nature and concept of plant disease, effect of plant diseases on human affairs, Nature and cause of diseases in plants, Classification of plant diseases: Criteria used in classification, Classification based on origin (soil, air, and seed), symptoms, causal organism and diagnosis of plant diseases.</p> <p>Methods of Studying Plant Diseases : Field observations, isolation of plant pathogens from infected plant parts, pure culture techniques, methods of inoculation, measurement of plant disease, Koch's postulates, preservation of plant pathogens and disease specimens, microscopic techniques ,staining methods</p>	Understand different plant diseases and there classification.
Unit-II	SEED PATHOLOGY	Significance of seed health, Seed borne pathogens, methods for detection of fungi, bacteria and viruses, transmission of seed borne pathogens, biochemical changes in seeds due to infection, spoilage of grains in storage; Production of toxic metabolites affecting seed quality and its impact on human, animal and plant health, Recent advances in the establishment and subsequent cause of disease development in	Learn seed born pathogen and there method of detection of Fungi, Bacteria and Viruses.

		seed and seedling, Control of seed borne diseases, seed treatments, seed certification	
Unit-III	DISEASES OF CROP PLANTS- I	History, symptomology, causal organism, etiology and management of the following diseases: Cereals: Jowar: Grain smut, head smut, rust, leaf spot, Wheat: Black /stem rust, loose smut, Bajra: Green ear, ergot, rust, smut, Rice: Brown leaf spot, blast, Maize: Leaf blight, smut Pluses: Pigeon pea: Wilt, sterility mosaic, Gram: Wilt, Ascochyta blight, Bean: Anthracnose, Bean mosaic, Black gram: Powdery mildew	Understand the different Crop plant diseases.
Unit-IV	DISEASES OF CROP PLANTS – II	History, symptomology, causal organism, etiology and management of the following diseases: Oil seeds: Ground nut: Leaf spot, rust, Sunflower: Leaf spot, downy mildew, rust, Safflower: Leaf spot, Sesame: Sesamum phyllody, Mustard: White rust, Soybean: Rust Vegetables: Tomato: Early blight, leaf curl, Potato: Early blight, late blight, soft rot, Brinjal: Little leaf, Root Knot, Chilli: Die back, leaf curl, Bhendi: Yellow vein mosaic, powdery mildew, Spinach: Leaf spot Cabbage: Leaf spot	Understand the different Crop plant diseases.

Specify Course Outcome: Learn the various work of plant pathology and different seed born and crop plant diseases.

Specify Program Outcome: Understand knowledge motivates the various agricultural universities for crop plant and seed born diseases. Understand the various techniques used in plant pathology.

Signature of Teacher

Miss. M.M. Dombe



**Dnyanopasak Shikshan Mandal's
College of Arts, Commerce and Science, Parbhani**

Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Miss. N.B. Pawar

Department: Botany

Program: MSc/SY

Subject: Botany

Course Code:

Paper Title: PLANT ANATOMY AND PHARMACOGNOSY-I–XIVB

Unit Number	Unit Name	Topics	Unit-wise Outcome
Unit-I	PLANT ANATOMY-I	Organisation of Root Apical Meristem (RAM): Apical cell theory, Histogen theory, Korper Kappe theory, Concept of Quiescent centre; Root development: Cell fates and lineages, Vascular tissue differentiation, Development of adventitious roots, Lateral roots and Root hairs, Primary and Secondary growth of root (Monocot and Dicot)	Understand the plant anatomy.
Unit-II	PLANT ANATOMY-II	Development, differentiation and Histology of Monocot and Dicot leaf tissues; Anatomy of node and its significance; Leaf venation pattern; Study of stomatal types and trichomes; Wood Anatomy: Hard wood and sap wood, porous & non porous wood, distribution and types of wood parenchyma	Understand the Leaf and Wood anatomy.

Unit-III	PHARMACOGNOSY-I	History, Definition and scope of Pharmacognosy; Classification of crude drugs: Taxonomical, morphological Chemical and Pharmacological (Therapeutic) classification; Scheme for Pharmacognostic studies of a crude drug; Floristic diversity and medicinal plant research scenario in Maharashtra	Understand Pharmacognosy and there classification.
Unit-IV	PHARMACOGNOSY-II	Pharmacognostic studies (Nomenclature, Morphology, Anatomy, Chemistry, Uses and Adulterants) of following drug plants: 1. Root drugs: Asparagus, Withania 2. Rhizome drugs: Zingiber, Curcuma, 3. Bark drugs: Acacia, Cassia 4. Fruits and Seeds: Coriander, Castor	Learn the various drug plants.

