

**AC/04.08.2018/RS1**



College of Arts,  
Science &  
Commerce (Autonomous)

**RISE WITH EDUCATION**

NAAC REACCREDITED - 'A' GRADE

**SIES College of Arts, Science and Commerce  
(Autonomous) Sion (West) Mumbai: 400022**

**Affiliated to Mumbai University**

**Syllabus under Autonomy - June 2018**

**Program: S. Y. B. Sc.**

**Course: Botany**

**Choice Based Credit System (CBCS)**

**with effect from the academic year 2018-2019**

### **PROGRAMME SPECIFIC OUTCOMES (PSOs)**

After completing the graduation (B.Sc.) course in Botany, the learners would be able to:

- **PSO1:** Identify the different groups of plants and gain the knowledge about plant biodiversity and its conservation.
- **PSO2:** Learn different techniques, protocols, methodologies during study and apply them in future.
- **PSO3:** Utilize the botanical knowledge for problem solving and for taking real time decisions while working with plants.
- **PSO4:** Learn good laboratory practices and acquire research skills required for industrial support services.
- **PSO5:** Inculcate scientific temperament, good reasoning power, technological and analytical skills while designing the experiments.
- **PSO6:** Develop interest in pursuing higher studies in plant sciences and allied fields to develop better future.
- **PSO7:** Understand the scope, current trends, job prospects and career avenues in Botany.
- **PSO8:** Share social and environmental consciousness with the fellow citizens and motivate them towards taking fundamental steps towards environmental conservation.

### **PREAMBLE**

The existing university syllabus of S. Y. B. Sc. Botany due for revision as per the CBCS pattern will be implemented from the academic year 2018 -2019 under autonomy.

Keeping in tune with the revised autonomous syllabus of F. Y. B. Sc. the committee has taken utmost care to maintain the continuity in the flow of information of higher level at S. Y. B. Sc. Hence some of the modules of the existing university S. Y. B. Sc. syllabus have been upgraded with the new modules in order to make the learners aware about the recent developments in various branches of Botany (like Thallophyta, Spermatophyta, Genetics, Molecular Biology, Plant physiology, Biochemistry, Environmental Botany, Medicinal Botany, etc.). Various interdisciplinary courses such as Biostatistics, Bioinformatics, Biotechnology & Bioinstrumentation are also introduced to make the students at par with the updated tools and techniques.

Three papers of theory and practicals (Semester - III & Semester - IV together) are compulsory for the students.

Each theory period shall be of 48 minutes duration. Theory component shall have 135 instructional periods per semester. Each practical will be of 3 periods of 48 minutes each.

**MODALITY OF ASSESSMENT:****Theory Examination Pattern**

A) Internal Assessment – 40M

(20M Class Test + 15M Assignment/Case study/ ppt. + 05 Class participation)

B) External examination – 60M (Semester End Theory Assessment)

- i. Duration - These examinations shall be of two hours duration.
- ii. heory question paper pattern: attached herewith.

**Practical Examination Pattern:**

A. Internal Examination: There will not be any internal examination/ evaluation for practicals.

B. External (Semester end practical examination)

The students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination. In case of loss of Journal and/ or Report, a Lost Certificate should be obtained from Head of the Department/ Co-ordinator of the department; failing which the student will not be allowed to appear for the practical examination.

**Overall Examination and Marks Distribution Pattern for Semester III**

Course	PAPER I			PAPER II			PAPER III			Grand Total
	Internal	External	Total	Internal	External	Total	Internal	External	Total	
<b>Theory</b>	40	60	100	40	60	100	40	60	100	<b>300</b>
<b>Practicals</b>	-	50	50	-	50	50	-	50	50	<b>150</b>

**Overall Examination and Marks Distribution Pattern for Semester IV**

Course	PAPER I			PAPER II			PAPER III			Grand Total
	Internal	External	Total	Internal	External	Total	Internal	External	Total	
<b>Theory</b>	40	60	100	40	60	100	40	60	100	<b>300</b>
<b>Practicals</b>	-	50	50	-	50	50	-	50	50	<b>150</b>

## S. Y. B. Sc. Botany Syllabus (Choice Based Credit System - CBCS)

To be implemented from the Academic year 2018-2019

**SEMESTER III**

Course Code	UNIT	TOPICS	Credits	L /Weeks
SIUSBOT31	<b>PLANT DIVERSITY II</b>			
	I	Thallophyta (Algae) and Bryophyta	2	1
	II	Angiosperms		1
	III	Modern Techniques to Study Plant Diversity		1
SIUSBOT32	<b>FORM AND FUNCTION II</b>			
	I	Cell Biology	2	1
	II	Cytogenetics		1
	III	Molecular Biology		1
SIUSBOT33	<b>CURRENT TRENDS IN PLANT SCIENCES I</b>			
	I	Pharmacognosy and Phytochemistry	2	1
	II	Forestry and Economic Botany		1
	III	Industry Based on Plant Products		1
SIUSBOTP3.1	Practicals based on courses Plant Diversity II, Forms and Functions II, and Current Trends in Plant Sciences I in theory		3	9

