



College of Arts,  
Science &  
Commerce

RISE WITH EDUCATION  
Sion(W), Mumbai . 400022

**Program: B.Sc.  
Course: BOTANY  
Syllabus for F.Y.B.Sc.  
To be implemented from 2018-2019**

(Credit Based Semester and Grading System with  
effect from the academic year 2018- 2019)

## **PREAMBLE**

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

In the revised autonomous syllabus, the committee has taken utmost care to maintain the continuity in the flow of information at F.Y.B.Sc level. Hence, some of the modules of the existing university 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, Cytology, Plant physiology, Environmental botany, Medicinal botany, etc.). Various interdisciplinary courses such as Biostatistics & Bioinstrumentation are also introduced to make the students at par with the updated tools and techniques.

Two papers of theory and practicals (Semester - I & Semester-II together) are compulsory for the students.

Each theory period shall be of 48 minutes duration. Theory component shall have 180 instructional periods. 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. Theory 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 I**

Course	PAPER I			PAPER II			Grand Total
	Internal	External	Total	Internal	External	Total	
<b>Theory</b>	40	60	100	40	60	100	<b>200</b>
<b>Practicals</b>	-	50	50	-	50	50	<b>100</b>

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

Course	PAPER I			PAPER II			Grand Total
	Internal	External	Total	Internal	External	Total	
<b>Theory</b>	40	60	100	40	60	100	<b>200</b>
<b>Practicals</b>	-	50	50	-	50	50	<b>100</b>

**SIES COLLEGE OF ARTS, SCIENCE AND COMMERECE, SION (W) – AUTONOMOUS STATUS**  
**DEPARTMENT OF BOTANY – F.Y. B.Sc. SYLLABUS (2018-19)**

**DISTRIBUTION OF TOPICS AND CREDITS**

**F Y B Sc. BOTANY SEMESTER I**

<b>Course</b>	<b>Nomenclature</b>	<b>Credits</b>	<b>Topics</b>
<b>SIUSBOT11</b>	Plant diversity I	02	1. Algae
			2. Fungi & Lichens
			3. Bryophyta & Pteridophyta
<b>SIUSBOT12</b>	Form and function I	02	1. Cell Biology
			2. Ecology
			3. Genetics & Biometry
<b>SIUSBOTP11</b> <b>SIUSBOTP12</b>	Plant Diversity I (Practical I) Form and Function I (Practical II)	01 01	Practicals based on Theory Topics

**F Y B Sc. BOTANY SEMESTER II**

<b>Course</b>	<b>Nomenclature</b>	<b>Credits</b>	<b>Topics</b>
<b>SIUSBOT21</b>	Plant diversity 1	02	1. Gymnosperms
			2. Angiosperms
			3. Systematic Botany
<b>SIUSBOT22</b>	Form and function I	02	1. Anatomy
			2. Physiology
			3. Medicinal Botany & Horticulture
<b>SIUSBOTP21</b> <b>SIUSBOTP22</b>	Plant Diversity I (Practical I) Form and Function I (Practical II)	01 01	Practicals based on Theory Topics

## SEMESTER-I Course: PLANT DIVERSITY- I

### LEARNING OBJECTIVES

The students will be able to-

- ❖ Differentiate between various groups of cryptogams. Understand the morphology, structure and importance of the lower plants.
- ❖ Learn the economic importance of Algae, Fungi, Lichens and Bryophyte.

**CIA** – Class Test (20M) + Assignment/ Case Study/ Presentation (15M) + Class Participation (5M)

<b>Semester I SIUSBOT11</b>		<b>L</b>	<b>Cr.</b>
<b>Paper I - Plant Diversity 1</b>		<b>45</b>	<b>02</b>
<b>UNIT I –ALGAE</b>		<b>15</b>	
1	General characters of Chlorophyta: Range of thallus; types of Chloroplast.		
2	Structure, life cycle and systematic position of <i>Nostoc</i> and <i>Spirogyra</i> .		
3	Algae in biotechnology: i) Algae- as Biofertilizers, Food & Nutraceuticals, Biofuel, Medicines. ii) Phytochemicals, Secondary metabolites from algae & use of algae in industry.		
<b>UNIT II - FUNGI AND LICHENS</b>		<b>15</b>	
1	General characters of Phycomycetes: Occurrence; hyphal structure; modes of nutrition, reproduction; alternation of generations.		
2	Structure, life cycle and systematic position of <i>Rhizopus</i> .		
3	Applications of Fungi: in industry, agriculture & medicines.		
4	Lichens: Classification, Internal structure of thallus, Reproduction & fructification, Ecological significance & Economic importance.		
<b>UNIT III - BRYOPHYTA &amp; PTERIDOPHYTA</b>		<b>15</b>	
1	General characters of Hepaticae: Occurrence, thallus structure, vegetative reproduction, sexual reproduction, sporophyte structure, alternation of generation. Structure, life cycle and systematic position of <i>Riccia</i> .		
2	Structure, life cycle, systematic position and alternation of generations in <i>Nephrolepis</i> . Types of Stele found in Pteridophytes.		

	<b>Semester I SIUSBOTP11</b>	<b>L</b>	<b>Cr</b>
	<b>Practical Paper I – Plant Diversity 1</b>	30	1
1	Study of stages in the life cycle of <i>Nostoc</i> from fresh/ preserved material and permanent slides.		
2	Study of stages in the life cycle of <i>Spirogyra</i> from fresh/ preserved material and permanent slides.		
3	Economic importance of algae: <i>Spirulina</i> (Nutraceutical), <i>Ulva</i> (Biofuel), <i>Ascophyllum</i> (Alginates), <i>Gelidium</i> (Agar)		
4	Study of chloroplast in chlorophyta		
5	Study of range of thallus in chlorophyta		
6	Study of stages in the life cycle of <i>Rhizopus</i> from fresh/ preserved material and permanent slides.		
7	Study of Lichens: Morphological types, Internal structure of thallus.		
8	Economic importance of Fungi: Mushroom, Yeast, Wood rotting fungi, Mycorrhiza (AMF).		
9	Study of stages in the life cycle of <i>Riccia</i> from fresh/ preserved materials and permanent slides.		
10	Study of stages in the life cycle of <i>Nephrolepis</i> : Mounting of ramentum, hydathode, T.S. of rachis, T.S. of pinna of <i>Nephrolepis</i> passing through sorus, prothallus and sex organs.		
11	Types of stele found in pteridophytes with the help of permanent slides: <b>Protostele:</b> Haplostele, Actinostele, Plectostele, Mixed. <b>Siphonostele:</b> Ectophloic, Amphiphloic, <b>Solenostele:</b> Dictyostele.		

## SEMESTER-I Course: Form and Function I

### LEARNING OBJECTIVES

The students will be able to

- ❖ Understand the Structure and functions of various cell organelles of plants.
- ❖ Learn the basic concepts in Ecosystem and understand the meaning of Biodiversity.
- ❖ Understand the genic interactions and learn the basic methods of Biometry.

**CIA** – Class Test (20M) + Assignment/ Case Study/ Presentation (15M) + Class Participation (5M)

<b>Semester I SIUSBOT12</b>		<b>L</b>	<b>Cr.</b>
<b>Paper II – Form and Function I</b>		<b>45</b>	<b>02</b>
<b>UNIT I - CELL BIOLOGY</b>		<b>15</b>	
1	General structure of plant cell: Cell wall, Plasma membrane (fluid mosaic model)		
2	Ultrastructure and functions of the following cell organelles: Chloroplast & Endoplasmic reticulum.		
3	Ultrastructure of eukaryotic nucleus, chromosomes. Mitosis in plant cell.		
<b>UNIT II - ECOLOGY</b>		<b>15</b>	
1.	Energy pyramids, energy flow in an ecosystem.		
2.	Types of ecosystems: aquatic and terrestrial.		
3.	Biodiversity- definition, significance and major hotspots in India.		
<b>UNIT III - GENETICS AND BIOMETRY</b>		<b>15</b>	
1	Interaction of genes:-interaction between alleles; interaction involving two pair of genes: epistatic and non-epistatic interactions.		
2	Multiple alleles.		
3	Biometry: Mean, Median, Mode and Standard deviation		

	<b>PRACTICAL PAPER II SIUSBOTP12 FORM AND FUNCTION I</b>	L	Cr
		30	1
1	Study of various stages of mitosis in root tip cells ( <i>Allium</i> )		
2	Study of Karyotypes: Human – Normal male and normal female		
3	Study of Karyotypes: <i>Allium cepa</i> .		
4	Identification of parts of cell and cell organelles with the help of photomicrographs: Plasma membrane, Chloroplast, Endoplasmic reticulum, Eukaryotic nucleus.		
5	Identification of plants adapted to different environmental conditions: Hydrophytes: Free floating ( <i>Pistia/Eichornia</i> ); Rooted floating ( <i>Nymphaea</i> ); Submerged ( <i>Hydrilla</i> ), Mesophytes (any common plant); Hygrophytes ( <i>Typha/Cyperus</i> ), Xerophytes: Succulent ( <i>Opuntia</i> ); Woody Xerophyte ( <i>Nerium</i> ); Halophyte ( <i>Avicennia</i> pneumatophore).		
6	Study of biodiversity hot spots in India.		
7	Study of ABO blood groups and Genetics problems on multiple alleles		
8	Frequency distribution, graphical representation of data: frequency polygon, histogram, pie chart.		
9	Calculation of mean, median and mode.		
10	Calculation of standard deviation.		