Specify Course Outcome: Learned about Anatomy and Pharmacognosy and various drug plants.

Specify Program Outcome: Motivate the student's knowledge about Anatomy And drug plants.

Signature of Teacher

N.B. Pawar



Dnyanopasak Shikshan Mandal's

College of Arts, Commerce and Science, Parbhani

Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Dr. A.P. Jadhav

Department: Botany

Program: MSc/SY

Subject: Botany

Course Code:

Paper Title: - PLANT BIOCHEMISTRY AND METABOLISM -XVI

Unit Number	Unit Name	Topics	Unit-wise Outcome
Unit-I	PLANT BIOCHEMISTRY-I	Amino Acids-Structure Classification and various physicochemical properties of amino acids, Protein and Non Protein amino acids, Essential and non essential amino acids Transamination, diminution, Reductive amination, Amino acid families, Bio-Synthesis of amino acids. Van der Waal's forces, electrostatic interactions, hydrogen bonding and hydrophobic interactions, Primary structure of proteins Conformation of proteins and polypeptides (secondary, tertiary, quaternary and domain structure), Ramachandran plot, Protein metabolism-Mechanism of synthesis and breakdown of proteins. Proteomics- an introduction to protein engineering, Leaf protein concentrates, seed protein.	To study Structure Classification of Biochemistry
Unit-II	PLANT BIOCHEMISTRY-II	Enzymology- Introduction, Classification and properties and structure of enzyme, active site, mechanism of enzyme catalyzed reaction, Enzyme kinetics, Michaelis-Menten equation, Significance of Km and V-max Enzyme inhibition, allosteric enzymes, activators and inhibitors, Coenzymes, relation between co-enzymes and vitamins, co-factors, Isozymes, ribozymes and abzymes	Learn about different types of Enzymes.

Unit-III	PLANT METABOLISM-I	Photochemistry: Nature and Properties of light, states of atom, fluorescence, phosphoresce, quantum requirement and quantum yield, Ultra structure of chloroplast, Location of photosynthetic pigments, Chemistry, properties and synthesis of photosynthetic pigments, Mechanism of light capturing and light harvesting Photosynthesis: Van Niel Hill Reaction, two pigment system, water oxidation complex, electron transport system - Z – scheme, cyclic, non cyclic, photophosphorylation cyclic mechanism, photosynthetic carbon reduction pathways in C3, C4 and CAM plants, Biochemical variants of C4 pathway. Biochemistry and Genetics of RUBISCO, Carbon dioxide concentration mechanism in C4 plants, photorespiration and its significance, inhibitors and uncouples of photosynthesis.	Proficiency with the basic terminology of Photosynthesis And Respiration
Unit -IV	PLANT METABOLISM-II	Cell Respiration : Introduction to plant respiration, respiration types and locations, fermentations, ultra structure of mitochondria, concept of RQ, Glycolysis , Kerb’s cycle and its significance, Electron transport system and oxidative phosphorylation, mechanism of ATP synthesis, Energetics of respiration, Oxidative pentose phosphate pathway, Respiratory inhibitors and uncouplers, Cyanide resistant respiration. Plant lipid metabolism: Biosynthesis and breakdown of triglycerides and fatty acids, Glyoxalate pathway, Gluconeogenesis, biological significance.	Able to Understanding cell metabolism

Specify Course Outcome: Learn about different types of Enzymes and Metabolism

Specify Program Outcome: Understand knowledge motivates the plant biochemistry and metabolism and Photosynthesis.

Signature of Teacher

Dr. A.P. Jadhav



Dnyanopasak Shikshan Mandal's

College of Arts, Commerce and Science, Parbhani

Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Mr. N.S. Pawar

Department: Botany

Program: MSc/SY

Subject: Botany

Course Code:

