

ST JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS)

VISAKHAPATNAM

DEPARTMENT OF BOTANY

The Department of Botany, St. Joseph's College for Women (A) seeks to serve BSc Programme students interested in careers related to Botany. The department offers Botany in the core combinations CBZ at undergraduate level. In order to cater to the diverse interests of students and employers, a total of 10 theory and 10 practical courses are offered as part of Botany.

Programme Specific Outcomes of BSc Programme with Botany

PSOs : Students after graduating with Botany as one of the core subjects will:

PSO 1: Be able to demonstrate basic knowledge in the core areas of Botany (Plant Diversity I, II, III, Plant Physiology & Metabolism, Cell Biology, Genetics & Plant Breeding, Ecology & Phytogeography, Biological Instrumentation, Plant Tissue Culture & its Biotechnological Applications and Mushroom Cultivation Technology)

PSO 2: Be versatile in classical laboratory techniques, use instrumental methods for analysis and follow standardised procedures and regulations in handling and disposal of biological and chemical materials.

PSO 3: Be able to access and use the botanical literature and also able to work singly as well as in team.

PSO 4: Be able to integrate knowledge gained in Botany to General education courses.

Assessment Methodology

PSO 1: Be able to demonstrate basic knowledge in the core areas of Botany (Plant Diversity I, II, III, Plant Physiology & Metabolism, Cell Biology, Genetics & Plant Breeding, Ecology & Phytogeography, Biological Instrumentation, Plant Tissue Culture & its Biotechnological Applications and Mushroom Cultivation Technology)

Direct method of computing PSO 1 attainment is based on the student performance in all assessment methods namely online and offline - subjective and objective tests for all the courses offered (B 1101, B2101, B3101, B4101, B5101, B5102, B6100, BA1 6101, BA2 6102, BA36103). These exams test students' learning at knowledge, understanding and application levels in the respective courses. Indirect method of computing PSOs is done through students' course exit survey wherein a structured questionnaire is administered to the students and their response is solicited on a 5 point scale. Responses are consolidated and students' satisfaction level with reference to course transaction is computed.

Level of attainment measurement

Level of attainment of course outcomes includes both direct and indirect assessments. Direct assessment is done by testing the knowledge and/or skills of the student in that course by conducting standardised examinations. In indirect assessment we use the student feedback on course which is measured on 5 point scale. The sum of these two assessments is shown as the level of attainment of that course.

Assessment of all the theory courses is done in two parts, namely by formative assessment (40%) which is internal and summative assessment (60%) which is external. The evaluation of 100% of the assessment in each semester is distributed as follows:

Mid Semester Examination 1	15% (which is offline)
Mid Semester Examination 2	15% (which is online)
Accessory Assessment (etc.)	5% (Seminar presentation, Assignment, Study Report etc.)
Attendance	5% (above 75% attendance will be rewarded)
End semester examination	60% (which is descriptive)

Level of attainment of PSO1 (all theory courses offered by the department): 81.4%

PSO 2: Be versatile in classical laboratory techniques, use instrumental methods for analysis and follow standardised procedures and regulations in handling and disposal of biological and chemical materials.

PSO 2 attainment level is ascertained based on continuous assessment(throughout) and summative assessment (at the end of)in every semester.This direct assessment involves testing students' knowledge on standardised procedures, their skill in executing them and their compliance with regulations in handling laboratory materials and instruments in the conduct of all the laboratory courses(B1151, B2151, B3151, B4151, B5151, B5152, B6150, BA1 6151,BA2 6152, BA3 6153).

Assessment of all the practical courses: Assessment is done in two parts, i. e. by continuous assessment (40%) and summative assessment (60%). In Continuous assessment each practical course will be assessed for 40% by considering the 50% (best scored) of the experiments and the total will be calculated for 40%. This includes regular evaluation of section cutting, staining & mounting and recorded observations, performance based evaluation of Physiology experiments, Cytological preparations etc. Summative assessment (60%) of practical courses is through end semester practical exams designed to test student's knowledge as well as skills in the conduct of experiments and generation of reliable results. A written record of experimental work carried out throughout the semester, Herbarium, Field notebook/ Field Reports, Botanical & Ecological News Diaries are also assessed.

Level of attainment PSO2 (all practical courses offered by the department): 88.7%

PSO 3: Be able to access and use the botanical literature and also able to work singly as well as in team.

