Rayat Shikshan Sanstha's

Annasaheb Awate Arts, Commerce and Hutatma Babu Genu Science College

Manchar, Tal. Ambegaon, Dist. Pune

DEPARTMENT OF BOTANY

Course Outcomes (CO) PG

Sr. No.	Class	Course	Course Outcomes (CO)
1	M. Sc. I Botany (Choice Based Credit System - CBCS Pattern) Semester I Core Compulsory Theory paper	BOUT 111: Botany Theory Paper 1-Plant Systematics I	The learner will be acquired with sound knowledge of 1. Know Systematics and Taxonomy of Algae and Fungi– Principles, Concept of species and hierarchical taxa, Classification of algae and fungi and commercial application of algae, fungi and bryophytes. 2. Understand Bryophytes with reference to distribution, distinguishing characters, morphology and anatomy of gametophyte and sporophytes of different orders.
		BOUT 112: Botany Theory Paper 2- Cell Biology and Evolution	The learner will be acquired with sound knowledge of 1. Get idea about Universal features of cells, cell chemistry and biosynthesis, chemical organization of cells, biogenesis of cell organelles and chromosome. 2. Understand Cellular signaling, transport and trafficking. Cellular Processes like Cell cycle and its regulation, Phases of cell cycle, Method of study of cell cycle, programmed cell death, Cell-ECM and cell-cell interactions and Role of hormones. 3. Gain Knowledge about Genome instability and cell transformation. 4. Know Steps and preview of evolution, Origin of cells and cellular evolution, Molecular Evolution and mechanism.
		BOUT 113: Botany Theory Paper 3- Cytogenetics and Plant Breeding	The learner will be acquired with sound knowledge of 1. Understand about Principles of Mendelian inheritance and Interaction of genes, Cytoplasmic inheritance, Quantitative inheritance, Linkage, Recombination and Crossing Over and mutation. 2. Get idea about Microbial & Phage Genetics, Karyotype and Chromosome Banding, Numerical alterations of chromosomes, Structural alterations of chromosomes and Model systems in Genetics. 3. Know Concept, Objectives, applications and various methods of plant breeding. 4. Gain knowledge about Plant Genetic Resources, Methods in plant breeding, Mutation Breeding.
	Choice Based optional paper	BODT 114: Botany Theory Paper 4- Pomoculture and	The learner will be acquired with sound knowledge of 1. Understand Pomoculture: Various types of Pomoculture, mass cultivation, methods of application and use of genetically engineered fruit plants for improvement

		Fruit Processing Technology	of Pomoculture. 2. Know Fruit Processing Technology: Fruit products, methods of fruit processing.
		BODP 114: Botany Practical Paper 4-based on BO 114	1. To study Correlation between practical experiments with theory to improve the understanding. 2. To study The learner will be acquired with sound knowledge of mass cultivation, methods of application and use of genetically engineered fruit plants for improvement of Pomoculture, Fruit products, methods of fruit processing.
	Core Compulsory practical paper	BOUP 115: Botany Practical Paper based on- BOUT 111, BOUT 112 and BOUT 113	1. To study Morphological observations, documentation (description and illustrations) and classification of various algal and fungal members. 2. Study of Morphological, anatomical and reproductive studies of the various members of bryophytes. 3. To study Practically understanding of polytene chromosome, mitotic and meiotic cell division. 4. How to isolate chloroplast, mitochondria and estimation of related biomolecules are practically studied. 5. study of Karyotype analysis, Meiotic configuration, polygenic inheritance, population genetics, giant chromosome, Floral Biology and various fossils.
	M. Sc. I Botany (Choice Based Credit System - CBCS Pattern) Semester II Core Compulsory Theory paper	BOUT 121: Botany Theory Paper 1-Plant Systematics II	The learner will be acquired with sound knowledge of 1. Understand Pteridophytes: Classification, stellar evolution, distribution, distinguishing characters, morphology and anatomy of sporophyte and gametophyte of various orders of pteridophytes. 2. Know Gymnosperms: Classification, Affinities with Pteridophytes and Angiosperms, Distribution, Economic aspects, General characters and morphology of various orders of gymnosperms. 3. Get idea about Angiosperms: Study of various plant families with respect to general characters, morphology, economic importance, affinities and classification.
		BOUT 122: Botany Theory Paper 2- Molecular Biology	The learner will be acquired with sound knowledge of 1. Understand Techniques and Tools in Molecular Biology: Applications, Enzymes, minor and major equipment's and techniques are used in molecular biology. 2. Know DNA – Structure, Functions and Damage: Structure, forms, properties, packaging, replication, damage and repair of DNA. 3. Study of Gene structure and Function: Structure, Transcription, Translation, gene regulation, Transposable elements, Genomics and Proteomics
		BOUT 123: Botany Theory Paper 3- Biochemistry	The learner will be acquired with sound knowledge of 1. Know Fundamental aspects of biochemistry, biomolecules like carbohydrates, lipids and nucleic acids. 2. Understand Protein biochemistry and nitrogen metabolism. 3. Get idea about Phytochemistry and Metablomics and phytochemical investigations.