**SEMESTER IV**

Course Code	UNIT	TOPICS	Credits	L /Weeks
SIUSBOT41	<b>PLANT DIVERSITY II</b>			
	I	Thallophyta: Fungi, Plant Pathology	2	1
	II	Pteridophyta and Palaeobotany		1
	III	Gymnosperms		1
SIUSBOT42	<b>FORM AND FUNCTION II</b>			
	I	Anatomy	2	1
	II	Plant Physiology and Plant Biochemistry		1
	III	Ecology and Environmental Botany		1
SIUSBOT43	<b>CURRENT TRENDS IN PLANT SCIENCES I</b>			
	I	Horticulture and Gardening: Introduction to Horticulture	2	1
	II	Biotechnology		1
	III	Biostatistics and Bioinformatics		1
SIUSBOTP4.1	Practicals based on courses Plant Diversity II, Forms and Functions II, and Current Trends in Plant Sciences I in theory		3	9

## SEMESTER III THEORY

Course Code	Title	Credits & Lectures
SIUSBOT31	PLANT DIVERSITY II	2 Credits & 45 Lectures
<p><b>COURSE OUTCOMES:</b></p> <p>After completion of the course, learners would be able to:</p> <ul style="list-style-type: none"> <li>• <b>CO1:</b> Study different cryptogams w. r. t. their general characters, structure, life cycle &amp; economic importance.</li> <li>• <b>CO2:</b> Understand the floral morphology, general characteristics and importance of angiosperms.</li> <li>• <b>CO3:</b> Learn the Techniques used to study Plant Diversity.</li> </ul>		
<p><b>CIA</b> – Class Test (20M) + Assignment / Case Study / Presentation (15M) + Class Participation (5M)</p>		
<p><b><u>Unit I: Thallophyta (Algae) &amp; Bryophyta</u></b></p> <ul style="list-style-type: none"> <li>• Structure, life cycle and systematic position of <i>Volvox</i>.</li> <li>• General characters of Division Phaeophyta: distribution, cell structure, range of thallus, economic importance.</li> <li>• Structure, life cycle and systematic position of <i>Sargassum</i>.</li> <li>• General account of class Anthocerotae - structure, life cycle and systematic position of <i>Anthoceros</i>.</li> </ul>		<p><b>(15 Lectures)</b></p>
<p><b><u>Unit II: Angiosperms</u></b></p> <p>Morphology of Flowering Plants</p> <ul style="list-style-type: none"> <li>• <b>Flower Morphology:</b> Parts of a flower, flower symmetry; <ul style="list-style-type: none"> <li>▪ Thalamus, insertion of floral leaves on the thalamus</li> <li>▪ The accessory whorls: Calyx types and modifications, Corolla – forms; Aestivation, The Perianth;</li> <li>▪ The Essential whorls: Androecium parts of the androecium, Number and insertion of stamens, Union of stamens; Types of Corona. Gynoecium: the carpel, style and stigma; Union of Carpel; ovary- placentation, types of ovules.</li> </ul> </li> <li>• With the help of <b>Bentham and Hooker's system of Classification for flowering plants</b> study the vegetative, floral characters and economic importance of the</li> </ul>		<p><b>(15 Lectures)</b></p>

<p>following families:</p> <ul style="list-style-type: none"><li>▪ Magnoliaceae</li><li>▪ Leguminosae (Papilionaceae, Caesalpinae, Mimosae)</li><li>▪ Asteraceae</li><li>▪ Amaranthaceae</li><li>▪ Palmae</li></ul>	
<p><b><u>Unit III: Modern Techniques to Study Plant Diversity</u></b></p> <ul style="list-style-type: none"><li>• Preservation methods: Dry (Herbarium) and Wet (Fixation)</li><li>• Microscopy: Principle and working of Light and Electron microscope.</li><li>• Chromatography: Principles and techniques in paper and thin layer chromatography.</li><li>• Principles and techniques of Horizontal and Vertical gel electrophoresis.</li></ul>	<b>(15 Lectures)</b>

Course Code	Title	Credits & Lectures
SIUSBOT32	FORM AND FUNCTION II	2 Credits & 45 Lectures
<p><b>COURSE OUTCOMES:</b></p> <p>After completion of the course, learners would be able to:</p> <ul style="list-style-type: none"> <li>• <b>CO1:</b> Understand the Structure and functions of various cell organelles and different aspects of cell cycle and cell division.</li> <li>• <b>CO2:</b> Learn various mechanisms of sex determination and related mechanisms.</li> <li>• <b>CO3:</b> Study the modes of replication and protein synthesis.</li> </ul>		
<p><b>CIA</b> – Class Test (20M) + Assignment/ Case Study/ Presentation (15M) + Class Participation (5M)</p>		
<p><b><u>Unit I: Cell Biology</u></b></p> <ul style="list-style-type: none"> <li>• <b>Ultrastructure and functions of the following cell organelles:</b> Mitochondrion (membranes, cristae, F<sub>1</sub> particles and matrix), Peroxisomes and Glyoxysomes, Ribosomes (prokaryotic, eukaryotic and subunits).</li> <li>• <b>Cell division and its significance:</b> Cell cycle, structure of interphase nucleus (introduction to nuclear envelop, chromatin network, nucleolus and nucleoplasm); Meiosis, differences between Mitosis and Meiosis</li> <li>• <b>Nucleic Acids:</b> Types, structure and functions of DNA and RNA</li> </ul>		<p>(15 Lectures)</p>
<p><b><u>Unit II: Cytogenetics</u></b></p> <ul style="list-style-type: none"> <li>• <b>Variation in Chromosome Structure (Chromosomal Aberrations):</b> <ul style="list-style-type: none"> <li>▪ Definition, origin, cytological and genetic effects of the following: Deletions, Duplications, Inversions and Translocations.</li> </ul> </li> <li>• <b>Sex Determination, Sex Linked and Sex Influenced - Sex Limited Traits:</b> <ul style="list-style-type: none"> <li>▪ <b>Sex determination:</b> Chromosomal Methods: heterogametic males and heterogametic females. Sex determination in monoecious and dioecious plants. Genic Balance theory of sex determination in <i>Drosophila</i>, Lyon's Hypothesis of X chromosome inactivation.</li> </ul> </li> <li>• <b>Sex Linked:</b> Eye colour in <i>Drosophila</i>, Haemophilia, colour blindness</li> <li>• <b>Sex Influenced - Sex Limited Traits:</b> Baldness in man</li> <li>• <b>Extranuclear Genetics:</b> Organelle heredity: Chloroplast determined heredity -</li> </ul>		<p>(15 Lectures)</p>