Attainment of PSO 3 is ascertained by assessing project study as part of continuous assessment in theory course B3151, B5102. This project work provides an opportunity for the student to apply knowledge and skills obtained in Botany theory and practical coursework. From a list of relevant application level topics provided by the dept., Students choose one topic for study, based on their own interest. Like minded students form teams of 4 to 5 members and plan & execute the task. The study is followed by collective report submission and individual oral presentation. Attainment of this learning outcome is ensured and assessed by the concerned faculty member at every stage through direct as well as indirect guidance and monitoring.

Assessment of Project work: Project work is assessed as part of continuous assessment in the theory course BA2 6102 by the concerned faculty member through direct and indirect guidance and monitoring with regard to Content in the report, Presentation, Viva voce etc.

Level of attainment of PSO3 (projects done by the students): 88.7%

PSO 4: Be able to integrate knowledge gained in Botany to General education courses.

Assessment of this learning outcome is largely done through the undergraduate general education course namely Environmental Science. This course provides an opportunity for the students to apply Botany knowledge to understand the structure and functions of Ecosystem, types of Ecosystems, Food Chains, Food Webs, Ecological Pyramids, Energy Flow in an Ecosystem, Natural Resources, Renewable Energy resources, Biodiversity conservation etc. Direct method of computing PSO 4 attainment is based on the student performance in all assessment instruments namely formative and summative tests in courses on environment as well as a report on the study on environment issues. Average percentage of level of attainments of this course is given below.

Assessment of Environmental Science: The evaluation of 100% of the assessment in environmental science is distributed as follows:

Continuous assessment involving field study, written test, presentation of project findings etc. 30%

Participation & Involvement in the course 10% (above 75% attendance will be rewarded)

End semester examination 60% (which is descriptive)

Level of attainment of PSO4 (Environmental science offered by the college): 88.5%

Course outcomes of all the courses offered by Botany department

Code	Title of the paper	Outcomes
B1101(3)	Plant Diversity - I	CO1: Develop skills in microscopic methods

(Th)		<p>CO2: Be able to identify microbial diversity</p> <p>CO3: Gain adequate knowledge on comparative account of various Algal, Fungal divisions.</p> <p>CO4: Study and import knowledge about the occurrence, distribution, structure and life history of lower plants such as algae, Fungi and Lichens.</p> <p>CO5: Study the different algae in the local ecosystems</p> <p>CO6: Learn the phylogeny and evolutionary concepts in lower group of organisms.</p> <p>CO7: Learn about classification characteristics, ultra - structure of prokaryotic and Eukaryotic microbes.</p> <p>CO8: Know about organisms and casual factor responsible for plant diseases and methods of studying plant diseases.</p> <p>CO9: Familiarize with some common plant diseases of India.</p> <p>CO10: Gain knowledge on host parasite interaction process.</p>
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Level of attainment of **B1101(3): 82.5%**

B1151(2) (Pr.)	Plant Diversity - I	<p>CO1: Learn about basics of biosafety and good lab practices like safe chemical handling, Hazardous wastes management, Safe and proper use of lab equipments.</p> <p>CO2: Learn about the principles of various basic and advanced microscopy.</p> <p>CO3: Advanced learning of Algae, Fungi specimens under Microscopy and hands on experience.</p> <p>CO4: Familiarize with the external and internal structure of lower group organism.</p> <p>CO5: Learn the microscopic technique and cellular drawing.</p> <p>CO6: Gain knowledge on plant diseases and various biological methods of analysis</p>
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Level of attainment of **B1151(2): 78.5%**