	Choice Based optional paper	BODT 124: Botany Theory Paper 4- a. Floriculture and Nursery Management	The learner will be acquired with sound knowledge of 1. Understand Concept, definition, Scope and Importance of floriculture, global scenario, Pre-requisites of commercial floriculture, Harvesting and processing of flowers and Commercial production of flowers. 2. Know Nursery Management: Types of Nurseries, primary requirements, site preparation, Design and layout of nurseries, Producing plants from seed, Vegetatively and growing media.
		BODP 124: Botany Practical paper 4- based on BODP 124	The learner will be acquired with sound knowledge of 1. Study of Correlation between practical experiments with theory to improve the understanding of theoretical knowledge. 2. Study of Students are practically prepared for construction of different protective structures of green houses, special cultural practices and methods of post-harvest technology for cut flowers. 3. Study of Students are motivated for preparation of project on cut flower, preparation of bed, method of seed germination, growing media, grafting, budding, air layering and cutting methods.
	Core Compulsory practical paper	BOUP 125: Botany Practical paper based on BOUT 121, BOUT 122 and BOUT 123	The learner will be acquired with sound practical knowledge of 1. Study of Studies of different plant families of dicotyledonae and monocotyledonae, artificial keys and different forms of fossils. 2. Study of Isolation and quantification of plant genomic DNA and effect of temperature and alkali on DNA. 3. Study of Separation of seed storage proteins of legumes by SDS-PAGE. 4. Study of Electrophoretic separation of plasmid isoforms restriction digestion study of plasmid DNA 5. Study of instruments or equipment's used in Molecular Biology techniques. 6.Study of Thin layer chromatography, spectrophotometry and Effect of pH and enzyme concentration on enzyme. 7. Study of Estimation of proteins by Lowry and Bradford Method
2	M. Sc. II Botany (Choice Based Credit System - CBCS Pattern) Semester I Core Compulsory Theory paper	BOUT 231: Botany Theory Paper 1- Computational Botany	The learner will be acquired with sound knowledge of 1. Get idea about Basic Biostatistics, Introduction to Statistics, Correlation and regression. 2. Understand Experimental Statistics: Statistics using R, SPSS and Excel : Introduction , features, installation, starting and ending of the sessions, R commands and case sensitivity. SPPS Software, Excel, Testing of Hypothesis 3. Know Scientific Communication: Importance, Different modes, Research paper writing, Thesis writing, IPR, patent submissions 4. To study Bio-analytical techniques & Bioinformatics: Making solutions, pH measurements and preparation of buffers, measuring concentrations using spectrophotometry, Bioinformatics, Data Retrieval tools.