Plastid transmission in plants, Streptomycin resistance in <i>Chlamydomonas</i> . Male sterility in maize	
<b><u>Unit III: Molecular Biology</u></b> <ul style="list-style-type: none"><li>• <b>DNA replication:</b> Modes of Replication, Meselson and Stahl Experiment, <b>DNA replication in prokaryotes and eukaryotes</b> - enzymes involved and molecular mechanism of replication.</li><li>• <b>Protein Synthesis:</b> Central dogma of Protein synthesis Transcription in prokaryotes and eukaryotes: promoter sites, initiation, elongation and termination.</li><li>• <b>RNA processing:</b> Adenylation &amp; Capping.</li></ul>	<b>(15 Lectures)</b>

Course Code	Title	Credits & Lectures
SIUSBOT33	CURRENT TRENDS IN PLANT SCIENCES I	2 Credits & 45 Lectures
<p><b>COURSE OUTCOMES:</b></p> <p>After completion of the course, learners would be able to:</p> <ul style="list-style-type: none"> <li>• <b>CO1:</b> Learn the basics of Pharmacognosy and various secondary metabolites found in plants.</li> <li>• <b>CO2:</b> Study different types of forests in India and their economic importance.</li> <li>• <b>CO3:</b> Understand applications of Aromatherapy &amp; nutraceuticals.</li> </ul>		
<p><b>CIA – Class Test (20M) + Assignment/ Case Study/ Presentation (15M) + Class Participation (5M)</b></p>		
<p><b><u>Unit1: Pharmacognosy and Phytochemistry</u></b></p> <ul style="list-style-type: none"> <li>• Introduction to Pharmacopoeia: Indian Pharmacopoeia, Indian Herbal Pharmacopoeia &amp; Ayurvedic Pharmacopoeia; Study of monograph from Pharmacopoeia</li> <li>• Secondary Metabolites: alkaloids, glycosides, tannins, volatile oils, saponins, phenolics - sources, properties, uses.</li> <li>• Adulterants: <i>Saraca indica</i>, <i>Polyalthia longifolia</i>; <i>Terminalia arjuna</i>, <i>Terminalia tomentosa</i>; <i>Centella asiatica</i>, <i>Bacopa monnieri</i>; <i>Glycyrrhiza glabra</i>, <i>Abrus precatorius</i>.</li> </ul>		<p><b>(15 Lectures)</b></p>
<p><b><u>Unit 2: Forestry and Economic Botany</u></b></p> <ul style="list-style-type: none"> <li>• <b>Forestry:</b> <ul style="list-style-type: none"> <li>▪ Types of forest in India</li> <li>▪ Agro-forestry and Urban forestry</li> <li>▪ Organic farming: Definition, Concept, objectives, methods and future scope</li> <li>▪ Silviculture</li> <li>▪ Trends in forest management and utilization</li> </ul> </li> <li>• <b>Economic Botany:</b> <ul style="list-style-type: none"> <li>▪ Classification of Fibres</li> <li>▪ Sources, Properties and Uses of Commercial Fibres: Cotton, Jute and Coir</li> <li>▪ Sources, Properties and Uses of Commercially important Spices and condiments: Nutmeg, Cardamom and Saffron</li> </ul> </li> </ul>		<p><b>(15 Lectures)</b></p>

▪ Commercial market of spices	
<b><u>Unit 3: Industry based on plant products</u></b> <ul style="list-style-type: none"><li>• Aromatherapy: Introduction, Uses with few examples; Jojoba, Geranium, Lavender, Patchouli</li><li>• Botanical and nutraceuticals: <i>Spirulina</i>, <i>Vanillin</i>, <i>Garcinia indica</i> / <i>Garcinia cambogia</i>, <i>Chlorella</i> and <i>Kale</i>.</li><li>• Enzymes industry: Cellulases, Papain, Bromelain, Biofuels.</li></ul>	<b>(15 Lectures)</b>