Paper Title: GENETIC ENGINEERING AND BIostatISTICS -XVII

Unit Number	Unit Name	Topics	Unit-wise Outcome
Unit-I	TECHNIQUES IN MOLECULAR GENETICS	Techniques in Molecular Genetics: Basic techniques (Restriction digestion, production of recombinant DNA molecules, amplification using vectors, construction of genomic libraries, cDNA libraries and screening DNA libraries for genes of interest); The manipulation of cloned DNA sequences: in vitro, using phagemid vectors; In vitro site specific mutagenesis, Molecular analysis of Genes and Chromosomes: PCR, Physical maps of DNA molecules based on RFLP and Fine structure maps Regulation of expression (Transcriptional, Post transcriptional, translational, post translational and compartment specific control)	Able to Understanding Genetic Engineering and its techniques.
Unit-II	r-DNA TECHNOLOGY	Restriction and nucleic acid modifying enzymes; restriction mapping, Vectors in gene cloning and their choice ; plasmids, phages, cosmids, plant viruses, synthetic DNA vectors; Isolation of specific genes from bacteria and higher plants; cloning; Genome sequencing strategies and programs, methods for sequencing, microarrays and their applications; gene tagging; gene and promoter trapping; knockout and knock-down mutants; Comparative genomics of model plants and related crop species; RNA and gene silencing, genome imprinting, small RNAs and their biogenesis, role of small RNAs in heterochromatin formation and gene silencing.	To understanding the Various techniques in Genetic engineering.

Unit-III	GENOMICS AND PROTEOMICS	Introduction to genomics and proteomics, Use of vectors for over-expression of proteins, Protein extraction/purification techniques viz., electrophoresis and column chromatography, Proteomics as a tool for plant genetics, breeding and diversity studies. Analysis of proteins by different biochemical and biophysical procedures like CD (Circular Dichroism), NMR, UV/Visible and fluorescent spectroscopy, 1-D and 2-D gel electrophoresis for proteome analysis, Mass spectrometry based method for protein identification like PMF (protein mass fingerprinting) and LCMS; Image analysis of 2D gels: Data acquisition, spot detection & quantization, gel matching, protein chips and arrays, future directions in proteomics, scope of functional proteomics.	Learn the methods of genomics and proteomics
Unit -IV	BIOSTATISTICS	Central value- Mean, mode, median, mean deviation, standard deviation and coefficient of variation, test of significance (T-test, chi-square test) Probability- Definition, mutually exclusive events and addition rule, independent events and multiplication rule. Sampling: Reasons for sampling, methods of sampling, SRS, Systematic, Stratified, Cluster, NPS. Probability distribution: Binomial, Poisson, Gaussian, Standard normal distribution. Drawing inferences from data: Confidence intervals, Confidence limits, Hypothesis tests, Types of errors, P-values, ANOVA	Able to understanding the Biostatistics and methods.

Specify Course Outcome: Learn about different types of techniques used in genetic engineering and methods of Biostatistics.

Specify Program Outcome: Understanding the Genetic Engineering and its techniques.

Signature of Teacher

Mr. N.S. Pawar



Dnyanopasak Shikshan Mandal's

College of Arts, Commerce and Science, Parbhani

Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Miss. M.M. Dombe

Department: Botany

Program: MSc/SY

Subject: Botany

Course Code:

Paper Title: PHYSIOLOGICAL AND MOLECULAR PLANT PATHOLOGY -XVIII

Unit Number	Unit Name	Topics	Unit-wise Outcome
Unit-I	PHYSIOLOGICAL AND MOLECULAR CHANGES IN DISEASED PLANTS	Changes in host cell walls, Effect of pathogens on permeability of cell membranes, Effect of infection on Photosynthesis, Respiration, Translocation of water and minerals, Phenol metabolism, Nitrogen metabolism and Growth regulators (Auxins, gibberellins and cytokinins) in diseased plants. Changes in the Molecular level - Nucleic acids, Proteins, Effect of pathogens on Transcription and Translation.	To learn about Molecular changes in Diseased plants.
Unit-II	HOST - PATHOGEN INTERACTION	Cell wall composition, Enzymes: Cellulolytic enzymes- Types, mode of action and Role. Pectolytic enzymes: Types, mode of action and Role of Pectolytic enzymes in pathogenesis and maceration, Toxins: Classification of Toxins- Pathotoxins, vivotoxins and phytotoxins, chemical nature and mode of action of Victorin, Lycomerasmin, Fusaric acid, Wild fire toxin, effect of toxins on plant tissues, Role of toxins in pathogenesis, Aflatoxins	Understanding the Composition and classification of host pathogen.
Unit-III	GENETICS AND BIOTECHNOLOGICAL	Genetics of host-parasite interaction, Genetic variability of bacteria, viruses and Fungi, Mechanism of variability, loss of virulence in plant pathogen, Physiological specialization and	To know about genetic biotechnology used in plant pathology.

