Deccan Education Society's
Fergusson College (Autonomous), Pune

Program Specific Outcomes (PSOs) and Course Outcomes (COs) 2019-20
Department of Botany
Programme: M.Sc. Botany

PSO No.	Program Specific Outcomes (PSOs) Upon completion of this programme the student will be able to
PSO1	**Academic competence:** (i) Recall fundamental concepts, state principles and outline processes underlying in the field of Botany, its different subfields and its linkage with related disciplinary areas/subjects. (ii) Demonstrate an understanding of a wide range of physiological, biochemical, cellular, molecular, developmental processes in plant cell. (iii) Execute botanical excursion tour for correct taxonomic identification, collection, preservation of plant specimens.
PSO2	**Personal and Professional Competence:** (i) Carry out activities effectively as an individual or a member of a team or leader of a group to fulfil the responsibilities related to group activities. (ii) Analyse data and samples procured during experiments, projects, and field work. (iii) Formulate the ideas, draft scientific reports, authenticate conclusions, present effectively with effective communication skills. (iv) Implement self-learning, discipline, and take logical correct approach for solving problems.
PSO3	**Research Competence:** (i) Apply appropriate techniques to solve and analyse problems with specific reference to biological techniques and instrumentations. (ii) Integrate knowledge of fundamental aspects of Botany with applied aspects to design the experiment, interpret the data, and provide valid conclusions. (iii) Assess problems, identify, formulate research literature, and test probable solutions for challenges in various fields of Botany.
PSO4	**Entrepreneurial and Social competence:** (i) Employ the applied knowledge of Botany for self-employment with demonstration of true values of leadership, co-operation, and teamwork. (ii) Associate the impact of anthropogenic factors, importance of conservation, diversity, and our social role in sustainable development. (iii) Execute social competence including listening, speaking, observational, effective interactive skills and presenting skills to meet global competencies.

F.Y. M.Sc. Semester I		
Title of the Course and Course Code	**Fundamental Botany I (BOT4101)**	**Number of Credits : 04**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Outline the position of algae, fungi and bryophytes in latest classification system. List the morphological and anatomical characters of the group and give examples of each group.	1
CO2	Classify the groups and differentiate the taxonomic forms. Exemplify endosymbiotic and symbiotic associations of lower groups. Implement bioprospecting of fungi.	2
CO3	Interpret the life cycle strategies of various groups and illustrates them.	3
CO4	Categorize the lower plants and discriminate the groups from each other using salient features. Identify economic importance of the members of the lower groups.	4
CO5	Compare the orders with respect to range thallus organization, morphological and anatomical characters, pigmentation, reserved food reproductive structures and life cycle patterns and interrelate them.	5
CO6	Arrange various taxonomic groups as per their evolutionary features.	6
Title of the Course and Course Code	**Plant Physiology and Biochemistry (BOT4102)**	**Number of Credits : 04**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Identify the role of various enzymes and their importance in metabolic pathways.	1
CO2	Interprete the role of light in various developmental processes and effect of stress on plants. Represent the mechanism of conduction and transport of water and minerals	2
CO3	Illustrate the roles of PGR's and secondary metabolites in plant growth and defence.	3
CO4	Order the different steps in important metabolic pathways like nitrogen metabolism and water transport.	4
CO5	Compare the structure, biosynthetic & metabolic pathways of primary metabolites, secondary metabolites and plant growth regulators.	5
CO6	Integrate the metabolic processes like photosynthesis and respiration and propose their dependence.	6

Title of the Course and Course Code	**Genetics & Evolution (BOT4103)**	**Number of Credits : 04**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Recall basic concepts of Genetics, state laws of inheritance, identify examples of cytoplasmic and quantitative inheritance.	1
CO2	Predict gene interactions and translate the result into Neo-Mendelian ratios. Categorize mechanisms of evolution and allied concepts	2
CO3	Interpret the results of linkage and recombination and construct gene maps. Solve the problems on population genetics, gene interactions. Explain concepts of microbial genetics and illustrate the pathways regarding bacteriophages.	3
CO4	Distinguish between structural alterations of chromosomes and analyse them.	4
CO5	Compare the traditional evolution theories and integrate them using modern molecular evolution theories.	5
CO6	Arrange the events of the geological time scale to understand the phenomenon of evolution. Assemble the steps of origin of cell and metabolic processes to bring out the full picture of evolution.	6
Title of the Course and Course Code	**Botany Practical I (BOT4104)** **Any 10 to 15 practicals of 3Hrs**	**Number of Credits : 04**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Identify and name the specimens of algae, fungi and bryophytes with vegetative and reproductive parts. Clarify the position of lichens and outline its internal and external structure	1
CO2	Explain thallus range using fresh and preserved plant materials and discuss the industrial applications of the groups. Estimate citric acid by titration and interpolate the result	2
CO3	Examine the vegetative and reproductive structures and predict the position of specimens in classification.	3
CO4	Compare the groups to find the interrelations and discriminate them from each other. Identify and isolate soil fungi including mycorrhiza.	4
CO5	Justify the position of specific specimens in particular divisions and support the explanation. Validate antibacterial activity of bryophytes.	5
CO6	Generate inventory of the specimens by exploring a given area, write a report and collect the representative specimens of the key groups. Perform herbarium preparation and alginate production method, produce results of Spirulina culture and construct growth curve of algae	6