## SEMESTER-II Course: Plant Diversity I

### LEARNING OBJECTIVES

The students will be able to understand-

- ❖ Study life cycle and economic importance of gymnospermic plants.
- ❖ Study morphology of leaf and inflorescence and acquire knowledge about wonders of plants.
- ❖ Learn systematic botany by studying different families.

**CIA** – Class Test (20M) + Assignment/ Case Study/ Presentation (15M) + Class Participation (5M)

<b>Semester II SIUSBOT21</b>		<b>Hrs</b>	<b>Cr.</b>
<b>Paper I - Plant Diversity I</b>		<b>45</b>	<b>02</b>
<b>UNIT II - GYMNOSPERMS</b>		<b>15</b>	
1	Structure, life cycle, systematic position and alternation of generations in <i>Cycas</i>		
2	Affinities of gymnosperms with pteridophytes and angiosperms		
3	Economic importance of Gymnosperms		
<b>UNIT II - ANGIOSPERMS: MORPHOLOGY &amp; WONDERS OF PLANTS</b>		<b>15</b>	
1	Morphology of leaf: simple leaf, types of compound leaves, phyllotaxy, types of stipules, leaf apex, leaf margin, leaf shapes, venation. Modifications of leaf: spine, tendril, hooks, phyllode,		
2	Inflorescence: Racemose: simple raceme, spike, catkin, spadix, panicle. Cymose: monochasial, dichasial, polychasial. Compound: corymb, umbel, capitulum Special Types: Cyathium, Verticillaster, Hypanthodium.		
3	Wonders of plants: <i>Rafflesia</i> , <i>Victoria regia</i> , carnivorous plants- pitcher, Venus Flytrap, <i>Dionea</i> . Sundew, Bladderwort, <i>Adansonia</i> , <i>Sequoia</i> , Strangler Fig, plant mimicry – orchids.		
<b>Unit III – SYSTEMATIC BOTANY</b>			
1.	Systems of classification: natural (Bentham & Hooker), artificial (Linnaeus) & phylogenetic (Hutchinson).		
2	Study of following families: Annonaceae, Cruciferae, Malvaceae, Solanaceae, Euphorbiaceae, Amaryllidaceae.		

	<b>Semester II SIUSBOTP21</b>	<b>L</b>	<b>Cr</b>
	<b>PRACTICAL Paper I - Plant Diversity I</b>	<b>30</b>	<b>01</b>
1	Study of stages in the life cycle of <i>Cycas</i> : T.S of leaflet ( <i>Cycas</i> pinna – section cutting), coralloid root, microsporophyll, microspore, Megasporophyll, Ovule (Specimens or slides to be shown).		
2	Economic importance of Gymnosperms: <i>Pinus</i> ( turpentine, wood, seeds)		
3	Leaf morphology : As per theory		
4	Types of inflorescence: As per theory		
5	Study of Family: Anonaceae, Cruciferae.		
6	Study of Family: Malvaceae, Solanaceae.		
7	Study of Family: Euphorbiaceae, Amaryllidaceae.		
8	Wonders of plants: Carnivorous plants- Pitcher, Venus Flytrap, <i>Dionea</i> . Sundew, Bladderwort & Plant mimicry – orchids		

## SEMESTER-II Course: Form and Function I

### LEARNING OBJECTIVES

The students will be able to understand:

- ❖ Learn basic types of plant tissues & anatomy of stem, root & leaves.
- ❖ Study various enzymes, their mode of actions and basics photosynthesis in plants.
- ❖ Understand basic horticulture & applications of Aromatherapy.

**CIA** – Class Test (20M) + Assignment/ Case Study/ Presentation (15M) + Class Participation (5M)

<b>Semester II SIUSBOT22</b>		<b>L</b>	<b>Cr.</b>
<b>Paper II – Form and Function I</b>		<b>45</b>	<b>02</b>
<b>UNIT I - ANATOMY</b>		<b>15</b>	
1	Simple tissues - Parenchyma, Collenchyma, Sclerenchyma. Complex tissues – Xylem and Phloem.		
2	Cell Inclusions – Starch, protein, Calcium oxalate and calcium carbonate crystals		
3	Primary structure of dicot and monocot root, stem and leaf.		
<b>UNIT II - PHYSIOLOGY</b>		<b>15</b>	
1.	Enzymes: Nomenclature, Classification, Properties, lock & key theory & induced fit theory of enzyme action.		
2.	Photosynthesis: light reaction- photolysis of water, photophosphorylation: cyclic, noncyclic. Dark reaction- C <sub>3</sub> cycle, C <sub>4</sub> cycle & CAM.		
<b>UNIT III - MEDICINAL BOTANY AND HORTICULTURE</b>		<b>15</b>	
1	Applications of Aromatherapy: Sandal wood oil, Lavender oil, Geranium oil		
2	Herbal cosmetics in skin and hair care.		
3	Introduction to Horticulture and various Garden locations: Fence, Avenue, Hedge, Edge, Lawn, Arches and Pergolas.		

	<b>Semester II SIUSBOTP22</b>	<b>L</b>	<b>Cr.</b>
	<b>PRACTICAL Paper II - Forms &amp; Function I</b>	<b>30</b>	<b>01</b>
1	Primary structure of dicot and monocot root.		
2	Primary structure of dicot and monocot stem.		
3	Primary structure of dicot and monocot leaf.		
4	Study of cell inclusions: Starch grains, Aleurone layer, Raphides, Sphaeraphides, Cystolith.		
5	Test for tannins		
6	Change in colour because of change in pH: Anthocyanin: black grapes/Purple cabbage		
7	Effect of variation in substrate concentration on Amylase activity.		
8	Applications of Aromatherapy: Sandal wood oil, Lavender oil, Geranium oil		
9	Plants used in skin care herbal cosmetics.		
10	Plants used in hair care herbal cosmetics.		
11	Study of different garden locations and suitable plants: Avenue, Hedge, Edge, Lawn, Arches and Pergolas and Fence. (As per theory).		

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- Chapman V.J. (1941). An Introduction to the Study of Algae. New York Macmillan Cambridge at the University Press
- Chopra G.L. (1976). A Textbook of Fungi. S.Nagin Publ. 13<sup>th</sup> Ed.
- Dash M.C. (2009). Fundamentals of Ecology. McGraw-Hill Publ.
- Fritsch F.E. (1956). The Structure and Reproduction of Algae. Cambridge University Press
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- Rao Manibhushan K.; Textbook of Horticulture; (2005), 2<sup>nd</sup> Ed; Macmillan India Ltd.
- Roy P.; Plant Anatomy; (2010); 2<sup>nd</sup> Edition; New Central Book Agency Pvt. Ltd.
- Sambamurty A.V.S.S., (2005). Taxonomy of Angiosperms., I.K. International Pvt. Ltd.
- Sharma O.P. (1992). Textbook of Fungi. Tata McGraw Hill Publ.
- Smith G. M. (1955). Cryptogamic Botany Vol I and II by Mcgraw Hill Publications
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- Vashishta B.R. (2005). Botany for Degree students Bryophyta & Pteridophyta. S. Chand and Co. Publ.
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**First/Second Semester**

**Class: F.Y.B.Sc**

**Sub: Botany**

**Paper: I/II**

**Day:**

**Date:**

**Time:**

**Marks: 60**

**N.B.:**

- 1) All questions are Compulsory.**
- 2) Figures to the right indicate marks.**
- 3) 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>b)</b>	Unit I: Short answer question	<b>(05)</b>
		<b>OR</b>	
	<b>b)</b>	Unit I: Short answer question	
<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>b)</b>	Unit II: Short answer question	<b>(05)</b>
		<b>OR</b>	
	<b>b)</b>	Unit II: Short answer question	
<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>b)</b>	Unit III: Short answer question	<b>(05)</b>
		<b>OR</b>	
	<b>b)</b>	Unit III: Short answer question	
<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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**Practical Examination Paper Pattern for Practical I & II**  
**(50 marks per semester)**

SEMESTER I		
TIME: 2 HRS 15MIN	PRACTICAL I	MARKS: 50
<b>ALGAE, FUNGI, LICHENS, BRYOPHYTES AND PTERIDOPHYTES</b>		
Q. 1	Identify, classify and describe the specimens A, B, C and D. Sketch & label the parts observed.	(24)
Q. 2	Identify and give economic importance of the specimens E and F.	(04)
Q. 3	Identify and describe specimens/slides G, H, I and J.	(12)
Q. 4	Journal	(05)
Q. 5	<i>Viva-voce</i>	(05)
	<p><b>Key:</b></p> <ul style="list-style-type: none"> <li>• <b>A: Algae</b> (<i>Nostoc/ Spirogyra</i>)</li> <li>• <b>B: Fungi</b> (<i>Rhizopus</i>)</li> <li>• <b>C: Bryophyte</b> (<i>Riccia</i>)</li> <li>• <b>D: Pteridophyte</b> (<i>Nephrolepis</i> – Leaflet or Rachis)</li> <li>• <b>E:</b> Economic importance of Algae</li> <li>• <b>F:</b> Economic importance of Fungi</li> <li>• <b>G:</b> Type of Chloroplast in Chlorophyta</li> <li>• <b>H:</b> Range of Thallus in Algae</li> <li>• <b>I:</b> Lichen</li> <li>• <b>J:</b> Types of stele</li> </ul>	