		BOUT 232: Botany Theory Paper 2- Developmental Botany	The learner will be acquired with sound knowledge of 1. Gain knowledge about Basic concepts of Plant development: Potency, commitment, specification, induction, Polarity & Symmetry, Difference between Plant and Animal development, Factors for development- intrinsic and extrinsic, Juvenility -Characteristics, Transition to Adult phase. 2. understand Embryology: Reproductive structure in plant, Gametophyte development, Fertilization, Development of embryo in dicots and monocot, Development of Endosperm, Polyembryony, Apomixis. 3. Know Physiological & Molecular Basis of Plant Development: Physiology of plant development, Molecular and Cellular Events. 4. gain idea about Molecular and Cellular Events, Inflorescence development, Flower development, Mutants in Developments, Genetic and Epigenetic Mechanisms Underlying Vernalization, Radial and Axial Pattern of development, Process of Senescence.
		BOUT 233: Botany Theory Paper 3- Plant Physiology-	The learner will be acquired with sound knowledge of 1. Understand Plant Nutrition: Soil, Essential elements, Mechanism of absorption of mineral elements, Active and passive transport, Merits and demerits of use of natural and chemical fertilizers, Properties of water, Mechanism of opening and closing of stomata. 2. Know Photosynthesis: Photosystem I and II, Organization of Photosynthetic electron transport system, Photo-oxidation of water, Fixation of CO2: Calvin (C3), Fixation of CO2: Calvin (C4), CAM pathway. 3. Get idea about Respiration and lipid metabolism: Schematic presentation of Glycolysis, TCA cycle and PPP, Organization of respiratory electron transport system, Mechanism of NADPH and NADH oxidation, Cyanide resistance pathway, Fatty acid biosynthesis, Synthesis of membrane lipids, Catabolism of storage lipids, Significance of lipids. 4. Know Solute transport, Growth and development: Seed dormancy, Growth, Physiology of flowering, Physiological organization phloem element, Plant growth regulators, Stress physiology: Schematic presentation of secondary metabolite synthesis pathways.
	Choice Based optional paper	BODT 234: Botany Theory Paper 4 - Seed science	The learner will be acquired with sound knowledge of 1. Understand Introduction, Scope, Importance and Definition of Seed Technology, Seed, Seed Morphology, Seed Dormancy and Seed Germination, Genetic Purity. 2. Know Quality testing, Seed Production, Seed Testing,
		BODP 234: Botany Practical Paper based on BODT 234	The learner will be acquired with sound practical knowledge of 1. Correlation between practical experiments with theory to improve the understanding of theoretical knowledge. 2. Students are practically prepared for collecting different seeds, breaking seed dormancy and its germination,

			physical purity test and Biochemical tests. 3. Students are motivated for preparation of project on seed bank.
	Core Compulsory practical paper	BOUP 235: Botany Practical Paper based on BOUT 231, BOUT 232, BOUT 233	The learner will be acquired with sound practical knowledge of 1. Correlation between practical experiments with theory to improve the understanding of theoretical knowledge. 2. Students are practically prepared for, Measurement of central tendency, Determination of regression lines, Calculation of correlation coefficient 3. Drawing a simple random sample, Chi-square test for goodness of fit, 4. Use of SPPS/Excel 5. Students also practically prepared for In-Vitro Germination of Spore/Pollen, Dissection & Isolation of Developing Embryo, Endosperm, 6. Microsporogenesis and Development of Male Gametophyte, Megasporogenesis and Development of Female Gametophyte. 7. Preparation of standard solutions, Detection of amino acids/sugars, determine the chlorophyll a/chlorophyll b. Estimation of soluble proteins by Lowry method. 8. Determination of activity of nitrate reductase.
	M. Sc. II Botany (Choice Based Credit System - CBCS Pattern) Semester II Core Compulsory Theory paper	BOUT 241: Botany Theory Paper 1- Botanical Techniques	The learner will be acquired with sound knowledge of 1. Understand Microscopic Techniques: Image formation (properties of light), Lens, Optical microscopy, Dissection, maceration, squash, peeling and whole mount, Microtomy, Histochemical and cytochemical techniques, Micrometry and camera lucida. 2. Know Chromatography techniques: Chromatography techniques, Electrophoretic techniques. 3. Get idea about Spectroscopic techniques, Radioactive techniques. 4. To study Centrifugation techniques, Electrochemical techniques, Immunological techniques, Bioinformatics, Herbarium Techniques
		BOUT 242: Botany Theory Paper 2- Advanced Ecology	The learner will be acquired with sound knowledge of 1. Know Levels of species diversity and its measurement, Basis of Ecosystem classification, Aquatic Ecology, Ecosystem Stability, Biomes, Agro-ecological zones of India, Forest types of India. 2. Understand Methods in field ecology, Biodiversity and its conservation, Concepts of gene pool, Environmental Biotechnology, Environmental issues. 3. Get knowledge about Plant relations (eco-physiology) with climatic factors, Plant-plant interaction, concept of allelopathy, Ecological/Environmental Ethics, Restoration ecology, Overview of Environmental Laws in India. 4. Understand Environmental Impact Assessment, EIA Guidelines; Impact Assessment Methodologies, Procedure for reviewing EIA of developmental projects, Human impact on ecosystem and its consequences, Bio-indicators

