

## COURSE OUTCOME

### DEPARTMENT OF SCIENCE, SERAMPORE GIRLS COLLEGE

By Course outcomes(CO) we mean the brief statement describing significance and learning that students will achieve and can reliably demonstrate at the end of a course i.e. after completing a paper (whether it is CC/GE). These relate to the skills, knowledge, and behavior that students acquire in their curriculum through the course. The knowledge they will gain should be related to skill development, i.e., writing skill, skill of analytical thinking, critical thinking, problem solving. And then how these skills may be used to get different kind of jobs.

Serampore Girls' College is affiliated to University of Calcutta. It follows the curriculum and syllabus framed by the University of Calcutta. Each departmental head will frame appropriate course outcomes of their Honours and General Programme in consultation with members of the department in this lockdown time and submit it to

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The CO statements are defined by considering the syllabus covered in each module of a course. By using the action verbs of learning levels, COs will be designed. Generally, four to five course outcome may be specified for each course base on its weights. It is a very important parameter for NAAC.

The final version of Course Outcomes will be communicated to students, guardians and alumni for their awareness in four ways. It will be uploaded in departmental page of college website. COs are available online in each departmental page in college website ([www.seramporegirlscollege.org](http://www.seramporegirlscollege.org)), which will help the students to compare different COs before admission.. Side by side COs will be also available in departmental notice board. Dept. teachers will also demonstrate students during the progression of course.

**Table 1: Methods of communication of Course outcome to students, parents and alumni**

How Published?	Where Published?	How Disseminated
Print in paper	Department Notice boards	Self-reading by students, parents and alumni
Online	Under Department tab of college Website	Available for Self-reading in public domain

**Table 2: Course Outcomes (COs), Program: B. Sc Botany (General), Program code: BOTG**

Sl. No	Course	Semester	Course Code	Credit	Marks	Course outcome	Skill Development related to employability and Entrepreneurship development
1	Plant diversity-I (theory)	1	BOT-G-CC-1-1-TH	4	70	<p>They can understand the diversity of plant kingdom and their interactions and its importance in our daily life.</p> <ul style="list-style-type: none"> <li>• Knowledge on life cycles of lower plant groups like algae, fungi, bryophytes.</li> <li>• Economical and industrial importance of algae, fungi and lichen.</li> <li>• Anatomical feature of root, shoot and leaf of higher plants.</li> <li>• Differences between monocot and dicot plant structures.</li> <li>• Tissue organization of higher plants.</li> </ul>	After completion of this course, students will be able to apply their knowledge of phycology, mycology, phytopathology, bryophyte, plant anatomy in further study and/or in the professional world of Agriculture, Plant Disease control.
2	Plant diversity-I (Practical)	1	BOT-G-CC-1-1-P	2	30	<p>In plant diversity practical, students can practice and learn dissection/tease of algae, fungi and bryophytes and angiosperm root, shoot.</p>	Very basic instrument, like light microscope handling capabilities are developed. Students can practices use of different dyes for staining of different plant cell/ tissues and also practices alcohol gradation to make permanent slide. They can easily differentiate a monocot root/stem from dicot one under a microscopic field. That knowledge is essential for further experiments and workout.