	APPROACHES IN PLANT PATHOLOGY	production of new races, Inheritance of resistance in the host, Biotechnological approaches in plant pathology: Development of virus free plants by meristem tip culture, single cell culture, strategies for development of transgenic plants.	
<u>Unit -IV</u>	MOLECULAR PLANT PATHOLOGY	Molecular diagnostics: Serological and molecular techniques for detection of plant pathogens (soil, seeds and other planting materials), Identification of the pathogens by Southern, Northern and Western hybridization, PCR based method, Methods for isolation of DNA and RNA from plant pathogens (Fungi and Bacteria), Molecular basis of host parasite interaction, Gene for gene relationship, Criteria for Gene for gene type of relationship, Genetic engineering of plants for disease resistance: Methods of gene transfer, Application of molecular biology to plant disease control,	Learn the molecular diagnostic and identification of pathogen and techniques.

Specify Course Outcome: To understanding the Molecular changes in diseased plants and identification of pathogen and techniques.

Specify Program Outcome: To Know plant pathology and identification of plant pathogen and their control.

Signature of Teacher

Miss. M.M. Dombe



Dnyanopasak Shikshan Mandal's

College of Arts, Commerce and Science, Parbhani

Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Mr. Shaikh Irshad S.N

Department: Botany

Program: MSc/SY

Subject: Botany

Course Code:

Paper Title: DISEASES OF CROP PLANTS AND THEIR MANAGEMENT -XIXA

Unit Number	Unit Name	Topics	Unit-wise Outcome
Unit-I	DISEASES OF CASH CROPS AND FRUIT CROPS	History, symptomology, causal organism etiology and management of Cash crops: Cotton- Wilt, black arm, brown leaf spot; Sugarcane- Red rot, grassy shoot, whip smut, Turmeric- Brown leaf spot, Fruit crops: Grape- Downy mildew, powdery mildew, Banana-Leaf spot, Citrus-Canker, gummosis, decline, Papaya- Mosaic, leaf curl, Trees: Teak- powdery mildew, Mango- Anthracnose, Mango malformation, Bacterial canker	To learn various diseases occurring on fruits and cash crops.
Unit-II	PARASITIC AND NON-PARASITIC DISEASES	Parasitic diseases caused by Nematodes- Root knot of tomato, Soyabean cyst, Parasitic diseases caused by Phanerogams-Dodder, Witch weed, Broomrapes and their management, Diseases due to unfavourable conditions of - Soil, drought, flood, stress and mineral deficiencies, Pollutants in air, Post harvest diseases: caused by Alternaria, Botrytis, Fusarium, Geotrichum, Penicillium, Sclerotinia and their management. Post harvest decays of grain and legume seeds.	To know various types of diseases like Nematodes and Phanerogams and their management.
Unit-III	DISEASE MANAGEME	Management planning against a disease, disease cycle-disease control relationship, bases of disease management principles, avoidance, exclusion of Pathogen- plant quarantines, quarantine restrictions	Learn about the management planning of diseases of crop.

	NT- THE PRINCIPLES	in the movement of agricultural produce, seed and planting material, history of quarantine legislation, contamination of food with toxigens, symptomatic diagnosis of and other techniques to detect pests/pathogens, infestations, eradication of plant pathogen, sanitary and phytosanitary issues under WTO,TRIPS & PRA.	
<u>Unit -IV</u>	DISEASE MANAGEMENT –THE PRACTICES	Cultural practices for disease management, production and use of disease free Seeds and propagating materials. Chemical nature and classification of fungicides, antibiotics, nematicides, antiviral chemicals and botanicals, formulations, mode of action and application of different fungicides, phytotoxicity of different fungicides, precautions during handling, health hazards, fungicidal resistance in plant pathogens. Biological control-merits and demerits, integrated disease management (IDM), spraying and dusting equipments and their care-maintenance.	Understanding the various cultural practices for disease management and classification of fungicides.

Specify Course Outcome: Understanding the incidence of diseases on different parts of plants and their management.

Specify Program Outcome: To know about different diseases infected on different fruits, cash crop and their control measures.