B2101(3) (Th)	Plant Diversity - II	<p>CO1: Gain adequate knowledge on comparative account of various Bryophytes, pteridophytes.</p> <p>CO2: Study and import knowledge about the occurrence, distribution, structure and life history of lower plants such as a, Bryophytes, Pteridophytes, gymnosperms and wood yielding plants.</p> <p>CO3: Learn the phylogeny and evolutionary concepts</p>
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		<p>in lower group of plants like bryophytes and pteridophytes.</p> <p>CO4 : Learn about classification characteristics, ultra structure of Bryophytes, Pteridophytes and Gymnosperms</p> <p>CO5: Know about Fossilisation and types of fossils, Bennettiales general account.</p> <p>CO6: Gain knowledge in evolutionary significance of Bryophytes and Pteridophytes</p> <p>CO7: Gain knowledge on geological time scale process.</p> <p>CO8: Get insight into various theories to understand organization of shoot and root apex.</p> <p>CO9: Acquire knowledge on plant histology, anatomy and anomalous secondary growth</p> <p>CO10: Familiarize with some common wood yielding Plants of India.</p>
Level of attainment of B2101(3): 77.25%		
B2151(2) Pr	Plant Diversity - II	<p>CO1: Learn about the principles of various basic and advanced microscopy.</p> <p>CO2: Advanced learning of Bryophytes, Pteridophytes and Anatomy slides and specimens under Microscope and hands on experience.</p> <p>CO3: Familiarize with the external and internal structure of Bryophytes ,Pteridophytesand Wood yielding plants.</p> <p>CO4: Learn the double staining technique.</p> <p>CO5: Learn to survey techniques to identify and evaluate the values of different timbers available locally.</p>
Level of attainment of B2151(2): 90%		
B3101(3) Th	Plant Diversity – III (Taxonomy & Embryology)	<p>CO1: get basic knowledge of principles of Taxonomy and the modern trends in plant Taxonomy</p> <p>CO2: acquire knowledge to identify and naming of plants as per ICBN rules.</p> <p>CO3:Able to classify Phanerogams according to the standard system of classification</p> <p>CO4: understand different types of systems of classification based on natural and evolutionary tendencies.</p> <p>CO5: realize the diversity of families of angiosperms.</p> <p>CO6: acquire basic and detailed knowledge for</p>

		<p>identifying the members of different families.</p> <p>CO7: have better understanding of various aspects of embryology of plants.</p> <p>CO8: understand and identify the different stages in reproduction leading to seed formation in angiosperms.</p> <p>CO9: enable to understand the process of pollination and fertilization leading the formation of fruit, seed and embryo.</p> <p>CO10: acquire an insight of diversity in Embryogeny of dicots and monocots and also about Polyembryony as an abnormal feature.</p>
Level of attainment of B3101(3): 75.13%		
B3151(2) Pr	Plant Diversity – III (Taxonomy & Embryology)	<p>CO1: Understand the Angiospermic plant diversity and identify the members of the representative families through taxonomic observations.</p> <p>CO2: Acquire the skill of Herbarium Technique</p> <p>CO3: Able to identify the different stages in reproduction leading to seed formation in angiosperms.</p> <p>CO4: Isolate the embryos and test the viability of pollen grains.</p>
Level of attainment of B3151(2): 86.2%		
B4101(3) Th	Plant Physiology & Metabolism	<p>CO1: Know about the requirement of mineral nutrition for plant growth.</p> <p>CO2: Understand the process of Photosynthesis, Respiration and Nitrogen metabolism.</p> <p>CO3: Learn about Sensory photobiology.</p> <p>CO4: Know about the Plant Growth hormones (Auxins, Gibberellins, Cytokinens, Ethylene) Understand the biosynthesis nitrogenous compounds.</p> <p>CO5: Stress physiology – Responses of plants to biotic and abiotic stresses.</p> <p>CO6: A pervasive understanding on the kingdoms of biomolecules, metabolites and pathways that are the prerequisites and consequences of physiological phenomenon for further manipulations.</p> <p>CO7: Acquaintance with mechanistic view on the plant environment interactions.</p> <p>CO8: Development of integrative approach for visions in biological problems.</p> <p>CO9: Assessing the role of phytohormones and nutrients in plants.</p> <p>CO10: Understanding the stress tolerance mechanism adapted by plants.</p>

Level of attainment of B4101(3): 76.55%		
B4151(2) Pr	Plant Physiology & Metabolism	<p>CO1: Upon completion of this course students will be able to understand the major functions and processes occurring in plants. These processes have both theoretical and practical value.</p> <p>CO2: Become acquainted with plant metabolism (photosynthesis, respiration, and mineral nutrition), water relations, gas exchange, and physiology of growth and development, and plant responses to environmental stress. able to describe and use the basic techniques for studying</p> <p>CO3: Be plant physiology. Students will be able to discuss some practical applications of plant physiological research.</p>
Level of attainment of B4151(2): 93.2%		
B5101(3) Th	Cell Biology, Genetics & Plant Breeding	<p>CO1: Gain basic knowledge to understand the ultrastructure of envelopes of plant cell, nucleus, chromosomes and cell division.</p> <p>CO2: acquire detailed knowledge about the different stages of cell division i.e mitosis, meiosis and karyotype</p> <p>CO3: acquire an insight of molecular biology.</p> <p>CO4: enable the students to understand and comprehend the basic principles of heredity.</p> <p>CO5: get basic and better knowledge about the mutations and polyploidy.</p> <p>CO6: acquire practical knowledge in cytochemical methods of fixation and nuclear staining.</p> <p>CO7: get good skills for cytological preparation for study of mitosis, meiosis and karyotype</p> <p>CO8: solve problems in genetics on the basis of Mendel's laws of inheritance.</p> <p>CO9: enable the students to know the different concepts, methods and recent trends of plant breeding.</p> <p>CO10: acquire practical knowledge to understand the principles and techniques of plant breeding.</p>
Level of attainment of B5101(3): 76.59%		
B5151(2) Pr	Cell Biology, Genetics & Plant Breeding	<p>CO1: Study the structure of plant cell through temporary mounts and cell organelles through Microphotographs</p> <p>CO2: Be able to identify different stages of Mitosis, Meiosis and karyotype by squash preparations of Onion roots and flower buds</p>