3	<b>Plant diversity-II (theory)</b>	2	BOT-G-CC-2-2-TH	4	70	<p>Completion of this course will enable the students to know:</p> <ul style="list-style-type: none"> <li>• The vascular cryptogams.</li> <li>• Gymnosperms</li> <li>• Plant taxonomy and different classification systems along with diagnostic characters of angiosperm families.</li> <li>• Palaeobotany, fossils and palynology.</li> </ul>	<p>Students can apply their knowledge gathered from this semester in various fields like forensic palynology, geology, and mining industries. Knowledge on plant taxonomy and the gradual advancement of their characters to adopt in different environmental condition as well as in different era is useful to understand the evolution of plant kingdom.</p>
4	<b>Plant diversity-II (practical)</b>	2	BOT-G-CC-2-2-P	2	30	<p>On completion of this course, the students will be able to demonstrate a practical understanding of hierarchy of plants and able to represent each plant family by their floral formula and floral diagram. They can distinguish each angiosperm family by their diagnostic characters.</p> <p>Students can learnt to produce the herbarium sheet and field record on the basis of their field excursion.</p>	<p>The basic knowledge from these practical course may helpful in various fields like forensic palynology, geology, and mining industries. Knowledge on plant classification system will help them in botanical survey.</p>
5	<b>Cell biology, Genetics and Microbiology (Theory)</b>	3	BOT-G-CC-3-3-TH	4	70	<p>Having successfully completed this course student will learn the basics of</p> <ul style="list-style-type: none"> <li>• Cell division</li> <li>• Central dogma i.e, replication of DNA, transcription of RNA on DNA strand and synthesis of protein.</li> <li>• Chromosomal aberration, mutation and gene expression.</li> <li>• Genetic code and their universal characteristics.</li> </ul>	<p>Students can understand the use of microbes in preparation of medicines, antibiotics, different enzyme. Role of bacteria food technology and pasteurization.</p> <p>In genetics they can learn one trait is inherited into next generation and how a gene is responsible for a characters. They will learn the basic protein synthesis in an organism.</p>
6	<b>Cell biology, Genetics and Microbiology (practical)</b>	3	BOT-G-CC-3-3-P	2	30	<p>On completion of this course students will have hands on experience of chromosome staining and determination of mitotic index.</p> <p>Gram staining to identify Gram negative and Gram positive bacteria from curd or any other natural sources.</p>	<p>Identification of different stages of mitotic cell division and preparation of different chromosome staining dyes are helpful in getting knowledges for genome study further competitive examination.</p>

7	<b>Plant Breeding and Biometry</b>	3	BOT-G-SEC-A-3-1	2	30	<ul style="list-style-type: none"> <li>• Plant Hybridisation Technique.</li> <li>• Selection of hybrid.</li> <li>• Crop improvement through Biotechnology.</li> <li>• Basic of Biostat.</li> </ul>	<ul style="list-style-type: none"> <li>• Plant Hybridization Programme in different farms.</li> <li>• Introductory ideas of biostatistics will help them in on field data collection in different crop fields, analysis of data and calculating significance.</li> </ul>
8	<b>Plant physiology and metabolism (Theory)</b>	4	BOT-G-CC-4-4-TH	4	70	<p>On completion of this course students will be able to understand:</p> <ul style="list-style-type: none"> <li>• Structure of nucleic acid and protein.</li> <li>• Different physiological processes like photosynthesis, respiration, transpiration, transport of water and solutes via xylem phloem tissue, nitrogen metabolism etc.</li> <li>• Phyto-hormones and their physiological function.</li> <li>• Photoperiodism and phytochromes.</li> <li>• Senescence of different plant parts.</li> </ul>	<p>They can understand the theory behind the metabolic processes like photosynthesis, respiration and flowering of a plant. Role of proteins in structure and function of a plant will be clear. How some plants are able to fix nitrogens or how gaseous exchanges take place will be well understood.</p>
9	<b>Plant physiology and metabolism (Practical)</b>	4	BOT-G-CC-4-4-P	2	30	<p>Physiological processes like photosynthesis, respiration, transpiration, imbibition are life defining processes for plants. Practicals on these processes will help students to learn the factors affecting them both positively and negatively.</p>	<ul style="list-style-type: none"> <li>• Handling instruments like respiroscope, photosynthetic apparatus.</li> <li>• Calculation of molar solution of different chemicals.</li> <li>• Graphical calculation of leaf area.</li> <li>• Determination of isotonic, hypotonic and hypertonic solutions.</li> </ul>
10	<b>Plant Biotechnology</b>	4	BOT-G-SEC-B-4-3	2		<ul style="list-style-type: none"> <li>• Plant tissue culture techniques.</li> <li>• Growing plants in aseptic environments.</li> <li>• Callusing, Rooting, Shooting and Hardening.</li> <li>• Gene cloning.</li> <li>• Bacterial transformation.</li> </ul>	<p>There are several biotech companies where gene cloning, primer designing, oligonucleotide sequencing are done. As well as different varieties of flowering plants, transgenic crops are also developed. Having an idea of biotechnology and plant tissue culture will provide students a chance of employment in those companies.</p>