**SEMESTER I**

**TIME: 2 HRS 15MIN**

**PRACTICAL II**

**MARKS: 50**

**CELL BIOLOGY, ECOLOGY, BIOMETRY AND GENETICS**

Q. 1	Determine frequency distribution & graphical representation / mean, median, mode / standard deviation from the given specimen A. ➤ Frequency Distribution & Graph ➤ Mean, Median, Mode ➤ Standard Deviation	(10)
Q. 2	Prepare a squash of the given root 'B' to show various stages of mitosis. Draw neat labelled diagrams of all the four stages of mitosis.	(10)
Q. 3	Analyze the given karyotype 'C' and comment upon it.	(05)
Q. 4	Identify and comment upon the highlighted biodiversity hot spots in Indian Map 'D'.	(05)
Q. 5	Identify the blood group A, B or O from the given sample 'E'  OR Solve the given genetic problem 'E'.	(06)
Q. 6	Identify and describe specimens / slides / photomicrograph F, G and H.	(09)
Q. 7	Journal	(05)
	<p><b>Key:</b></p> <ul style="list-style-type: none"> <li>• <b>A:Biometry</b> – Frequency distribution &amp; graphical representation / Mean, median, mode / Standard deviation</li> <li>• <b>B:Mitosis</b> – Hydrolyzed Onion root</li> <li>• <b>C:</b> Karyotype analysis – <i>Allium cepa</i>.</li> <li>• <b>D:</b> Biodiversity Hotspots in Indian map</li> <li>• <b>E:</b> Blood sample interaction photo / Genetic problem</li> <li>• <b>F: Photomicrograph</b> of any one <b>cell organelle</b> (Plasma membrane/Chloroplast/Mitochondria/Eukaryotic Nucleus)</li> <li>• <b>G: Hydrophyte</b>(<i>Eichornia/Nymphaea/Hydrilla</i>) / <b>Xerophyte</b> (<i>Opuntia / Nerium</i>) / <b>Mesophyte</b> (<i>Vinca</i>) / <b>Halophyte</b> (<i>Avicennia</i>) /<b>Hygrophyte</b> (<i>Typha / Cyperus</i>)</li> <li>• <b>H:</b>Idiogram study – Normal male / Normal female</li> </ul>	



SEMESTER II		
TIME: 2 HRS 15MIN	PRACTICAL I	MARKS: 50
GYMNOSPERMS, ANGIOSPERMS AND SYSTEMATIC BOTANY		
Q. 1	Identify, classify, describe, sketch and label specimen A.	(08)
Q. 2	Classify specimen B up to their families giving reasons. Give the floral formula. Sketch labelled diagrams of L.S of flower and T.S of ovary.	(08)
Q. 3	Identify and give economic importance of the specimen C.	(04)
Q. 4	Identify and describe slides/specimens/photomicrograph D, E, F, G and H.	(15)
Q. 5	Field Report	(05)
Q. 6	Journal	(05)
Q. 7	<i>Viva-voce</i>	(05)
	<p><b>Key:</b></p> <ul style="list-style-type: none"> <li>• <b>A: <i>Cycas</i>:</b> Pinna</li> <li>• <b>B: Systematic Botany:</b> Annonaceae/ Cruciferae/Malvaceae/ Solanaceae/ Euphorbiaceae/Amarylidaceae.</li> <li>• <b>C:</b> Economic importance of <i>Pinus</i></li> <li>• <b>D: <i>Cycas</i>:</b> Coralloid roots/ Microsporophylls/ Microspore/ Megasporephylls/ L.S. of Ovule</li> <li>• <b>E:</b> Leaf morphology</li> <li>• <b>F:</b> Inflorescence morphology</li> <li>• <b>G:</b> Wonders of plants</li> <li>• <b>H:</b> Wonders of plants</li> </ul>	

SEMESTER II		
TIME: 2 HRS 15MIN	PRACTICAL II	MARKS: 50
ANATOMY, PHYSIOLOGY, MEDICINAL BOTANY AND HORTICUTURE		
Q. 1	Make a temporary stained preparation of T.S of specimen A. Sketch a labelled diagram and describe its internal structure.	(06)
Q. 2	Mount and comment on the cell inclusions B and C. Draw neat labelled diagrams.	(08)
Q. 3	Perform the physiology experiment D. Give the requirements, principle and flow chart. Record the observations and result.	(08)
Q. 4	Perform two positive chemical tests to detect the presence of tannins in specimen E.	(06)
Q. 5	Identify and give uses of specimens F, G and H.	(06)
Q. 5	Give the botanical name and common name of two plants suitable for the given garden locations I, J and K.	(06)
Q. 6	Journal	(05)
Q. 7	<i>Viva-voce</i>	(05)
	<p><b>Key:</b></p> <ul style="list-style-type: none"> <li>• <b>A:</b> Dicot Root (Gram Seed) /Dicot stem (Sunflower)/ Monocot root (maize)/ Monocot stem (maize)/ Dicot leaf (Sunflower leaf)/ Moncot leaf (Maize leaf).</li> <li>• <b>B: Starch</b> (Potato/Rice) /<b>Proteins</b> (Maize)</li> <li>• <b>C: Raphides</b> (<i>Pistia</i>)/ <b>Sphaeraphides</b> (<i>Opuntia</i>) / <b>Cystoliths</b> (<i>Ficus</i>)</li> <li>• <b>D: Physiology Experiment</b> – Effect of pH on colour of Anthocyanin / Amylase activity</li> <li>• <b>E:</b> Test for Tannins</li> <li>• <b>F:</b> Aromatherapy oils</li> <li>• <b>G:</b> Plants used in Skin care</li> <li>• <b>H:</b> Plants used in Hair care</li> <li>• <b>I, J and K:</b> Garden locations –Avenue/ Hedge/ Edge/ Lawn/Arches and Pergolas/ Fence</li> </ul>	

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**College of Arts,  
Science &  
Commerce**

**RISE WITH EDUCATION**  
**Sion(W), Mumbai – 400022**

**Program: B.Sc.**  
**Course: BOTANY**  
**Syllabus for S.Y.B.Sc.**  
**To be implemented from 2018-2019**

**(Credit Based Semester and Grading System with  
effect from the academic year 2018-2019)**

## **PREAMBLE**

The existing university syllabus of S.Y.B.Sc. Botany due for revision as per the CBSGS 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. Theory 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>

**SIES COLLEGE OF ARTS, SCIENCE AND COMMERECE, SION (W) – AUTONOMOUS STATUS**

**DEPARTMENT OF BOTANY – S.Y. B.Sc. SYLLABUS (2018-19)**

**SEMESTER III Paper I THEORY**

Course Code	Title	Credits
<b>SIUSBOT31</b>	<b>Plant Diversity II</b>	<b>2 (45 lects.)</b>
<p><b>LEARNING OBJECTIVES</b>                      The students will be able to-</p> <ul style="list-style-type: none"> <li>❖ Study different cryptogams w.r.t. their general characters, structure, life cycle &amp; economic importance.</li> <li>❖ Understand the floral morphology, general characteristics and importance of angiosperms.</li> <li>❖ Learn the Techniques used to study Plant Diversity.</li> </ul> <p><b>CIA – Class Test (20M) + Assignment/ Case Study/ Presentation (15M) + Class Participation (5M)</b></p>		
<p><b>Unit I : Thallophyta (Algae) &amp; Bryophyta</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.</li> <li>• Structure, life cycle and systematic position of <i>Anthoceros</i> .</li> </ul>		15 L
<p><b>Unit II: Angiosperms</b>  <b>Morphology of Flowering Plants</b></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> </ul> <p>With the help of Bentham and Hooker’s system of <b>Classification for flowering plants</b> study the vegetative, floral characters and economic importance of the following families:</p> <ul style="list-style-type: none"> <li>• Magnoliaceae</li> <li>• Leguminosae (Papilionaceae, Caesalpiniae, Mimosae)</li> <li>• Asteraceae</li> <li>• Amaranthaceae</li> <li>• Palmae</li> </ul>		15 L

<p><b>Unit III :Modern Techniques to Study Plant Diversity</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>	15 L
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**Semester III SIUSBOTP31 Practical Paper I – Plant Diversity II CR1**

<p><b>Algae &amp; Bryophyta</b></p> <ol style="list-style-type: none"> <li>1. Study of stages in the life cycle of <i>Volvox</i> from fresh/ preserved material and permanent slides.</li> <li>2. Study of stages in the life cycle of <i>Sargassum</i> from fresh/ preserved material and permanent slides.</li> <li>3. Economic importance and range of thallus in Phaeophyta</li> <li>4. Study of stages in the life cycle of <i>Anthoceros</i> from fresh/ preserved material and permanent slides.</li> </ol> <p><b>Angiosperms</b></p> <ol style="list-style-type: none"> <li>5. Study of Floral Morphology part I</li> <li>6. Study of Floral Morphology part II</li> <li>7. Study of one plant from Magnoliaceae, Papilionaceae,</li> <li>8. Study of one plant from Caesalpinae, Mimosae,</li> <li>9. Study of one plant from Asteraceae</li> <li>10. Study of one plant from Amaranthaceae , Palmae</li> </ol> <p><b>Techniques to study Plant Diversity</b></p> <ol style="list-style-type: none"> <li>11. Preparation of herbarium and wet preservation technique</li> <li>12. Chromatography: Separation of amino by circular paper chromatography</li> <li>13. Separation of Carotenoids by thin layer chromatography</li> <li>14. Horizontal and Vertical Gel Electrophoresis – Demonstration</li> </ol>
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## Semester III Paper II Theory