		<p>CO3: Able to do Calorimetric estimation of DNA by diphenylamine method</p> <p>CO4: Develop analytical skills to solve Numerical problems in Genetics and field skills to perform Emasculation and Hybridization methods in Plant Breeding</p>
Level of attainment of B5151(2): 84.7%		
B5102(3) Th	Ecology & Phytogeography	<p>CO1: understand basic concepts of Ecology and environment.</p> <p>CO2: understand the morphological, anatomical and physiological responses of plants to the environmental factors.</p> <p>CO3: Learn the role and impact of climatic factors on plant communities and general vegetation.</p> <p>CO4: Understand Population Characteristics</p> <p>CO5: Learn methods to Study Plant Communities</p> <p>CO6: understand the importance of community ecology and ecological succession.</p> <p>CO7: know the significance of Phytogeography and understand the phytogeographical regions of India and the world.</p> <p>CO8: Ability to identify causes of Biodiversity loss and learn ex situ and in situ conservation methods of Biodiversity.</p> <p>CO9: Be able to locate Biodiversity hotspots on a map</p> <p>CO10: Understand the role of seed banks and International Organizations in the conservation of biodiversity.</p>
Level of attainment of B5102(3): 82.97%		
B5152(2) Pr	Ecology & Phytogeography	<p>CO1: Learn handling of instruments used to measure microclimatic variables; soil thermometer, Maximum and Minimum thermometer, Anemometer, Psychrometer, Rain gauge, and Lux meter</p> <p>CO2: learn the quantitative aspects of a plant community by quadrat method</p> <p>CO3: Estimation of Primary Productivity of an ecosystem</p> <p>CO4: Acquire knowledge of the Phytogeography of India and the world</p> <p>CO5: locate the hotspots, phytogeographical regions and distribution of endemic plants in the map of India.</p>
Level of attainment of B5152(2): 84.4%		
B6100(3)	Plant Physiology &	CO1: Know about the requirement of mineral nutrition

Th	Metabolism	<p>for plant growth.</p> <p>CO2: Understand the process of Photosynthesis, Respiration and Nitrogen metabolism.</p> <p>CO3: Learn about Sensory photobiology.</p> <p>CO4: Know about the Plant Growth hormones (Auxins, Gibberellins. Cytokinins, Ethylene) Understand the biosynthesis nitrogenous compounds.</p> <p>CO5: Stress physiology – Responses of plants to biotic and abiotic stresses .</p> <p>CO6: A pervasive understanding on the kingdoms of biomolecules, metabolites and pathways that are the prerequisites and consequences of physiological phenomenon for further manipulations.</p> <p>CO7: Acquaintance with mechanistic view on the plant environment interactions.</p> <p>CO8: Development of integrative approach for solutions in biological problems.</p> <p>CO9: Assessing the role of phytohormones and nutrients in plants.</p> <p>CO10: Understanding the stress tolerance mechanism adapted by plants.</p>
Level of attainment of B6100(3): 84.85%		
B6150(2) Pr	Plant Physiology & Metabolism	<p>CO1: Be able to understand the major functions and processes occurring in plants. These processes have both theoretical and practical value.</p> <p>CO2: Become acquainted with plant metabolism (photosynthesis, respiration, and mineral nutrition), water relations, gas exchange, and physiology of growth and development, and plant responses to environmental stress. able to describe and use the basic techniques for studying</p> <p>CO3: Be plant physiology. Students will be able to discuss some practical applications of plant physiological research.</p>
Level of attainment of B6150(2): 94.2%		
BA1 6101(3) Th	Biological Instrumentation	<p>CO1: Understand the Principles of microscopy</p> <p>CO2: Learn the structure and functioning of various biological instruments</p> <p>CO3: Get enlighten their knowledge in various biochemical methods</p> <p>CO4: Learn to measure microscopic objects</p> <p>CO5: Able to separate Amino acids from purified samples and biological materials</p>