## SEMESTER III PRACTICALS

SIUSBOTP3.1	<b>PRACTICAL I (PLANT DIVERSITY II), PRACTICAL II (FORM AND FUNCTION II) &amp; PRACTICAL III (CURRENT TRENDS IN PLANT SCIENCES I)</b>	<b>3 Credits &amp; 30 Lectures</b>
<p><b>COURSE OUTCOMES:</b></p> <p>After completion of the course, learners would be able to study:</p> <ul style="list-style-type: none"> <li>• <b>CO1:</b> Specimens of Algae and Bryophyta and their life cycles; Floral morphology &amp; angiosperm families/ subfamilies with suitable examples.</li> <li>• <b>CO2:</b> Ultra-structure of cell organelles, estimation procedure of nucleic acids, inheritance pattern &amp; chromosomal aberrations, sequencing techniques.</li> <li>• <b>CO3:</b> Identify herbal drugs with their adulterants &amp; economic importance.</li> </ul>		
<b>PRACTICAL I – PLANT DIVERSITY II (SIUSBOTP3.1)</b>		
1.	Study of stages in the life cycle of <i>Volvox</i> from fresh/ preserved material and permanent slides.	
2.	Study of stages in the life cycle of <i>Sargassum</i> from fresh/ preserved material and permanent slides.	
3.	Economic importance and range of thallus in Phaeophyta.	
4.	Study of stages in the life cycle of <i>Anthoceros</i> from fresh/ preserved material and permanent slides.	
5.	Study of Floral Morphology Part I: Parts of a flower, flower symmetry, types of thalamus, Calyx types and modifications, Corolla – forms; Aestivation, Perianth.	
6.	Study of Floral Morphology Part II: Androecium parts of the androecium, Number and insertion of stamens, Union of stamens; Types of Corona. Gynoecium: the carpel, style and stigma; Union of Carpel; ovary-placentation, types of ovules.	
7.	Study of one plant from Magnoliaceae, Papilionaceae	
8.	Study of one plant from Caesalpinae, Mimosae	
9.	Study of one plant from Asteraceae	
10.	Study of one plant from Amaranthaceae, Palmae	
11.	Preparation of herbarium and wet preservation technique.	
12.	Chromatography: Separation of amino by circular paper chromatography.	
13.	Separation of Carotenoids by thin layer chromatography.	
14.	Horizontal and Vertical Gel Electrophoresis – Demonstration.	

**PRACTICAL II – FORM AND FUNCTION II (SIUSBOTP3.1)**

1.	Study of the ultra-structure of cell organelles prescribed for theory from Photomicrographs.	
2.	Estimation of DNA from plant material (one Std & one Unknown, No Std Graph).	
3.	Estimation of RNA from plant material (one Std & one Unknown, No Std Graph).	
4.	Study of Sex-linked inheritance (eye colour in <i>Drosophila</i> , Haemophilia, colour blindness) & Sex influenced characters (baldness in man, Hypertrichosis).	
5.	Study of inheritance pattern with reference to Plastid Inheritance.	
6.	Study of cytological consequences of chromosomal aberrations (Laggards, Chromosomal Bridge, Ring chromosome, Chromosomal ring) from permanent slides or photomicrographs.	
7.	Study of meiosis from suitable plant material	
8.	DNA sequencing - Sanger's method	
9.	Determining the sequence of amino acids in the protein molecule synthesized from the given m-RNA strand (prokaryotic and eukaryotic).	

**PRACTICAL III – CURRENT TRENDS IN PLANT SCIENCES I (SIUSBOTP3.1)**

1.	Study of drug & adulterants: <i>Saraca indica</i> / <i>Polyalthia longifolia</i> ; <i>Terminalia arjuna</i> / <i>Terminalia tomentosa</i> ; <i>Centella asiatica</i> / <i>Bacopa monnieri</i> ; <i>Glycyrrhiza glabra</i> / <i>Abrus precatorius</i> .	
2.	Test for alkaloids, glycosides, saponins, phenolics.	
3.	Study of Types of forest in India.	
4.	Sources, Properties & uses of: Fibres (Cotton, Jute and Coir)	
5.	Sources, Properties & uses of: Spices & condiments (Nutmeg, Cardamom and Saffron)	
6.	Preparation of herbal cosmetics (Face pack & herbal shampoo)	
7.	TLC of Jojoba / Geranium / Lavender / Patchouli oil	
8.	Study of Botanical and nutraceuticals - <i>Spirulina</i> , <i>Vanillin</i> , <i>Garcinia indica</i> / <i>Garcinia cambogia</i> , <i>Chlorella</i> and <i>Kale</i>	
9.	Evaluation of nutraceutical value of mushroom / wheatgerm / <i>Moringa</i>	