Title of the Course and Course Code	**Botany Practical II (BOT4105)**	**Number of Credits : 04**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Prepare solutions with appropriate concentrations. Identify different stages of mitosis and meiosis.	1
CO2	Estimate the enzyme activities and compare the effect of different factors on enzyme activities. Categorize different fossil types by studying the characters.	2
CO3	Use proper method for analysis of biochemical contents of different plant parts. Execute the method to carry out steps to demonstrate mitosis, meiosis and polyploidy.	3
CO4	Deconstruct the different concepts of genetics and solve problems based on them.	4
CO5	Assess the results of experiments, calculate the results of experiments and interpret it with the help of graphs. Discriminate the organisms on the basis of sexual dimorphism.	5
CO6	Plan and perform the experiments, compile the observations, draw conclusions and propose the result.	6
F.Y. M.Sc. Semester II		
Title of the Course and Course Code	**Fundamental Botany II (BOT4201)**	**Number of Credits : 04**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Outline the position of Pteridophytes and Gymnosperms in latest classification.	1
CO2	Classify the specimens and associate them with salient features, distribution, morphology, anatomy and reproductive structures of their respective orders.	2
CO3	Examine the morphological and anatomical characters of the specimens and illustrate the life cycle strategies. Interpret evolution of pteridophytes and Gymnosperms.	3
CO4	Discriminate primary and evolved characters of various orders and relate the orders with each other. Identify economic importance of Pteridophytes and Gymnosperms.	4
CO5	Compare fossil groups using their distinctive features. organize fossil groups of pteridophytes and gymnosperms in increasing order of complexity of characters.	5
CO6	Integrate the data of characters of different groups to design evolutionary development amongst the groups.	6

Title of the Course and Course Code	**Cell Biology (BOT4202)**	**Number of Credits : 04**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Outline the different cellular processes.	1
CO2	Compare different cell signalling pathways.	2
CO3	Execute the importance of different components of the secretory pathway in correct order.	3
CO4	Explain molecular and functional aspects of various processes in cell life cycle, apoptosis, cell senescence.	4
CO5	Support the crucial roles of plant specific cell organelles using ultrastructure and biogenetic pathway.	5
CO6	Specify the molecular functional aspects of cell organelles.	6
Title of the Course and Course Code	**Molecular Biology & Genetic Engineering (BOT4203)**	**Number of Credits : 04**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Describe structural details of nucleic acids and their properties.	1
CO2	Articulate the importance of different molecules for molecular processes.	2
CO3	Illustrate the molecular processes from synthesis of molecules to their breakdown.	3
CO4	Identify the different levels of gene regulation.	4
CO5	Determine use of different genetic engineering tools for better understanding molecular biology.	5
CO6	Compile basic molecular processes of prokaryotes and eukaryotes.	6
Title of the Course and Course Code	**Techniques in Biology (BOT4204)**	**Number of Credits : 04**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Name the chemicals used in a particular technique and their role	1
CO2	Discuss the principles of different techniques.	2
CO3	Generalize applications of different techniques.	3
CO4	Analyse different preparatory, separation and analytical techniques with the help of diagrams, construction and use of the parts.	4
CO5	Explain the role of various techniques.	5
CO6	Specify the proper technique for preparation and analysis of given sample.	6

Title of the Course and Course Code	**Botany Practical III (BOT4206) (Any 10 to 15P of 3Hr)**	**Number of Credits : 04**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Identify and name the specimens of pteridophytes and gymnosperms with the help of vegetative and reproductive parts.	1
CO2	Explain the plant body with the help of anatomy and vegetative and reproductive structures. Discuss the fossil characters and justify the positions of fossils in the relevant orders.	3
CO3	Classify the preserved and live specimens and organize them in different orders.	4
CO4	Compare the living specimens of different orders and relate them to each other.	5
CO5	Section the specimens and discriminate the wood anatomy characters of Gymnosperms.	5
CO6	Write a tour report, collect the specimens and organize the herbarium sheets in the order of evolution.	6
Title of the Course and Course Code	**Botany Practical IV (BOT4207) (Any 10 to 15P of 3Hr)**	**Number of Credits : 04**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Describe DNA and protein gel electrophoresis technique.	1
CO2	Interpret the structural properties of cell organelles with the help of electron micrographs.	2
CO3	Apply differential centrifugation technique to isolate various cell organelles and evaluate their properties with different methods.	3
CO4	Discriminate the cell types with the help of cytochemical techniques.	4
CO5	Assess the result of electrophoresis and genetic engineering techniques.	5
CO6	Plan and perform the experiments, compile the observations, draw conclusions and interpret the result.	6
S.Y. M.Sc. Semester III		
Title of the Course and Course Code	**Plant Systematics & Developmental Botany (BOT5301)**	**Number of Credits : 04**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Outline the position of different taxa using different classification systems. Define the basic concepts of Developmental Botany and Systematics.	1
CO2	Discuss the vegetative and reproductive development of higher	2