		<p>CO6: Learn the Principle & operation of Centrifuge, Spectrophotometer, Colorimeter, PCR and pH meter</p> <p>CO7: Learn preparation of standard acids and alkali and standardize them.</p> <p>CO8: Ability to prepare molar, molal, normal solutions and solutions of different dilutions</p> <p>CO9: Get training in writing scientific articles, detect plagiarism and understand copyright.</p> <p>CO10: Interpreting scientific results, and ability to present them in a scientific way through graphs, photographs, poster presentations and power point presentations.</p>
Level of attainment of BA1 6101(3): 85.7%		
BA1 6151(2) Pr	Biological Instrumentation	<p>CO1: Learn techniques of Microscopy</p> <p>CO2: Able to operate different biological instruments such as colorimeter, spectrophotometer, P^H Meter, Centrifuge, Chromatography tools, Gel electrophoresis PCR etc.</p> <p>CO3: Measure the pH of Milk, Pepsi, Lemon juice etc. using pH paper and pH meter</p> <p>CO4: Learn Chromosome banding, FISH, chromosome painting methods</p>
Level of attainment of BA1 6151(2): 93.2%		
BA2 6102(3) Th	Paper VII-(C): Plant tissue culture and its biotechnological applications	<p>CO1: Gain knowledge in basic principles of plant tissue callus culture, meristem culture, organ culture, Totipotency of cells, differentiation and dedifferentiation.</p> <p>CO2: Ability to prepare artificial nutrient media applying various sterilization procedures</p> <p>CO3: able to prepare different culture media for micro-propagation/clonal propagation of ornamental and horticulturally important plants</p> <p>CO4: Able to develop In vitro initiation of callus on artificial medium</p> <p>CO5: identify vegetative characteristics of Bt.cotton and the features of its pest resistance</p> <p>CO6: learn the method of Production of secondary metabolites</p> <p>CO7: understand biological role and application of Restriction Endonucleases</p> <p>CO8: learn Methods of gene transfer-</p> <p>CO9: understand Applications of Plant Genetic Engineering in crop improvement,</p>

		CO10: learn the techniques of Isolation of plasmid DNA, Restriction digestion and gel electrophoresis of plasmid DNA
Level of attainment of BA2 6102(3): 83.45%		
BA2 6152(2) Pr	Paper VII-(C): Plant tissue culture and its biotechnological applications	CO1: Acquire skills in various methods of tissue culture CO2: Study of methods of gene transfer by electroporation, microinjection, and micro projectile etc. CO3: Gain skills to produce GM Crops through Genetic Engineering methods CO4: Able to Isolate Plasmid DNA and subject it to restriction digestion.
Level of attainment of BA2 6152(2): 93.5%		
BA2 6103(3) Th	Mushroom Cultivation Technology	CO1: Understand importance of mushroom cultivation CO2: Develop knowledge in various methods in mushroom cultivation CO3: Identify edible mushrooms and realize their nutritional value CO4: Able to prepare different culture media to grow mushroom spawn CO5: Develop skills to prepare mother spawn in saline bottle and polypropylene bag and their multiplication. CO6: Able to prepare Mushroom bed using paddy straw, sugarcane trash, maize straw, banana leaves CO7: Learn Short-term storage by Refrigeration and Long term Storage by canning, pickles & papads. CO8: Acquire skills to preserve mushrooms in dry storage and in salt solutions CO9: Gain skills in the preparation of different types of foods from mushrooms such as soup, cutlet omlette, samosa, pickles and curry. CO10: Gain knowledge in marketing and export value of mushrooms in India and abroad
Level of attainment of BA2 6103(3): 89.35%		
BA2 6153(2) Pr	Mushroom Cultivation Technology	CO1: Able to handle Microscopic and anatomical observations of different mushroom species CO2: Develop skills to prepare PDA and Oatmeal agar medium CO3: Gain skills to prepare Compost and Mushroom beds CO4: Acquire skills in Inoculation and spawning of compost, Incubation and harvesting of mushrooms.

Level of attainment of **BA2 6153(2): 89.5%**