**SEMESTER IV THEORY**

Course Code	Title	Credits & Lectures
SIUSBOT41	PLANT DIVERSITY II	2 Credits & 45 Lectures
<p><b>COURSE OUTCOMES:</b></p> <p>After completion of the course, learners would be able to:</p> <ul style="list-style-type: none"> <li>• <b>CO1:</b> Study different Fungi w. r. t. their general characters, structure, life cycle and pathogenicity.</li> <li>• <b>CO2:</b> Understand the basic features of Pteridophyta and Paleobotany.</li> <li>• <b>CO3:</b> Learn the Gymnosperms w. r. t. their distribution, life cycle &amp; economic importance.</li> </ul>		
<p><b>CIA</b> – Class Test (20M) + Assignment/ Case Study/ Presentation (15M) + Class Participation (5M)</p>		
<p><b><u>Unit I: Thallophyta: Fungi, Plant Pathology</u></b></p> <ul style="list-style-type: none"> <li>• General characters of Ascomycetae &amp; Basidiomycetae</li> <li>• Structure, life cycle and systematic position of <i>Aspergillus</i> and <i>Xylaria</i></li> <li>• Structure, life cycle and systematic position of <i>Agaricus</i></li> <li>• Plant Pathology: Symptoms, causative organism, disease cycle and control measures of Powdery mildew and Late blight of potato.</li> </ul>		<p><b>(15 Lectures)</b></p>
<p><b><u>Unit II: Pteridophyta and Paleobotany</u></b></p> <ul style="list-style-type: none"> <li>• Salient features and classification up to orders (with examples of each) of Psilophyta and Lepidophyta (G M Smith's system of classification to be followed)</li> <li>• Structure, life cycle and systematic position of <i>Selaginella</i></li> <li>• Paleobotany- The geological time scale; Formation and types of fossils;</li> <li>• Structure and systematic position of form genus <i>Rhynia</i></li> </ul>		<p><b>(15 Lectures)</b></p>
<p><b><u>Unit III: Gymnosperms</u></b></p> <ul style="list-style-type: none"> <li>• Salient features, classification up to orders (with examples of each) and economic importance of Coniferophyta (Chamberlain's system of classification to be</li> </ul>		<p><b>(15 Lectures)</b></p>

followed).

- Structure, life cycle and systematic position of *Pinus*.
- Structure and systematic position of the form genus *Cordaites*.

Course Code	Title	Credits & Lectures
SIUSBOT42	FORM AND FUNCTION II	2 Credits & 45 Lectures
<p><b>COURSE OUTCOMES:</b></p> <p>After completion of the course, learners would be able to:</p> <ul style="list-style-type: none"> <li>• <b>CO1:</b> Understand the mechanical tissue and secondary growth in plants.</li> <li>• <b>CO2:</b> Learn various processes involved in respiration and basic reproductive biology in plants.</li> <li>• <b>CO3:</b> Study the different biogeochemical cycle and various ecological factors.</li> </ul>		
<p><b>CIA</b> – Class Test (20M) + Assignment/ Case Study/ Presentation (15M) + Class Participation (5M)</p>		
<p><b><u>Unit I: Anatomy</u></b></p> <ul style="list-style-type: none"> <li>• Normal Secondary Growth in Dicotyledonous stem and root.</li> <li>• Growth rings, periderm, lenticels, tyloses, heart wood and sap wood.</li> <li>• Mechanical Tissue system: Tissues providing mechanical strength and support and their principle &amp; distribution in plant body, I-girders in aerial and underground organs.</li> <li>• Types of Vascular Bundles.</li> </ul>		<p><b>(15 Lectures)</b></p>
<p><b><u>Unit II: Plant Physiology and Plant Biochemistry</u></b></p> <ul style="list-style-type: none"> <li>• <b>Respiration: Aerobic:</b> Glycolysis, TCA Cycle, ETS &amp; Energetic of respiration; Anaerobic respiration.</li> <li>• <b>Photorespiration</b></li> <li>• <b>Photoperiodism:</b> Phytochrome Response and Vernalization with reference to flowering in higher plants, Physico-chemical properties of phytochrome, Pr-Pfr interconversion, role of phytochrome in flowering of SDPs and LDPs;</li> <li>• <b>Vernalization</b> mechanisms and applications.</li> </ul>		<p><b>(15 Lectures)</b></p>
<p><b><u>Unit III: Ecology and Environmental Botany</u></b></p> <ul style="list-style-type: none"> <li>• <b>Biogeochemical Cycles:</b> Carbon, Nitrogen and Water.</li> <li>• <b>Ecological factors:</b> Concept of environmental factors, soil as an edaphic factor,</li> </ul>		<p><b>(15 Lectures)</b></p>



soil composition, types of soil, soil formation, soil profile.

- **Community ecology:** Characters of community - quantitative characters and qualitative characters.