Course Code: <b>SIUSBOT32</b>	Title: <b>FORM AND FUNCTION II</b>	Credits <b>2 (45 lect)</b>
<p><b>LEARNING OBJECTIVES</b></p> <p>The students will be able to-</p> <ul style="list-style-type: none"> <li>❖ Understand the Structure and functions of various cell organelles and different aspects of cell cycle and cell division.</li> <li>❖ Learn various mechanisms of sex determination and related mechanisms.</li> <li>❖ 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>Unit I : Cell Biology</b></p> <ul style="list-style-type: none"> <li>• Ultra Structure and functions of the following cell organelles: Mitochondrion (membranes, cristae, F<sub>1</sub> particles and matrix) , Peroxisomes and Glyoxysomes, Ribosomes (prokaryotic, eukaryotic and subunits)</li> <li>• Cell Division and its significance</li> <li>• Cell Cycle, structure of Interphase Nucleus (introduction to nuclear envelop, chromatin network, nucleolus and nucleoplasm).</li> <li>• Meiosis , Differences between Mitosis and Meiosis</li> <li>• Nucleic Acids: Types, structure and functions of DNA and RNA</li> </ul>		15 L
<p><b>Unit II : Cytogenetics</b></p> <ul style="list-style-type: none"> <li>• <b>Variation in Chromosome structure (Chromosomal Aberrations)</b> Definition, Origin, Cytological and Genetic Effects of the following: Deletions, Duplications, Inversions and Translocations.</li> <li>• <b>Sex determination, Sex linked, sex influenced and sex limited traits:</b> <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> <li>• <b>Sex linked-</b> eye colour in <i>Drosophila</i>, Haemophilia, colour blindness</li> <li>• <b>Sex influenced-</b> baldness in man</li> <li>• <b>Extranuclear Genetics</b> Organelle heredity- o Chloroplast determines heredity - Plastid transmission in plants, Streptomycin resistance in <i>Chlamydomonas</i>. Male sterility in maize</li> </ul>		15 L
<p><b>Unit III : Molecular Biology</b></p> <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>• RNA processing: Adenylation &amp; Capping.</li> </ul>		15 L



**Semester III SIUSBOTP32 Practical Paper II – Forms & Functions II CR1**

<b>Cell Biology</b>	
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)
<b>Cytogenetics</b>	
4	Study of <b>Sex linked inheritance</b> (eye colour in <i>Drosophila</i> , Haemophilia, colour blindness) & <b>Sex influenced characters</b> (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
<b>Molecular Biology</b>	
8	DNA sequencing- Sanger's method
9	Determining the sequence of amino acids in the protein molecule synthesized from the given mRNA strand (prokaryotic and eukaryotic)

### Semester III Paper III Theory

Course Code	Title	Credits
<b>SIUSBOT33</b>	<b>CURRENT TRENDS IN PLANT SCIENCES I</b>	<b>2 (45 Lects.)</b>
<p><b>LEARNING OBJECTIVES</b></p> <p>The students will be able to understand-</p> <ul style="list-style-type: none"> <li>❖ Learn the basics of Pharmacognosy and various secondary metabolites found in plants.</li> <li>❖ Study different types of forests in India and their economic importance.</li> <li>❖ Understand applications of Aromatherapy &amp; nutraceuticals.</li> </ul> <p><b>CIA</b> – Class Test (20M) + Assignment/ Case Study/ Presentation (15M) + Class Participation (5M)</p>		
<p><b>Unit1: Pharmacognosy and Phytochemistry</b></p> <ul style="list-style-type: none"> <li>• Introduction to pharmacopoeia</li> <li>• Indian pharmacopoeia, Indian Herbal Pharmacopoeia &amp; Ayurvedic Pharmacopoeia</li> <li>• Study of Monograph from pharmacopoeia</li> <li>• Secondary Metabolites: alkaloids, glycosides, 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>		15 L
<p><b>Unit 2: Forestry and Economic Botany</b></p> <ul style="list-style-type: none"> <li>• Forestry: <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>• Economic Botany:</li> <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> <li>• Commercial market of spices</li> </ul>		15 L
<p><b>Unit 3: Industry based on plant products</b></p> <ul style="list-style-type: none"> <li>• Aromatherapy- Introduction, Uses with few examples.</li> <li>• 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</li> <li>• Biofuels.</li> </ul>		15 L

**Semester III SIUSBOTP33 Practical Paper III – Current Trends In Plant Sciences I CR1**

1. Study of *Saraca indica*, *Polyalthia longifolia* *Terminalia arjuna*, *Terminalia tomentosa*, *Centella asiatica*, *Bacopa monnieri*, *Glycyrrhiza glabra*, *Abrus precatorius*.
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 - *Spirulina*, *Vanillin*, *Garcinia indica*/  
*Garcinia cambogia*, *Chlorella* and *Kale*.
9. Evaluation of nutraceutical value of mushroom/ wheat germ/ *Moringa*

## SEMESTER IV Paper I THEORY

Course Code	Title	Credits
<b>SIUSBOT41</b>	<b>Plant Diversity</b>	<b>2 (45 Lects.)</b>
<p><b>LEARNING OBJECTIVES</b>            The students will be able to-</p> <ul style="list-style-type: none"> <li>❖ Study different Fungi w.r.t. their general characters, structure, life cycle &amp; pathogenicity.</li> <li>❖ Understand the basic features of Pteridophyta and Paleobotany.</li> <li>❖ 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>Unit I : Thallophyta: Fungi, Plant Pathology</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>		15 L
<p><b>Unit II: Pteridophyta and Paleobotany -</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; Structure and systematic position of form genus <i>Rhynia</i></li> </ul>		15 L
<p><b>Unit III : Gymnosperms</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 followed)</li> <li>• Structure life cycle and systematic position of <i>Pinus</i></li> <li>• Structure and systematic position of the form genus <i>Cordaites</i></li> </ul>		15 L

**Semester IV SIUSBOTP41 Practical Paper I – Plant Diversity II CR1**

**Fungi and Plant Pathology**

- 1 Study of stages in the life cycle of *Aspergillus* from fresh/ preserved material and permanent slides.
- 2 Study of stages in the life cycle of *Xylaria* from fresh/ preserved material and permanent slides.
- 3 Study of stages in the life cycle of *Agaricus* from fresh/ preserved material and permanent slides.
- 4 Study of fungal diseases as prescribed for theory.

**Pteridophyta and Palaeobotany**

- 5 Study of stages in the life cycle of *Selaginella* from fresh/ preserved material and permanent slides.
- 6 Study of form genera *Rhynia* with the help of permanent slides/ photomicrographs.

**Gymnosperms**

- 7- Study of stages in the life cycle of *Pinus* from fresh/ preserved material and permanent slides.
- 8- Study of the form genus *Cordaites* with the help of permanent slide/ photomicrographs.

## SEMESTER IV Paper II THEORY

Course Code	Title	Credits
<b>SIUSBOT42</b>	<b>Plant Diversity</b>	<b>2 (45 lects )</b>
<p><b>LEARNING OBJECTIVES</b></p> <p>The students will be able to-</p> <ul style="list-style-type: none"> <li>❖ Understand the mechanical tissue and secondary growth in plants.</li> <li>❖ Learn various processes involved in respiration and basic reproductive biology in plants.</li> <li>❖ Study the different biogeochemical cycle and various ecological factors.</li> </ul> <p><b>CIA – Class Test (20M) + Assignment/ Case Study/ Presentation (15M) + Class Participation (5M)</b></p>		
<p><b>Unit I : Anatomy</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>		15 L
<p><b>Unit II : Plant Physiology and Plant Biochemistry</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>		15 L
<p><b>Unit III : Ecology and Environmental Botany</b></p> <ul style="list-style-type: none"> <li>• Biogeochemical Cycles- Carbon, Nitrogen and Water.</li> <li>• Ecological factors: Concept of environmental factors. Soil as an edaphic factor, Soil composition, types of soil, soil formation, soil profile.</li> <li>• Community ecology- Characters of community - Quantitative characters and qualitative characters</li> </ul>		15 L

**Semester IV SIUSBOTP42 Practical Paper II – Forms & Functions CR1**

<b>Anatomy</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.
<b>Plant Physiology and Plant Biochemistry</b>	
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).
<b>Ecology and Environmental Botany</b>	
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

## SEMESTER IV Paper III THEORY

Course Code	Title	Credits
SIUSBOT43	CURRENT TRENDS IN PLANT SCIENCES I	2 (45 lects)
<p><b>LEARNING OBJECTIVES</b></p> <p>The students will be able to understand-</p> <ul style="list-style-type: none"> <li>❖ Learn the basics of indoor gardening and various national parks and botanical garden.</li> <li>❖ Introduction to plant tissue culture and r-DNA technology.</li> <li>❖ Understand applications of biostatistics &amp; bioinformatics.</li> </ul> <p><b>CIA – Class Test (20M) + Assignment/ Case Study/ Presentation (15M) + Class Participation (5M)</b></p>		
<p><b>Unit I : Horticulture and Gardening Introduction to Horticulture:</b></p> <ul style="list-style-type: none"> <li>• Branches of Horticulture</li> <li>• Bonsai, dish garden &amp; terrarium</li> <li>• <b>Types of garden</b> -Formal and informal gardens</li> <li>• National Park: Sanjay Gandhi National Park.</li> <li>• Botanical Garden: Veer Mata Jijabai Udyan (Victoria Garden).</li> <li>• Flower arrangements: Bouquets, gajra, veni, garland, Floral rangoli.</li> </ul>		15 L
<p><b>Unit II : Biotechnology</b></p> <p><b>Introduction to plant tissue culture</b></p> <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> <p><b>r-DNA technology-</b></p> <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>		15 L
<p><b>Unit III : Biostatistics and Bioinformatics</b></p> <ul style="list-style-type: none"> <li>• <b>Biostatistics:</b> The chi square test. Correlation – Calculation of coefficient of correlation.</li> <li>• <b>Bioinformatics:</b> 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.</li> </ul>		15 L



**Semester IV SIUSB0TP43 Practical Paper III – Current Trends In Plant Sciences I CR1**

**Horticulture**

- 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 preparation.