11	<b>Biofertilizer</b>	5	BOT-G-SEC-A-5-2	2	<ul style="list-style-type: none"> <li>• Preparation biofertilizers using micro-organisms like <i>Rhizobium</i>, <i>Azotobacter</i>, <i>Anabaena</i> and pteridophyte like <i>Azolla</i>.</li> <li>• Role of mycorrhiza in growth of crop plants.</li> <li>• Green manuring, compost preparation and their field application.</li> <li>• Recycling of biodegradable wastes.</li> </ul>	<p>In present scenario of increasing soil and water pollution due to excessive use of chemical fertilizers, Bio-fertilizer is the only ray of hope. It will reduce the rate of pollution and is an eco-friendly process. Students having an idea of this course can take up Bio-fertilizer Industry as his/her career.</p> <p>Recycling of biodegradable wastes is another burning topic in present and upcoming days to save our nature.</p>
12	<b>Phytochemistry &amp; medicinal botany (theory)</b>	5	BOT-G-DSE-A-5-1-TH	4	<p>Students can understand-</p> <ul style="list-style-type: none"> <li>• Ayurveda.</li> <li>• Unani</li> <li>• Siddha.</li> <li>• Poly Herbal Formulation.</li> <li>• Characteristics of plant metabolites.</li> <li>• Evaluation of drugs.</li> <li>• Uses of steroid, tannin, resin, alkaloids, phenols.</li> <li>• Application of natural products in jaundice, cardiac and diabetes.</li> </ul>	<p>Students with knowledge in herbal technology, ethnobotany, and pharmacognosy will get a chance in different Ayurveda companies.</p>
13	<b>Phytochemistry &amp; medicinal botany (practical)</b>	5	BOT-G-DSE-A-5-1-P		<ul style="list-style-type: none"> <li>• Instrumentation: autoclave, laminar air flow, incubator, pH meter, colorimeter, distillation plant, water bath, analytical balance, clinical centrifuge.</li> <li>• Buffer and solution preparation.</li> <li>• Qualitative tests for sugar, protein, lipid</li> <li>• Test for tannin and alkaloid.</li> </ul>	<p>Students will be able to demonstrate proficiency in instrumentation, different experimental techniques and methods of analysis appropriate for their area of specialization in biology.</p>
14	<b>Natural resource managements (theory)</b>	5	BOT-G-DSE-A-5-2-TH	4	<p>On completion of this course students will be able to understand:</p> <ul style="list-style-type: none"> <li>• Nature, natural resources and their sustainable utilization.</li> <li>• Biodiversity, its significance, threats and management strategies.</li> <li>• Forestry, major and minor forest products.</li> <li>• Different kinds of renewable and non-renewable energy.</li> </ul>	<p>Students must aware about the fact that Environmental science is integral part of biological science. In present scenario when natural resources are declining, sustainable management of natural resources is key to our survival.</p>

15	Natural resource managements (practical)	5	BOT-G-DSE-A-5-2-P	2	<p>On completion of this course students will have hands on experience of:</p> <ul style="list-style-type: none"> <li>• Frequency distribution of plants.</li> <li>• Determination of minimal quadrat.</li> <li>• Calculation of DBH.</li> <li>• Calculation of abundance of plant species.</li> <li>• Measurement of dissolved oxygen.</li> <li>• Soil test for different minerals.</li> </ul>	<p>Hands on practical of quadrat method, frequency distribution, abundance, DBH are helpful in on field vegetation studies. Calculation of dissolved oxygen will give an idea of water pollution. Soil fertility of any region can be measured by rapid spot test of soil mineral.</p> <p>All these qualities will make students eligible for employment in forestry and any branch of environmental science.</p>
16	Mushroom culture technology	6	BOT-G-SEC-B-6-4	2	<p>After completion of this course students will get a brief idea about mushroom cultivation, its nutritional as well as medicinal importance. They will have a knowledge about research and workout with mushroom.</p>	<p>Mushroom cultivation is now becoming a household culture. Nutritionally rich edible mushrooms are valuable in markets. Therefore mushroom cultivation itself can provide self-employment opportunity.</p>
17	Economic botany (theory)	6	BOT-G-DSE-B-6-3-TH	4	<p>Having successfully completed this course student will learn origin and uses of economically important cultivated crop plants.</p>	<p>Theoretical knowledge on cultivation, morphology, processing and uses of economically important crops will be helpful in development of agro-based industries and proper utilization of different parts of those crops.</p>
18	Economic botany (practical)	6	BOT-G-DSE-B-6-3-P	2	<p>On completion of this course students will have hands on experience of cultivation of economically important plant, data collection, field report preparation and analysis of data accordingly.</p>	<p>As our country is based on agro-economy this course of study is very much essential and important for students. This course will prepare student eligible for different agro based industries and field data collection.</p>
19	Horticulture practices and postharvest technology (theory)	6	BOT-G-DSE-B-6-4-TH	4	<p>Students will gather knowledge of</p> <ul style="list-style-type: none"> <li>• Identification of ornamental plants.</li> <li>• Identification of fruits and vegetables plants and their processing and benefits.</li> <li>• How to cut a flower and handling of fruits and vegetables after harvesting</li> <li>• Identification of common diseases and pests of fruits and vegetables crops and their control.</li> </ul>	<p>Our country is hugely dependent on natural resources like flowering plants, fruits and vegetables. Knowledge on Horticultural techniques, post harvesting technology, Disease management of fruits and vegetables will enhance the management skills of these plants.</p>