Course Code	Title	Credits & Lectures
SIUSBOT43	CURRENT TRENDS IN PLANT SCIENCES I	2 Credits & 45 Lectures
<p><b>COURSE OUTCOMES:</b></p> <p>After completion of the course, learners would be able to:</p> <ul style="list-style-type: none"> <li>• <b>CO1:</b> Learn the basics of indoor gardening and various national parks and botanical garden.</li> <li>• <b>CO2:</b> Introduction to plant tissue culture and r-DNA technology.</li> <li>• <b>CO3:</b> Understand applications of biostatistics and bioinformatics.</li> </ul>		
<p><b>CIA</b> – Class Test (20M) + Assignment/ Case Study/ Presentation (15M) + Class Participation (5M)</p>		
<p><b><u>Unit I: Horticulture and Gardening: Introduction to Horticulture</u></b></p> <ul style="list-style-type: none"> <li>• Branches of Horticulture</li> <li>• Bonsai, dish garden &amp; terrarium</li> <li>• <b>Types of gardens:</b> Formal and informal gardens</li> <li>• National Park: Sanjay Gandhi National Park</li> <li>• Botanical Garden: Veermata Jijabai Udyan (Victoria Garden)</li> <li>• Flower arrangements: Bouquets, gajra, veni, garland, Floral rangoli</li> </ul>		<p><b>(15 Lectures)</b></p>
<p><b><u>Unit II: Biotechnology</u></b></p> <ul style="list-style-type: none"> <li>• <b>Introduction to plant tissue culture:</b> <ul style="list-style-type: none"> <li>▪ Laboratory organization and techniques in plant tissue culture</li> <li>▪ Totipotency</li> <li>▪ Organogenesis</li> <li>▪ Organ culture – root cultures, meristem cultures, anther and pollen culture, embryo culture.</li> </ul> </li> <li>• <b>r-DNA technology:</b> <ul style="list-style-type: none"> <li>▪ Gene cloning</li> <li>▪ Enzymes involved in Gene cloning</li> <li>▪ Vectors used for Gene cloning.</li> </ul> </li> </ul>		<p><b>(15 Lectures)</b></p>
<p><b><u>Unit III: Biostatistics and Bioinformatics</u></b></p> <ul style="list-style-type: none"> <li>• <b>Biostatistics:</b> The chi square test. Correlation – Calculation of coefficient</li> </ul>		<p><b>(15 Lectures)</b></p>

of correlation.

- **Bioinformatics:** Information technology: History and tools of IT, Internet and its uses. Introduction to Bioinformatics - goal, need, scope and limitation, Aims of Bioinformatics: Data organization, Tools of Bioinformatics- tools for web search, Data retrieval tools- Entrez, BLAST, Bioinformatics programme in India.

## SEMESTER IV PRACTICALS

SIUSBOTP4.1	<b>PRACTICAL I (PLANT DIVERSITY II), PRACTICAL II (FORM AND FUNCTION II) &amp; PRACTICAL III (CURRENT TRENDS IN PLANT SCIENCES I)</b>	<b>3 Credits &amp; 30 Lectures</b>
<p><b>COURSE OUTCOMES:</b></p> <p>After completion of the course, learners would be able to study:</p> <ul style="list-style-type: none"> <li>• <b>CO1:</b> Specimens of fungi, pteridophytes and gymnosperms with their life cycles, along with plant fossils and fungal diseases.</li> <li>• <b>CO2:</b> Different types of tissues and secondary structures in plant, plant physiology experiments and concepts of ecological experiments.</li> <li>• <b>CO3:</b> Various techniques of flower arrangements, plant tissue culture, biostatistics and bioinformatics.</li> </ul>		
<b>PRACTICAL I – PLANT DIVERSITY II (SIUSBOTP4.1)</b>		
1.	Study of stages in the life cycle of <i>Aspergillus</i> from fresh/ preserved material and permanent slides.	
2.	Study of stages in the life cycle of <i>Xylaria</i> from fresh/ preserved material and permanent slides.	
3.	Study of stages in the life cycle of <i>Agaricus</i> from fresh/ preserved material and permanent slides.	
4.	Study of fungal diseases as prescribed for theory.	
5.	Study of stages in the life cycle of <i>Selaginella</i> from fresh/ preserved material and permanent slides.	
6.	Study of form genera <i>Rhynia</i> with the help of permanent slides/ photomicrographs.	
7.	Study of stages in the life cycle of <i>Pinus</i> from fresh/ preserved material and permanent slides.	
8.	Study of the form genus <i>Cordaites</i> with the help of permanent slide/ photomicrographs.	

<b>PRACTICAL II - FORM AND FUNCTION II (SIUSBOTP4.1)</b>		
1.	Study of normal secondary growth in the stem and root of a Dicotyledonous plant.	
2.	Types of mechanical tissues, mechanical tissue system in aerial, underground organs.	
3.	Study of conducting tissues: Xylem and phloem elements in Gymnosperms and Angiosperms through maceration technique.	
4.	Study of different types of vascular bundles.	
5.	Q <sub>10</sub> – germinating seeds using Phenol red indicator.	
6.	NR activity – <i>in-vivo</i>	
7.	Estimation of proteins by Lowry's method (prepare standard graph).	
8.	Study of the working of the following Ecological Instruments: Soil thermometer, Soil testing kit, Soil pH, Wind anemometer.	
9.	Mechanical analysis of soil by the sieve method & pH of soil.	
10.	Quantitative estimation of organic matter of the soil by Walkley and Blacks Rapid titration method.	
11.	Study of vegetation by the list quadrat method	

<b>PRACTICAL III - CURRENT TRENDS IN PLANT SCIENCES I (SIUSBOTP4.1)</b>		
1.	Study of Indian style Flower arrangements: Bouquets, gajra, veni, garland, Floral rangoli.	
2.	Preparation of garden plans – formal and informal gardens.	
3.	Bottle and dish garden (Demonstration)	
4.	Various sterilization techniques.	
5.	Preparation of Stock solutions; Preparation of MS medium	
6.	Seed sterilization	
7.	Callus induction & Regeneration of plantlet from callus (Demonstration).	
8.	Identification of the cloning vectors – pBR322, pUC18, Ti-plasmid	
9.	Chi-square test	
10.	Calculation of coefficient of correlation.	
11.	Web Search – Google, Entrez	
12.	BLAST	

**SIES COLLEGE OF ARTS, SCIENCE & COMMERCE (AUTONOMOUS)**  
**Three/Fourth Semester**

Class: S.Y.B.Sc

Sub: Botany

Paper: I/II/III

Day:

Date:

Time:

Marks: 60

- N.B. :
- All questions are Compulsory.
  - Figures to the right indicate marks.
  - Draw neat labelled diagrams wherever necessary.