**Biotechnology**

- 4 Various sterilization techniques
- 5 Preparation of Stock solutions, Preparation of MS medium.
- 6 Seed sterilization, callus induction
- 7 Regeneration of plantlet from callus.
- 8 Identification of the cloning vectors – pBR322, pUC 18, Ti plasmid.

**Biostatistics and Bioinformatics**

- 9 Chi square test
- 10 Calculation of coefficient of correlation
- 11 Web Search – Google, Entrez.
- 12 BLAST

Three/Fourth Semester

Sub: Botany

Class: S.Y.B.Sc

Paper: I/II/III

Day:

Date:

Time:

Marks: 60

N.B.:

- 1) All questions are Compulsory.
- 2) Figures to the right indicate marks.
- 3) Draw neat labelled diagrams wherever necessary.

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

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**SIES COLLEGE OF ARTS, SCIENCE & COMMERCE**

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

**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 **10 M**

**OR**

Separate Carotenoids by thin layer chromatography.

Q. 4 Identify and describe slide/ specimen '**D**' '**E**', '**F**' & '**G**' **12M**

Q. 5 Viva - voce **05M**

Q. 6 Field Book **05M**

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**Key -**

A- Algae

B -Bryophyta

C- Angiosperms

D – Algae/ Bryophyta

E & F – Flower morphology

G - Horizontal / Vertical Gel Electrophoresis Unit

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**SIES COLLEGE OF ARTS, SCIENCE & COMMERCE**

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

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

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

**OR**

Determine the sequence of Amino acids in the polypeptide synthesized from the given mRNA strand **C**.

- Q. 4 Identify and describe slide/ specimen '**D**', '**E**', & '**F**'. **15M**
- Q. 5 Journal **05M**

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**Key –**

- A – Mitosis/ Meiosis  
B – Germinating seeds or Onion  
C- DNA/ mRNA sequence  
D- Cell organelles  
E- Plastid inheritance  
F- Chromosomal aberrations.

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**SIES COLLEGE OF ARTS, SCIENCE & COMMERCE**

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

**PRACTICAL III**

**Duration: 3 hours**

**Max. Marks: 50**

- |  |            |
|--|------------|
| Q. 1 Describe microscopic & macroscopic characters of Specimen A.                        | <b>10M</b> |
| Q. 2 Prepare face pack / herbal shampoo & comment upon the role of the ingredients used. | <b>08M</b> |
| Q. 3 Estimate nutraceutical value of protein from given sample B.                        | <b>08M</b> |
| Q. 4. Perform the TLC of given oil sample C.   | <b>08M</b> |
| Q.5 Perform the test for _____ & _____ from Specimen D & E.                              | <b>08M</b> |
| Q. 6. Identify and describe slide/specimen 'F' & 'G'                                     | <b>08M</b> |

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**Key –**

A: Drug & adulterant

B: Nutraceuticals

C: Jojoba/ Geranium/ Lavender/ Patchouli oil

D &E: alkaloids, glycosides, saponins, phenolics

F: Fibres

G: Spices & condiments

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**SIES COLLEGE OF ARTS, SCIENCE & COMMERCE**  
**S.Y.B.Sc. BOTANY SEMESTER IV**  
**PLANT DIVERSITY III**  
**PRACTICAL I**

**Duration: 3 hours**

**Max. Marks: 50**

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

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Key –

A & B- Fungi

C - Pteridophyte

D - Gymnosperm

E - Plant pathology

F- *Rhynia*

G - *Pinus*

H - *Cordaites*

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**SIES COLLEGE OF ARTS, SCIENCE & COMMERCE**

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

**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. **10M**

**OR**

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.

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**SIES COLLEGE OF ARTS, SCIENCE & COMMERCE**

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

**PRACTICAL III**

**Duration: 3 hours**

**Max. Marks: 50**

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

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Key –

A: Garden plan

B: Moong / Mustard seeds

E: Bottle/ dish garden

F: Cloning vector

G & H: Garden plants

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College of Arts,  
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RISE WITH EDUCATION  
Sion (W), Mumbai - 400022

**Program: B.Sc.**  
**Course: BOTANY**  
**Syllabus for T.Y.B.Sc.**  
**To be implemented from 2018-19**

Credit Based Semester and Grading System with  
effect from the academic year 2018-19

## PREAMBLE

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

In the revised autonomous syllabus, the committee has taken utmost care to maintain the continuity in the flow of information at T.Y.B.Sc. level. Hence, some of the modules of the existing university syllabus have been upgraded with the new modules in order to introduce the learners to the recent developments in various branches of Botany. All the papers of theory and practicals (Semester - V & Semester - VI together) are compulsory for the students according to their specialization.

Each theory period shall be of 48 minutes duration. Theory component shall have 240 instructional periods per semester. Each practical will be of 4 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 and half hours duration.
- ii. Theory 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 V**

Course	PAPER I			PAPER II			PAPER III			PAPER IV			Grand Total
	Internal	External	Total	Internal	External	Total	Internal	External	Total	Internal	External	Total	
<b>Theory</b>	40	60	100	40	60	100	40	60	100	40	60	100	<b>400</b>
<b>Practicals</b>	-	50	50	-	50	50	-	50	50	-	50	50	<b>200</b>

#### **Overall Examination and Marks Distribution Pattern for Semester VI**

Course	PAPER I			PAPER II			PAPER III			PAPER IV			Grand Total
	Internal	External	Total	Internal	External	Total	Internal	External	Total	Internal	External	Total	
<b>Theory</b>	40	60	100	40	60	100	40	60	100	40	60	100	<b>400</b>
<b>Practicals</b>	-	50	50	-	50	50	-	50	50	-	50	50	<b>200</b>

**T.Y.B.Sc. Botany Syllabus (Restructured for Credit Based and Grading System)  
To be implemented from the Academic year 2018-2019**

**SEMESTER V**

Course Code	UNIT	TOPICS	Credit L / Weeks		
<b>SIUSBOT51</b>	<b>PLANT DIVERSITY III</b>		<b>2.5</b>		
	<b>I</b>	<b>Microbiology</b>			<b>1</b>
	<b>II</b>	<b>Algae</b>			<b>1</b>
	<b>III</b>	<b>Fungi</b>			<b>1</b>
	<b>IV</b>	<b>Plant Pathology</b>	<b>1</b>		
<b>SIUSBOTP52</b>	<b>PLANT DIVERSITY IV</b>		<b>2.5</b>		
	<b>I</b>	<b>Paleobotany</b>			<b>1</b>
	<b>II</b>	<b>Angiosperms I</b>			<b>1</b>
	<b>III</b>	<b>Anatomy I</b>			<b>1</b>
	<b>IV</b>	<b>Palynology</b>	<b>1</b>		
<b>SIUSBOT53</b>	<b>FORM AND FUNCTION III</b>		<b>2.5</b>		
	<b>I</b>	<b>Cytology and Molecular biology</b>			<b>1</b>
	<b>II</b>	<b>Physiology I</b>			<b>1</b>
	<b>III</b>	<b>Environmental Botany</b>			<b>1</b>
	<b>IV</b>	<b>Plant tissue culture</b>	<b>1</b>		
<b>SIUSBOTP54</b>	<b>CURRENT TRENDS IN PLANT SCIENCES II</b>		<b>2.5</b>		
	<b>I</b>	<b>Ethnobotany and Mushroom Industry</b>			<b>1</b>
	<b>II</b>	<b>Biotechnology I</b>			<b>1</b>
	<b>III</b>	<b>Instrumentation</b>			<b>1</b>
	<b>IV</b>	<b>Pharmacognosy and medicinal botany</b>	<b>1</b>		
<b>SIUSBOTP51 SIUSBOTP52 SIUSBOTP53 SIUSBOTP54</b>	<b>Practicals based on all the four courses in theory</b>		<b>6</b>	<b>16</b>	