	plants and rules of nomenclature.	
CO3	Examine taxonomic characters, systematic position, phylogeny and economic importance and identify the plant specimens. Interpret the results of molecular development.	3
CO4	Create floral diagrams and floral formulae. Relate the role of different genes with plant development.	4
CO5	Compare the family characters, determine interrelation between different families and assess the role of hormones in the plant development.	5
CO6	Integrate morphological, anatomical, molecular and biochemical data to design a complete picture of plant development.	6
Title of the Course and Course Code	**Plant Biotechnology(BOT5302)**	**Number of Credits : 04**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	List the advanced techniques of plant biotechnology.	1
CO2	Summarize the different methods of biotechnology.	2
CO3	Apply the basics of molecular biology for better understanding of the techniques.	3
CO4	Compare different techniques of biotechnology on the basis of principles.	4
CO5	Evaluate the different techniques in the specified area of biotechnology.	5
CO6	Integrate the knowledge of techniques of biotechnology to find solutions to different problems of society.	6
Title of the Course and Course Code	**Plant Ecology(BOT5303)**	**Number of Credits : 04**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Outline principles of conservation and state importance of EIA. Recall basic concepts related to ecosystems, energy flow and productivity.	1
CO2	Compute parameters of demographic study and exemplify different life strategies. Discuss succession and categorize diversity types.	2
CO3	Classify biomes and apply this knowledge to study habitat ecology.	3
CO4	Analyze relationships between plants, plants and animals, plants and microbes in ecological settings.	4
CO5	Appraise pollution and justify its role in global warming. Assess biodiversity and management.	5
CO6	Propose adaptive responses of plants to variation in abiotic factors.	6

Title of the Course and Course Code	**Industrial Botany (BOT5305)**	**Number of Credits : 04**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	List and get acquainted with different industrial facets of Botany.	1
CO2	Summarize upcoming trends of industries in Botany. Discuss greenhouse technology.	2
CO3	Outline case studies of micropropagation of commercially important medicinal plants and examine the ways of increasing the yield of secondary metabolites.	3
CO4	Relate the floriculture aspects of Botany and integrate the knowledge to plan a startup and become an entrepreneur.	4
CO5	Evaluate the resource potential of algae, fungi as pharmaceuticals and nutraceuticals in national and international markets.	5
CO6	Specify different types of plant resources and their uses.	6
Title of the Course and Course Code	**Botany Practical V(BOT5307) (Any 10 to 15 practicals of 3 Hours)**	**Number of Credits : 04**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Recall and identify types of Inflorescence, Aestivation, adhesion and cohesion of Floral whorls.	1
CO2	Outline the transition of different stages in development of higher plants.	2
CO3	Employ artificial keys and Flora volumes for classification and identification of the plants. Demonstrate the dissections of embryo, endosperm and apical meristem.	3
CO4	Identify and trace the vegetative and reproductive pathways of development of plant organs.	4
CO5	Assess the morphology of reproductive parts of angiosperms to study families	5
CO6	Write the tour report, collect the plant specimens or create digital herbarium, rearrange herbarium as per the classification system and compile the taxonomic data of given area.	6

Title of the Course and Course Code	**Botany Practical VI (BOT5308)**	**Number of Credits : 04**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Describe the procedures of basic biotechnology experiments.	1
CO2	Predict the results of experiments.	2
CO3	Use proper plant tissue culture method to fulfil the objective.	3
CO4	Differentiate the plant tissue culture techniques.	4
CO5	Assess the results of experiments with correct observations and calculations.	5
CO6	Plan and perform the experiments, compile the observations, draw conclusion and interpret the result.	6
S.Y M.Sc. Semester IV		
Title of the Course and Course Code	**Biostatistics & Bioinformatics (BOT5401)**	**Number of Credits : 04**
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	List the applications of different biostatistics and bioinformatics tools. Recall basic concepts of biostatistics to solve problems	1
CO2	Articulate different bioinformatics tools for in-silico analysis. Discuss principles and guidelines of designing the experiment.	2
CO3	Compute given statistical problems with right hypotheses and calculations to propose solution.	3
CO4	Identify the sampling processes and their role by using different bioinformatics tools and techniques for data analysis.	4
CO5	Compare different statistical and bioinformatics tools and select proper methods. Explain correlation and regression concept.	5
CO6	Justify solution to any given problem with application of correct statistical and bioinformatics tools.	6

Title of the Course and Course Code	Project (BOT5403)	Number of Credits : 04
On completion of the course, the students will be able to:		**Bloom's Cognitive level**
CO1	Identify the topic of research, its objectives and state its importance.	1
CO2	Articulate the information to write a review of literature.	2
CO3	Prepare the reagents and implement the experiment procedure with precision and accuracy.	3
CO4	Arrange weekly progress reports of the work. Analyse the data statistically using tests of significance.	4
CO5	Standardize the protocols of the experiments, test the hypothesis and compare the work with relevant national and international research papers.	5
CO6	Design, perform the experiments, compile the observations, draw conclusions, interpret the results, write a thesis and integrate the work in form of presentation.	6