<b>Q.1</b>	<b>a)</b>	Unit I: Long answer question	<b>(10)</b>
		<b>OR</b>	
	<b>a)</b>	Unit I: Long answer question	<b>(10)</b>
	<b>b)</b>	Unit I: Short answer question	<b>(05)</b>
		<b>OR</b>	
	<b>b)</b>	Unit I: Short answer question	<b>(05)</b>
<b>Q.2</b>	<b>a)</b>	Unit II: Long answer question	<b>(10)</b>
		<b>OR</b>	
	<b>a)</b>	Unit II: Long answer question	<b>(10)</b>
	<b>b)</b>	Unit II: Short answer question	<b>(05)</b>
		<b>OR</b>	
	<b>b)</b>	Unit II: Short answer question	<b>(05)</b>
<b>Q.3</b>	<b>a)</b>	Unit III: Long answer question	<b>(10)</b>
		<b>OR</b>	
	<b>a)</b>	Unit III: Long answer question	<b>(10)</b>
	<b>b)</b>	Unit III: Short answer question	<b>(05)</b>
		<b>OR</b>	
	<b>b)</b>	Unit III: Short answer question	<b>(05)</b>
<b>Q. 4</b>		Write notes on the following:	<b>(15)</b>
	<b>i)</b>	Unit I	
		<b>OR</b>	
	<b>i)</b>	Unit I	
	<b>ii)</b>	Unit II	
		<b>OR</b>	
	<b>ii)</b>	Unit II	
	<b>iii)</b>	Unit III	
		<b>OR</b>	
	<b>iii)</b>	Unit III	

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## SIES COLLEGE OF ARTS, SCIENCE &amp; COMMERCE (AUTONOMOUS)

## S. Y. B. Sc. BOTANY SEMESTER III

## PLANT DIVERSITY II

## PRACTICAL I

Duration: 3 hours

Max. Marks: 50

- Q.1. Identify, classify and describe specimen 'A' and 'B'. Sketch neat and labeled diagrams of morphological/microscopical structures seen in the specimens. **10M**
- Q.2. Classify specimen 'C' up to its family giving reasons. Give floral formula. Sketch and label L. S. of flower and T. S. ovary. **10M**
- Q.3. Separate amino acids by circular paper chromatography. **08M**
- OR**
- Separate carotenoids by thin layer chromatography. **08M**
- Q.4. Identify and describe slide / specimen 'D' 'E', 'F' and 'G'. **12M**
- Q.5. *Viva – voce*. **05M**
- Q.6. Field report. **05M**

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**KEY:**

- **A: Algae:** (*Volvox/ Sargassum*)
- **B: Bryophyte:** (*Anthoceros*)
- **C: Families:** (Magnoliaceae, Papilionaceae, Caesalpinae, Mimosae, Asteraceae, Amaranthaceae, Palmae)
- **D: Algae** (Economic importance and range of thallus in Phaeophyta)
- **E:** Floral Morphology
- **F:** Floral Morphology
- **G:** Horizontal or Vertical Gel Electrophoretic apparatus

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**SIES COLLEGE OF ARTS, SCIENCE & COMMERCE (AUTONOMOUS)**

**S. Y. B. Sc. BOTANY SEMESTER III**

**FORM AND FUNCTION II**

**PRACTICAL II**

**Duration: 3 hours**

**Max. Marks: 50**

Q.1. Make a squash or smear preparation of specimen 'A'. Draw & comment on your observations & show the slides to the examiners. **10M**

Q.2. Estimate DNA / RNA from the given sample 'B'. **10M**

Q.3. Determine the sequence of bases in a DNA strand by Sanger's method from the given data 'C'. **10M**

**OR**

Q.3. Determine the sequence of Amino acids in the polypeptide synthesized from the given mRNA strand 'C'.