			of environmental degradation, Concept of carrying capacity, Biomass carbon sequestration.
	Choice Based optional paper	BODT 243: Botany Theory Paper 3- Advanced Plant Physiology	The learner will be acquired with sound knowledge of 1. Know Photosynthesis and Respiration : 2. Understand Post-Harvest and Stress physiology: Post harvest physiology-ripening of fruits, storage of vegetables and flowers. Stress Physiology, Case studies for improvement of stress tolerance by conventional and recombinant DNA technology, Mechanism of action of herbicides, fungicides and bactericides.
		BODP 243: Botany Practical paper based on BODT 243 Advanced Plant Physiology	The learner will be acquired with sound practical knowledge of 1. Correlation between practical experiments with theory to improve the understanding of theoretical knowledge. 2. Students are practically prepared for development of skills to Estimation of chlorophylls and carotenoids, Separation of pigment, Effects of auxins and cytokinin's or gibberellins on growth. 3. Screening of cultivars for biotic and abiotic stress tolerance, Estimation of ascorbic acid, extraction and estimation of enzyme activity. 3. Students are motivated for Estimation of total amino acid in germinating and non-germinating seed.
		BODT 244: Botany Theory Paper 4- Plant Tissue culture Technology	The learner will be acquired with sound knowledge of 1. In vitro culture 2. In vitro production of secondary metabolites and genetic transformation.
		BODP 244: Botany Practical Paper based on BODT 244 Or PG Dissertation	The learner will be acquired with sound practical knowledge of 1. Correlation between practical experiments with theory to improve the understanding of theoretical knowledge. 2. Students are practically prepared for development of skills in handling of Laboratory instruments, sterilization techniques. 3. Preparation and sterilization of MS- medium, Study of different growth regulators. 4. Study of invitro production of haploid, isolation of protoplast, 5. Study of production of secondary metabolites, 6. Visit to any Commercial tissue culture laboratory and Ex situ Germplasm Bank.
	Core Compulsory practical paper	BOUP 245: Botany Practical paper based on BOUT 241 and BOUT 242	The learner will be acquired with sound practical knowledge of 1. Correlation between practical experiments with theory to improve the understanding of theoretical knowledge. 2. Development of skills in students regarding handling of Micrometry, Maceration technique. Electrical conductivity and pH measurements. 3. Separation of leaf pigments by paper chromatography and TLC.

			4. To equipped the students with skills related to laboratory as well as field-based studies 5. To develop skill in Microtomy- Processing, double staining, sectioning. 6. Cytochemical analysis- Nucleus, Golgi bodies, Mitochondria. 7. Remote sensing techniques for vegetation/ plant diversity assessment, 8. Comparison of stomatal index and pollen fertility, community coefficients, two ecological variables using correlation and regression analysis, 9. To determine percent soil organic carbon and organic matter in soils of cropland, grassland and forest. 10. To make the students aware about conservation and sustainable use of plants, visit to different types of ecosystems to understand the species composition and diversity.