**SEMESTER VI**

Course Code	UNIT	TOPICS	Credit L / Weeks		
<b>SIUSBOT61</b>	<b>PLANT DIVERSITY III</b>		<b>2.5</b>		
	<b>I</b>	<b>Bryophyta</b>			<b>1</b>
	<b>II</b>	<b>Pteridophyta</b>			<b>1</b>
	<b>III</b>	<b>Bryophyta and Pteridophyta: Applied aspects</b>			<b>1</b>
	<b>IV</b>	<b>Gymnosperms</b>	<b>1</b>		
<b>SIUSBOTP62</b>	<b>PLANT DIVERSITY IV</b>		<b>2.5</b>		
	<b>I</b>	<b>Angiosperms II</b>			<b>1</b>
	<b>II</b>	<b>Anatomy II</b>			<b>1</b>
	<b>III</b>	<b>Embryology</b>			<b>1</b>
	<b>IV</b>	<b>Biostatistics</b>	<b>1</b>		
<b>SIUSBOT63</b>	<b>FORM AND FUNCTION III</b>		<b>2.5</b>		
	<b>I</b>	<b>Plant Biochemistry</b>			<b>1</b>
	<b>II</b>	<b>Physiology II</b>			<b>1</b>
	<b>III</b>	<b>Genetics</b>			<b>1</b>
	<b>IV</b>	<b>Bioinformatics</b>	<b>1</b>		
<b>SIUSBOTP64</b>	<b>CURRENT TRENDS IN PLANT SCIENCES II</b>		<b>2.5</b>		
	<b>I</b>	<b>Plant biotechnology II</b>			<b>1</b>
	<b>II</b>	<b>Plant Geography</b>			<b>1</b>
	<b>III</b>	<b>Economic Botany</b>			<b>1</b>
	<b>IV</b>	<b>Post-harvest Technology</b>	<b>1</b>		
<b>SIUSBOTP61 SIUSBOTP62 SIUSBOTP63 SIUSBOTP64</b>	<b>Practicals based on all the four courses in theory</b>		<b>6</b>	<b>16</b>	

**SEMESTER V THEORY**

<b>Course Code</b>	<b>Title</b>	<b>Credits</b>
<b>SIUSBOT51</b>	<b>PLANT DIVERSITY III</b>	<b>2.5 Credits (60 lectures)</b>
<p><b>LEARNING OBJECTIVES</b>            The students will be able to -</p> <ul style="list-style-type: none"> <li>❖ Study different types of microbes. Culturing &amp; fermentation techniques.</li> <li>❖ Understand the morphology, general characteristics and economic importance of algae and fungi.</li> <li>❖ Learn the different plant diseases w.r.t. symptoms &amp; control measures.</li> </ul> <p><b>CIA – Class Test (20M) + Assignment/ Case Study/ Presentation (15M) + Class Participation (5M)</b></p>		
<p><b><u>Unit I: Microbiology</u></b></p> <ul style="list-style-type: none"> <li>• Types of Microbes</li> <li>• Culturing: Sterilization, media, staining, colony characters</li> <li>• Pure cultures</li> <li>• Role of microbes in fermentation: Alcohol and Antibiotics</li> </ul>		<b>(15 lectures )</b>
<p><b><u>Unit II: Algae</u></b></p> <ul style="list-style-type: none"> <li>• Division <u>Rhodophyta</u> Classification and General Characters: Distribution, Cell structure, pigments, reserve food, range of thallus, reproduction: asexual and sexual, Alternation of Generations, Economic Importance.</li> <li>• Structure, life cycle and systematic position of <i>Polysiphonia</i>, <i>Batrachospermum</i></li> <li>• Classification and General Characters of <u>Xanthophyta</u>: Distribution, Cell structure, pigments, reserve food, range of thallus, Reproduction: asexual and sexual, Alternation of Generations, Economic Importance.</li> <li>• Structure, life cycle and systematic position of <i>Vaucheria</i></li> <li>• Classification and General Characters of <u>Bacillariophyta</u>: Distribution, Cell structure, pigments, reserve food, range of thallus, Reproduction: asexual and sexual, Alternation of Generations, Economic Importance.</li> <li>• Structure, life cycle and systematic position of <i>Pinnularia</i></li> </ul>		<b>(15 lectures )</b>
<p><b><u>Unit III: Fungi</u></b></p> <ul style="list-style-type: none"> <li>• Basidiomycetes: Classification and General characters</li> <li>• Life cycle of <i>Agaricus</i></li> <li>• Life cycle of <i>Puccinia</i></li> <li>• Deuteromycetae: Classification and General Characters</li> <li>• Life cycle of <i>Alternaria</i></li> </ul>		<b>(15 lectures )</b>
<p><b><u>Unit IV: Plant Pathology</u></b></p> <ul style="list-style-type: none"> <li>• Study of plant diseases: Causative organism, symptoms, predisposing factors, disease cycle and control measures of the following.               <ul style="list-style-type: none"> <li>▪ White Rust – <i>Albugo sp.</i></li> <li>▪ Tikka disease of ground nut – <i>Cercospora</i></li> <li>▪ Damping off disease – <i>Pythium</i></li> <li>▪ Citrus canker – <i>Xanthomonas sp.</i></li> <li>▪ Leaf curl – leaf curl virus</li> </ul> </li> <li>• Study of Physical, chemical and biological control methods of plant diseases.</li> </ul>		<b>(15 lectures )</b>

Course Code	Title	Credits
SIUSBOT52	PLANT DIVERSITY III	2.5 (60 lectures)
<p><b>LEARNING OBJECTIVES</b></p> <p>The students will be able to-</p> <ul style="list-style-type: none"> <li>❖ Study different fossils &amp; contribution of Birbal Sahni in the field of Paleobotany.</li> <li>❖ Understand the morphology of fruits &amp; general characteristics and economic importance of angiosperms.</li> <li>❖ Learn the different aspects of plant anatomy &amp; palynology.</li> </ul> <p><b>CIA</b> – Class Test (20M) + Assignment/ Case Study/ Presentation (15M) + Class Participation (5M)</p>		
<p><b><u>Unit I : Paleobotany</u></b></p> <ul style="list-style-type: none"> <li>• <i>Calamites</i> – All form genera Stem, leaf, male and female fructification</li> <li>• <i>Lepidodendron</i>–All form genera root, stem, bark, leaf, male and female fructification</li> <li>• <i>Lyginopteris</i> – All form genera root, stem, leaf, male and female fructification</li> <li>• <i>Pentoxylon</i> – All form genera</li> <li>• Contribution of Birbal Sahni, Birbal Sahni Institute of Paleobotany, Lucknow</li> </ul>		(15 lectures )
<p><b><u>Unit II : Angiosperms I</u></b></p> <ul style="list-style-type: none"> <li>• Morphology of fruit</li> <li>• Complete classification of Bentham and Hooker (only for prescribed families), Merits and demerits</li> <li>• Bentham and Hooker’s system of classification for flowering plants up to family with respect to the following prescribed families and economic and medicinal importance for members of the families <ul style="list-style-type: none"> <li>○ Capparidaceae</li> <li>○ Umbelliferae</li> <li>○ Cucurbitaceae</li> <li>○ Rubiaceae</li> <li>○ Solanaceae</li> <li>○ Commelinaceae</li> <li>○ Graminae</li> </ul> </li> </ul>		(15 lectures )
<p><b><u>Unit III : Anatomy</u></b></p> <ul style="list-style-type: none"> <li>• Anomalous secondary growth in the Stems of <i>Bignonia</i>, <i>Salvadora</i>, <i>Achyranthes</i>, <i>Aristolochia</i>, <i>Dracaena</i>. Storage roots of Beet, Radish</li> <li>• Root stem transition</li> <li>• Types of Stomata – Anomocytic, Anisocytic, Diacytic, Paracytic, and Gramineous</li> </ul>		(15 lectures )
<p><b><u>Unit IV : Palynology</u></b></p> <ul style="list-style-type: none"> <li>• Pollen Morphology</li> <li>• Pollen viability – storage</li> <li>• Germination and growth of pollen</li> <li>• Application of Palynology in honey industry, coal and oil exploration, Aerobiology and pollen allergies, forensic science</li> </ul>		(15 lectures )

Course Code	Title	Credits
<b>SIUSBOT53</b>	<b>FORM AND FUNCTIONS- II</b>	<b>2.5 (60 lects.)</b>
<b>LEARNING OBJECTIVES</b> The students will be able to- <ul style="list-style-type: none"> <li>❖ Study structure of nucleus &amp; its function also characteristics of the genetic code, transcription and translation processes.</li> <li>❖ Understand different aspects of water relations in plants. Bioremediation &amp; succession.</li> <li>❖ Learn the different techniques in Plant tissue culture &amp; its application.</li> </ul> <b>CIA – Class Test (20M) + Assignment/ Case Study/ Presentation (15M) + Class Participation (5M)</b>		
<b><u>Unit I : Cytology And Molecular Biology</u></b> <ul style="list-style-type: none"> <li>• Structure and function of nucleus</li> <li>• Structure and function of vacuole</li> <li>• Structure and function of giant chromosomes</li> <li>• The genetic code: Characteristics of the genetic code</li> <li>• Transcription and Translation in Eukaryotes</li> </ul>		<b>(15 lectures )</b>
<b><u>Unit II: Physiology</u></b> <ul style="list-style-type: none"> <li>• <b>Water relations:</b> Potential, osmosis, transpiration, imbibition,</li> <li>• Solute transport: Transport of ions across cell membranes, active and passive transport, carriers, channels and pumps.</li> <li>• Translocation of solutes: Composition of phloem sap, girdling experiment, pressure flow model, phloem loading and unloading, anatomy of sieve tube elements, mechanisms of sieve tube translocation, Munch's hypothesis.</li> </ul>		<b>(15 lectures )</b>
<b><u>Unit III: Environmental Botany</u></b> <ul style="list-style-type: none"> <li>• <b>Bioremediation:</b> Principles, factors responsible and microbial population in bioremediation.</li> <li>• <b>Phytoremediation:</b> Metals, Organic pollutants</li> <li>• <b>Plant succession:</b> Hydrosere and Xerosere – Formation of barren space, succession on the land citing different seres leading up to the climax, succession in water, ecesis, poly and monocl原因 theories</li> </ul>		<b>(15 lectures )</b>
<b><u>Unit IV: Plant Tissue Culture</u></b> <ul style="list-style-type: none"> <li>• Applications of micropropagation in Floriculture and detailed study of Orchid culture.</li> <li>• Plant cell suspension cultures for the production of secondary metabolites with special reference to Shikonin production.</li> <li>• Somatic embryogenesis and artificial seeds- Concept, definition and various methods of protoplast fusion</li> <li>• Applications of somatic hybridization in agriculture</li> </ul>		<b>(15 lectures )</b>