Q.4. Identify and describe the specimen/ slide/ photograph – 'D', 'E', and 'F'. **15M**

Q.5. Journal. **05M**

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**KEY:**

- A: Mitosis / Meiosis
- B: Germinating seeds or Onion
- C: DNA / mRNA sequence
- D: Ultra-structure of cell organelles
- E: Sex linked inheritance or Sex influenced character
- F: Plastid Inheritance / chromosomal aberrations

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## SIES COLLEGE OF ARTS, SCIENCE &amp; COMMERCE (AUTONOMOUS)

## S. Y. B. Sc. BOTANY SEMESTER III

## CURRENT TRENDS IN PLANT SCIENCES I

## PRACTICAL III

Duration: 3 hours

Max. Marks: 50

- Q.1. Describe macroscopic characters of specimen 'A'. 10M
- Q.2. Prepare face pack and comment upon the role of the ingredients used. 08M
- Q.3. Estimate nutraceutical value of protein from given sample 'B'. 08M
- Q.4. Perform the TLC of given oil sample 'C'. 08M
- Q.5. Perform the test for \_\_\_\_\_ and \_\_\_\_\_ from specimen 'D' & 'E'. 08M
- Q.6. Identify and describe 'F' and 'G'. 08M

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**KEY:**

- A: Drug & adulterants: *Saraca indica* / *Polyalthia longifolia*; *Terminalia arjuna* / *Terminalia tomentosa*; *Centella asiatica* / *Bacopa monnieri*; *Glycyrrhiza glabra* / *Abrus precatorius*
- B: Evaluation of nutraceutical value of mushroom / wheatgerm / *Moringa*
- C: TLC of Jojoba / Geranium / Lavender / Patchouli oil
- D & E: alkaloids, glycosides, saponins, phenolics (any 2)
- F: Study of types of forest in India
- G: Fibres, spices & condiments / *Spirulina*, *Vanillin*, *Garcinia indica* / *Garcinia cambogia*, *Chlorella* and *Kale*.

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## SIES COLLEGE OF ARTS, SCIENCE &amp; COMMERCE (AUTONOMOUS)

## S. Y. B. Sc. BOTANY SEMESTER IV

## PLANT DIVERSITY II

## PRACTICAL I

Duration: 3 hours

Max. Marks: 50

- Q.1. Identify, classify and describe specimen 'A' and 'B'. Sketch neat and labeled diagrams of morphological / microscopical structures seen in the specimens. **12M**
- Q.2. Identify, classify and describe specimen 'C'. Sketch neat and labeled diagrams of morphological / microscopical structures seen in the specimen. **08M**
- Q.3. Identify, classify and describe specimen 'D'. Sketch neat and labeled diagrams of morphological / microscopical structures seen in the specimen. **08M**
- Q.4. Identify and describe slides / specimen 'E', 'F', 'G' and 'H'. **12M**
- Q.5. Journal. **05M**
- Q.6. Field report. **05M**

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**KEY:**

- **A & B:** Fungi (*Aspergillus*, *Xylaria*, *Agaricus*)
- **C:** Pteridophyte (*Selaginella*)
- **D:** Gymnosperm (*Pinus*)
- **E:** Plant pathology (Powdery mildew / Late blight of potato)
- **F:** *Rhynia*
- **G:** *Pinus*
- **H:** *Cordaites*

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**SIES COLLEGE OF ARTS, SCIENCE & COMMERCE (AUTONOMOUS)****S. Y. B. Sc. BOTANY SEMESTER IV****FORM AND FUNCTION II****PRACTICAL II****Duration: 3 hours****Max. Marks: 50**

- Q.1. Make a temporary stained preparation of T.S. of specimen 'A' and comment on the secondary growth / Mechanical tissues observed / Macerate the given material 'A' to expose the wood elements & comment upon it. **10M**
- Q.2. Perform the Major Physiological / Ecological experiment 'B' allotted to you. **15M**
- Q.3. Perform the Minor Physiological / Ecological experiment 'C' allotted to you. **10M**
- Q.4. Identify and describe the specimen/ slide/ photograph – 'D', 'E' and 'F'. **09M**
- Q.5. *Viva-voce.* **06M**

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**KEY:**

- **A:** Dicot stem / dicot root / monocot stem / mechanical Tissue (*Coleus* stem, *Typha* leaf, Maize stem and Maize root / *Annona* / *Magnolia* for maceration).
- **D:** Vascular bundles
- **E:** Tyloses / heart wood / sapwood / growth rings / periderm / lenticels
- **F:** Ecological Instrument - Soil thermometer, Soil testing kit, Soil pH, Wind anemometer.

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**SIES COLLEGE OF ARTS, SCIENCE & COMMERCE (AUTONOMOUS)**

**S. Y. B. Sc. BOTANY SEMESTER IV**

**CURRENT TRENDS IN PLANT SCIENCES I**

**PRACTICAL III**

**Duration: 3 hours**

**Max. Marks: 50**

- |           |                                                                                            |            |
|-----------|--------------------------------------------------------------------------------------------|------------|
| Q.1.      | Prepare a garden plan 'A' with suitable garden locations (any three).                      | <b>10M</b> |
| Q.2.      | Perform seed sterilization technique 'B'.                                                  | <b>08M</b> |
| Q.3. (a.) | Perform chi-square test/ coefficient of correlation using data 'C' and analyze the result. | <b>10M</b> |
| Q.3. (b.) | Perform the experiment 'D' related to web search.                                          | <b>06M</b> |
| Q.4.      | Identify and describe slides / specimen 'E', 'F', 'G' and 'H'.                             | <b>12M</b> |
| Q.5.      | Biodiversity Report.                                                                       | <b>04M</b> |

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**KEY:**

- **A:** Garden plan
- **B:** Moong / Mustard seeds
- **E:** Terrarium / Dish garden
- **F:** Cloning vector
- **G and H:** Garden Plants / Gajra / Veni / Garland / Floral rangoli

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