Signature of Teacher

Mr. Shaikh Irshad S.N



Dnyanopasak Shikshan Mandal's

College of Arts, Commerce and Science, Parbhani

Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Miss. Baig Zeba. R

Department: Botany

Program: MSc/SY

Subject: Botany

Course Code:

Paper Title: TAXONOMY AND SYSTEMATICS-II -XVIIIIB

Unit Number	Unit Name	Topics	Unit-wise Outcome
Unit-I	TAXONOMY -I	1. Plant Speciation: Allopatric, Parapatric, Stasipatric, sympatric, abrupt or gradual speciation. 2. Isolating Mechanisms: Geographical and Ecological, Seasonal and Temporal, Mechanical and Ethological, Internal barriers 3. Concept of Species: Nominalistic, Typological and Biological	Understanding the plant speciation and isolating mechanism.
Unit-II	TAXONOMY -II	1. Concept of taxonomic Characters: synthetic v/s analytic characters, Qualitative v/s Quantitative characters. Homology and Analogy, Parallelism and Convergence. 2. Taxonomic Evidences: Numerical taxonomy, Chemotaxonomy, Cytotaxonomy; Palynology, and Embryology in relation to taxonomy. 3. Types of Keys: Punched cards and dichotomous keys	Understand the Concept of taxonomic Characters, Evidences and Types of Keys.
Unit-III	SYSTEMATICS-I	Comparative account of floral morphology, interrelationship of plant families belonging to following orders as per Engler and Prantl's system of classification 1. Centrospermae: (Chenopodiaceae, Amaranthaceae, Nyctaginaceae, Phytolacaceae, Aizoaceae, Portulacaceae and Caryophyllaceae,) 2. Rosales: (Podostemaceae, Crassulaceae, Saxifragaceae, Hamamelidaceae, Rosaceae, Leguminosae) 3. Sapindales: (Learn various families belonging to different orders.

		Anacardiaceae, Celastraceae, Salvadoraceae, Sapindaceae, Melianthaceae and Balsaminaceae) 4. Ebenales: (Sapotaceae and Ebenaceae)	
<u>Unit -IV</u>	SYSTEMATI CS-II	Comparative account of floral morphology, interrelationship of plant families belonging to the order as per Engler and Prantl's system of classification 1. Helobiae: (Potamogetonaceae, Najadaceae, Aponogetonaceae, Allismataceae, Butomaceae, Hydrocharitaceae) 2. Spathiflorae: (Araceae and Lemnaceae) 3. Farinosae: (Eriocauliaceae, Bromeliaceae, Commelianaceae, Potenderiaceae) 4. Scitaminae: (Musaceae, Zingiberaceae, Cannaceae, Marantaceae)	Learn various families belonging to different orders.

Specify Course Outcome: Develop about the knowledge of different Angiospermic plant families, taxonomic tools and plant identification methods.

Specify Program Outcome: Awareness of Plant Taxonomy for teaching and learning of students, Universities, and educational institutes.

Signature of Teacher

Miss. Baig Zeba. R



Dnyanopasak Shikshan Mandal's

College of Arts, Commerce and Science, Parbhani

Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Miss. N.B. Pawar

Department: Botany

Program: MSc/SY

Subject: Botany

Course Code:

Paper Title: PLANT ANATOMY AND PHARMACOGNOSY-II- XIXB

Unit Number	Unit Name	Topics	Unit-wise Outcome
Unit-I	PLANT ANATOMY-I	1. Organization of Shoot Apical Meristem (SAM): Apical theory, Tunica corpus theory, Histogenic layer theory 2. Cytological and molecular analysis of SAM, 3. Control of cell division and cell to cell communication, Control of tissue differentiation, specially xylem and phloem, secretary ducts and laticifers, 4. Root stem transition	Understand the plant anatomy.
Unit-II	PLANT ANATOMY-II	1. Development of flower, Vascular anatomy of flower, Transition to flowering 2. General account of anatomy of fruit 3. General account of anatomy of seed	Understand the Floral anatomy.
Unit-III	PHARMACOGNOSY-I	1. Methods of cultivation, harvesting, drying and storage of drug plants, 2. Quality control of Herbal drugs: Drug adulteration and their types, detection adulterants by organoleptic and microscopic. 3. General introduction to secondary metabolites of plant origin with their properties.	Understand the various methods of cultivation and types of adultration.
Unit -IV	PHARMACOGNOSY-II	Pharmacognostic studies of following drug plants: (Nomenclature, Morphology, Anatomy, Chemistry, Uses and Adulterants of following drugs, 1. Leaf drug: Adhatoda , Vitex, 2. Essential oils: Eucalyptus, Citronella 3. Fatty oils: Sesamum, Safflower 4. Flowers: Clove, Artemisia annua	Learn the various types of drug plants and their uses.

Specify Course Outcome: Learned about Anatomy and Pharmacognosy and various drug plants.

Specify Program Outcome: Motivate the student's knowledge about Anatomy And drug plants.

Signature of Teacher

Miss. N.B. Pawar