Course Code	Title	Credits
SIUSBOT54	CURRENT TRENDS IN PLANT SCIENCES I	2.5 (60 lects)
<p><b>LEARNING OBJECTIVES</b></p> <p>The students will be able to-</p> <ul style="list-style-type: none"> <li>❖ Study construction of DNA libraries and analysis of genes.</li> <li>❖ Understand the basic principles &amp; methods of ethnobotany and medicinal botany.</li> <li>❖ Learn Colorimetry and Spectrophotometry.</li> </ul> <p>CIA – Class Test (20M) + Assignment/ Case Study/ Presentation (15M) + Class Participation (5M)</p>		
<p><b><u>Unit I: Ethnobotany And Mushroom Industry</u></b></p> <ul style="list-style-type: none"> <li>• <b>Ethnobotany</b> - Definition, history, sources of data and methods of study.</li> <li>• <b>Applications of Ethnobotany:</b> 1) Ethnomedicines 2) Agriculture 3) Famine related plants 4) Toxic plants and Antidotes.</li> <li>• <b>Traditional medicines</b> as used by tribals in Maharashtra towards <ul style="list-style-type: none"> <li>i) Skin ailments: <i>Rubia cordifolia</i>, Sandalwood</li> <li>ii) Liver ailments : <i>Phyllanthus</i> , <i>Andrographis</i></li> <li>iii) Wound healing and ageing: <i>Centella</i>, <i>Typha</i>, <i>Terminalia</i>, <i>Tridax</i></li> <li>iv) Fever : <i>Vitex negundo</i>, <i>Tinospora cordifolia</i> leaves</li> <li>v) Diabetes: <i>Momordica charantia</i>, <i>Syzygium cuminii</i></li> </ul> </li> <li>• <b>Mushroom industry:</b> Commercial production of the mushrooms - <i>Pleurotus</i>, <i>Agaricus</i> and <i>Volvariella</i> with respect to composting, spawning, casing, harvesting, picking and packaging, nutritional value and economic importance.</li> </ul>		<p><b>(15 lectures )</b></p>
<p><b><u>Unit II: Biotechnology I</u></b></p> <ul style="list-style-type: none"> <li>• Construction of genomic DNA libraries, Chromosome libraries and c-DNA libraries.</li> <li>• Identification of specific cloned sequences in cDNA libraries and Genomic libraries</li> <li>• Analysis of genes and gene transcripts – Restriction enzyme, analysis of cloned DNA sequences.</li> <li>• Hybridization (Southern Hybridization)</li> </ul>		<p><b>(15 lectures )</b></p>
<p><b><u>Unit III: Instrumentation</u></b></p> <ul style="list-style-type: none"> <li>• Colorimetry and Spectrophotometry (Visible, UV and IR) - Instrumentation, working, principle and applications.</li> <li>• Chromatography: General account of Column chromatography. Principle and bedding material involved in adsorption and partition chromatography, ion exchange chromatography, molecular sieve chromatography.</li> </ul>		<p><b>(15 lectures )</b></p>
<p><b><u>Unit IV: Pharmacognosy And Medicinal Botany</u></b></p> <ul style="list-style-type: none"> <li>• Monographs of drugs with reference to biological sources, geographical distribution, common varieties, macro and microscopic characters, chemical constituents, therapeutic uses, adulterants – <ul style="list-style-type: none"> <li>▪ <i>Strychnos</i> seeds,</li> <li>▪ Senna leaves,</li> <li>▪ Clove buds,</li> <li>▪ <i>Allium sativum</i>,</li> <li>▪ <i>Acorus calamus</i> and</li> <li>▪ <i>Curcuma longa</i></li> </ul> </li> </ul>		<p><b>(15 lectures )</b></p>



**SEMESTER V PRACTICAL**

<b>PRACTICAL Paper I – PLANT DIVERSITY III SIUSBOTP51</b>	<b>Cr. 1.5</b>
<b>Microbiology</b> <ul style="list-style-type: none"><li>• Study of aeromicrobiota by petriplate exposed method Fungal culture; Bacterial culture</li><li>• Determination of Minimum Inhibitory Concentration (MIC) of sucrose against selected micro organism</li><li>• Study of antimicrobial activity by the disc diffusion method</li></ul>	
<b>Algae</b> <p>Study of stages in the life cycle of the following Algae from fresh / preserved material and permanent slides</p> <ul style="list-style-type: none"><li>• <i>Polysiphonia</i></li><li>• <i>Batrachospermum</i></li><li>• <i>Vaucheria</i></li><li>• <i>Pinnularia</i></li></ul>	
<b>Fungi</b> <p>Study of stages in the life cycle of the following Fungi from fresh / preserved material and permanent slides</p> <ul style="list-style-type: none"><li>• <i>Agaricus</i></li><li>• <i>Puccinia</i></li><li>• <i>Alternaria</i></li></ul>	
<b>Plant Pathology</b> <p>Study of the following fungal diseases:</p> <ul style="list-style-type: none"><li>• White rust</li><li>• Tikka disease in Groundnut</li><li>• Damping off disease</li><li>• Citrus canker</li><li>• Leaf curl</li></ul>	
<b>PRACTICAL Paper II – PLANT DIVERSITY IV SIUSBOTP52</b>	
<b>Paleobotany</b> <p>Study of the following form genera with the help of permanent slides/ photomicrographs.</p> <ul style="list-style-type: none"><li>• <i>Calamites</i></li><li>• <i>Lepidodendron</i></li><li>• <i>Lyginopteris</i></li><li>• <i>Pentoxylon</i></li></ul>	
<b>Angiosperms</b> <ul style="list-style-type: none"><li>• Morphology of fruit</li><li>• Study of one plant from each of the following Angiosperm families<ul style="list-style-type: none"><li>▪ Capparidaceae</li><li>▪ Umbelliferae</li><li>▪ Cucurbitaceae</li><li>▪ Rubiaceae</li><li>▪ Solanaceae</li><li>▪ Commelinaceae</li><li>▪ Graminae</li></ul></li><li>• Morphological peculiarities and economic importance of the members of the above mentioned Angiosperm families</li><li>• Identifying the genus and species of a plant with the help of Flora</li></ul>	
<b>Anatomy I</b> <p><b>Study of anomalous secondary growth in the stems using double staining technique:</b></p> <ul style="list-style-type: none"><li>• <i>Bignonia</i></li><li>• <i>Salvadora</i></li><li>• <i>Achyranthes</i></li><li>• <i>Aristolochia</i></li><li>• <i>Dracaena</i></li></ul>	

<p><b>Study of anomalous secondary growth in the roots of</b></p> <ul style="list-style-type: none"> <li>• Beet</li> <li>• Radish</li> </ul> <p><b>Types of Stomata</b></p> <ul style="list-style-type: none"> <li>• Anomocytic</li> <li>• Anisocytic</li> <li>• Diacytic</li> <li>• Paracytic</li> <li>• Graminaceous</li> </ul>	
<p><b>Palynology</b> Study of pollen morphology (NPC Analysis) of the following by Chitale's Method</p> <ul style="list-style-type: none"> <li>• <i>Hibiscus</i></li> <li>• <i>Datura</i></li> <li>• <i>Ocimum</i></li> <li>• <i>Crinum</i></li> <li>• <i>Pancreatium</i></li> <li>• <i>Canna</i></li> </ul> <p>Determination of pollen viability Pollen analysis from honey sample – unifloral and multifloral honey Effect of varying concentration of sucrose on <i>In vitro</i> Pollen germination</p>	
<b>PRACTICAL - Paper III FORM AND FUNCTION II SIUSBOTP53</b>	
<p><b>Cytology And Molecular Biology</b></p> <ul style="list-style-type: none"> <li>• Mounting of Giant chromosomes from Chironomous larva</li> <li>• Smear preparation from <i>Tradescantia</i> buds</li> <li>• Predicting the sequence of amino acids in the polypeptide chain that will be formed following translation (Eukaryotic)</li> </ul>	
<p><b>Physiology</b></p> <ul style="list-style-type: none"> <li>• Estimation of Phosphate phosphorus (Plant acid extract )</li> <li>• Estimation of Iron (Plant acid extract )</li> </ul>	
<p><b>Environmental Botany</b> Estimation of the following in given water sample</p> <ul style="list-style-type: none"> <li>• Dissolved oxygen demand</li> <li>• Biological oxygen demand</li> <li>• Hardness</li> <li>• Salinity and Chlorinity</li> </ul>	
<p><b>Micropropogation</b> Plant Tissue culture:</p> <ul style="list-style-type: none"> <li>• Identification – Multiple shoot culture, hairy root culture, somatic embryogenesis</li> <li>• Preparation of stock solutions for preparation of MS medium</li> </ul> <p>(Note: Concept of preparation of specified molar solutions should be taught and problems based on preparation of stock solutions for tissue culture media will be given).</p>	
<b>PRACTICAL - Paper IV CURRENT TRENDS IN PLANT SCIENCES II SIUSBOTP54</b>	
<p><b>Ethnobotany And Mushroom Industry</b></p> <ul style="list-style-type: none"> <li>• Study of plants mentioned in theory for Ethnobotany</li> <li>• Mushroom cultivation (To be demonstrated)</li> <li>• Identification of various stages involved in mushroom cultivation – spawn, pin head stage, mature/ harvest stage of <i>Agaricus</i>, <i>Pleurotus</i>, <i>Volvariella</i></li> </ul>	
<p><b>Biotechnology I</b></p> <ul style="list-style-type: none"> <li>• Growth curve of E. coli</li> <li>• Plasmid DNA isolation and Separation of DNA using AGE</li> <li>• Restriction mapping (problems), Southern blotting</li> </ul>	
<p><b>Instrumentation</b></p> <ul style="list-style-type: none"> <li>• Demonstration of Beer Lambert's Law</li> <li>• Experiment based on ion exchange chromatography for demonstration</li> <li>• Experiment based on separation of dyes/ plant pigments using silica gel column.</li> </ul>	