20	<b>Horticulture practices and postharvest technology (practical)</b>	6	BOT-G-DSE-B-6-4-P	2		Field studies to orchards, nurseries, horticultural fields will provide practical knowledge of cultivation practices, grafting techniques and maintenance of those plants.	Nurseries, orchards, horticulture are now-a-days an efficient self-employment practice. Practical knowledge will influence and help students in business strategies.
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## Programme Outcomes of B. Sc Botany:

- ✚ **Social responsibilities:** To a botanist no plant is a weed. Conservation of biodiversity in the era of urbanization and industrialization should be the priority. The courses students will go through during this 3years under graduate program will teach students the value of natural wealth and their conservation. Awareness of society about planting trees, their medicinal and industrial values, role of ethno botany, herbal medicines will be top priority.
- ✚ **Knowledge development:** They will understand the range of plant diversity in terms of morphology, anatomy, phylogeny, classification and their interrelationship. Students will gather knowledge of biochemistry, physiology, cell biology, genetics, plant breeding and micro-propagation, tissue culture and horticulture.
- ✚ **Intellectual skill development:** Students are able to think logically and organize task into a structured form. Assimilate knowledge and ideas based on wide reading and in digital platforms.
- ✚ **Practical skills:** Students learn to carry out practical work, in the field and in the laboratory. An array of techniques & practical skills like identification of algae, fungi, bryophytes, pteridophytes, gymnosperms, plant morphology and anatomy, angiosperm taxonomy, vegetation analysis techniques, physiochemical analyses of plant materials, physiology-biochemistry, cytology and genetics will be learnt.
- ✚ **Environment and sustainable development:** Understand the impact of the plant diversity in societal and environmental contexts, and demonstrate the knowledge and requirement of sustainable development.
- ✚ **Project management:** Different projects, field works will prepare students how to plan and execute a project either individually or as a team. These experiences will be invaluable in long run.
- ✚ **Use of instruments:** Create, select, and apply appropriate techniques, resources, and modern instruments and equipments for Biochemical estimation, Molecular Biology, Plant Tissue culture experiments, cellular and physiological activities of plants with an understanding of the application and limitations.
- ✚ **Ability to use digital platform:** Use of different software enrich their communication skill and make them friendly to digital platform like Microsoft, Adobe acrobat, Adobe Photoshop, Google etc.
- ✚ **Ethics:** Being students of natural science ethics is the key to protect our mother nature. The principles of conservation need to be followed while collecting specimens or doing a field work. Manipulation of laboratory data and protocols are strictly prohibited and thus building ethics among students is a must.



## **Programme Specific Outcomes (PSO) B. Sc Botany**

- ✚ Students will acquire a knowledge of classical and applied botany.
- ✚ Students will develop practical and analytical skills of botany and statistics.
- ✚ Students will learn to plan and execute different projects and field studies. These will make them efficient in agricultural field and management.
- ✚ Students will be prepared to acquire a range of general skills, to solve analytical problems, to evaluate information, to use computers productively, to communicate with society effectively and learn independently.
- ✚ Job opportunities in agro based industries, self-employment in nurseries, orchards of ornamental plants, bio fertilizer preparation, bio technological companies, horticulture etc. will be opened to our students.