**Pharmacognosy**

Macroscopic/ Microscopic characters and Chemical tests for active constituents of the following plants

- *Allium sativum*
- *Acorus calamus*
- *Curcuma longa*
- *Senna angustifolia*
- *Strychnos nux-vomica*
- *Eugenia caryophyllata*

**SEMESTER VI**

Course Code	Title	Credits
SIUSBOT61	PLANT DIVERSITY III	2.5 (60 Lects.)
<b>LEARNING OBJECTIVES</b> The students will be able to- <ul style="list-style-type: none"><li>❖ Study different bryophytes w.r.t. their morphology, general characteristics and ecology as well as economic importance.</li><li>❖ Learn the different pteridophytes w.r.t. their morphology, general characteristics and ecology as well as economic importance.</li><li>❖ Understand life cycles of few coniferophytes and their economic importance.</li></ul> CIA – Class Test (20M) + Assignment/ Case Study/ Presentation (15M) + Class Participation (5M)		
<b><u>Unit I : Bryophyta</u></b> <ul style="list-style-type: none"><li>• Life cycle of <i>Marchantia</i></li><li>• Life cycle of <i>Pellia</i></li><li>• Life cycle of <i>Funaria</i></li></ul>		(15 lectures )
<b><u>Unit II : Pteridophyta</u></b> <ul style="list-style-type: none"><li>• Lepidophyta – Classification, general characters; Life cycle of <i>Lycopodium</i></li><li>• Calamophyta – Classification, general characters; Life cycle of <i>Equisetum</i></li><li>• Pterophyta – Classification and general characters, Life cycle of <i>Adiantum</i> and <i>Marsilea</i></li></ul>		(15 lectures )
<b><u>Unit III : Bryophytes and Pteridophytes: Applied aspects</u></b> <ul style="list-style-type: none"><li>• Ecology of Bryophytes</li><li>• Economic importance of Bryophytes</li><li>• Bryophytes as indicators</li><li>• Evolution of Sporophyte and Gametophyte</li><li>• Economic importance of Pteridophytes</li><li>• Diversity and distribution of Indian Pteridophytes</li><li>• Types of sori and evolution of sori</li></ul>		(15 lectures )
<b><u>Unit IV : Gymnosperms</u></b> <ul style="list-style-type: none"><li>• Life cycle of <i>Biota (Thuja)</i>, Classification</li><li>• Life cycle of <i>Gnetum</i>, Classification</li><li>• Life cycle of <i>Ephedra</i>, Classification</li><li>• Economic importance of Gymnosperms</li></ul>		(15 lectures )

Course Code	Title	Credits
SIUSBOT62	PLANT DIVERSITY IV	2.5 (60 lects)
<b>LEARNING OBJECTIVES</b> The students will be able to- <ul style="list-style-type: none"> <li>❖ Understand the general characteristics and economic importance of angiosperms &amp; Major Botanic gardens of India.</li> <li>❖ Learn the different aspects of ecological anatomy &amp; embryology.</li> <li>❖ Study different statistical tests &amp; their applications.</li> </ul> CIA – Class Test (20M) + Assignment/ Case Study/ Presentation (15M) + Class Participation (5M)		
<b><u>Unit I : Angiosperms II</u></b> <ul style="list-style-type: none"> <li>• Major Botanic gardens of India – Indian Botanic Garden, Howrah; National Botanic Garden (NBRI) Lucknow; Lloyd Botanic Garden, Darjeeling; Lalbaugh or Mysore State Botanic Garden Bangalore</li> <li>• Botanical survey of India and regional branches of India</li> <li>• Study of following plant families               <ul style="list-style-type: none"> <li>➤ Combretaceae</li> <li>➤ Rhamnaceae</li> <li>➤ Asclepiadaceae</li> <li>➤ Labiatae</li> <li>➤ Euphorbiaceae</li> <li>➤ Cannaceae</li> </ul> </li> <li>• Hutchinson’s classification – merits and demerits</li> </ul>		<b>(15 lectures )</b>
<b><u>Unit II : Anatomy II</u></b> Ecological anatomy <ul style="list-style-type: none"> <li>• Hydrophytes – submerged, floating, rooted</li> <li>• Hygrophytes - <i>Typha</i></li> <li>• Mesophytes</li> <li>• Sciophytes</li> <li>• Halophytes</li> <li>• Epiphytes</li> <li>• Xerophytes</li> </ul>		<b>(15 lectures )</b>
<b><u>Unit III : Embryology</u></b> <ul style="list-style-type: none"> <li>• Microsporogenesis</li> <li>• Megasporogenesis - Development of monosporic type, examples of all embryo sacs</li> <li>• Types of ovules</li> <li>• Double fertilization</li> <li>• Development of embryo – <i>Capsella</i></li> </ul>		<b>(15 lectures )</b>
<b><u>Unit IV : Biostatistics</u></b> <ul style="list-style-type: none"> <li>• Test of significance student’s <i>t</i>-test (paired and unpaired)</li> <li>• Regression</li> <li>• ANOVA (one way)</li> </ul>		<b>(15 lectures )</b>

Course Code	Title	Credits
SIUSBOT63	FORM AND FUNCTION III	2.5 (60 lectures)
<p><b>LEARNING OBJECTIVES</b></p> <p>The students will be able to -</p> <ul style="list-style-type: none"> <li>❖ Understand biomolecules and Enzyme kinetics, nitrogen metabolism &amp; PGRs.</li> <li>❖ Study Genetic mapping in eukaryotes, Gene mutations &amp; metabolic disorders.</li> <li>❖ Learn the Organization, retrieval, analysis and application biological data.</li> </ul> <p><b>CIA</b> – Class Test (20M) + Assignment/ Case Study/ Presentation (15M) + Class Participation (5M)</p>		
<p><b><u>Unit I: Plant Biochemistry</u></b></p> <ul style="list-style-type: none"> <li>• Structure of biomolecules: Carbohydrates (sugars, starch, cellulose, pectin, lipids ( fatty acids and glycerol), proteins ( amino acids)</li> <li>• Enzymes: Nomenclature, classification, mode of action, Enzyme kinetics, Michaelis Menten equation, competitive non-competitive, and uncompetitive inhibitors.</li> </ul>		<b>15 Lectures</b>
<p><b><u>Unit II: Plant Physiology II</u></b></p> <ul style="list-style-type: none"> <li>• NITROGEN METABOLISM: Nitrogen cycle, root nodule formation, and leg haemoglobin, nitrogenase activity, assimilation of nitrates, (NR, NiR activity), assimilation of ammonia, (amination and transamination reactions), nitrogen assimilation and carbohydrate utilisation.</li> <li>• Physiological effects and commercial applications of Auxins, Gibberellins, Cytokinins and Abscissic acid</li> </ul>		<b>15 Lectures</b>
<p><b><u>Unit III: Genetics</u></b></p> <ul style="list-style-type: none"> <li>• Genetic mapping in eukaryotes: discovery of genetic linkage, gene recombination, construction of genetic maps, three point crosses and mapping chromosomes, problems based on the same</li> <li>• Gene mutations: definition, types of mutations, causes of mutations, induced mutations, the Ames' test</li> <li>• Metabolic disorders – enzymatic and non-enzymatic: Gene control of enzyme structure Garrod's hypothesis of inborn errors of metabolism, Phenylketonuria, albinism, sickle cell anaemia</li> </ul>		<b>15 Lectures</b>
<p><b><u>Unit IV: Bioinformatics</u></b></p> <ul style="list-style-type: none"> <li>• Organization of biological data, databases</li> <li>• Exploration of data bases, retrieval of desired data, BLAST.</li> <li>• Protein structure analysis and application</li> <li>• Multiple sequence analysis and phylogenetic analysis</li> </ul>		<b>15 Lectures</b>

Course Code	Title	Credits
SIUSBOT64	CURRENT TRENDS IN PLANT SCIENCES II	2.5 (60 lectures)
<p><b>LEARNING OBJECTIVES</b></p> <p>The students will be able to-</p> <ul style="list-style-type: none"> <li>❖ Understand DNA sequence analysis, PCR and DNA barcoding.</li> <li>❖ Study of Economic Botany and Post-Harvest Technology.</li> <li>❖ Learn Biodiversity and different Phytogeographical regions of India.</li> </ul> <p>CIA – Class Test (20M) + Assignment/ Case Study/ Presentation (15M) + Class Participation (5M)</p>		
<p><b>Unit I: Plant Biotechnology II</b></p> <ul style="list-style-type: none"> <li>• DNA sequence analysis – Maxam – Gilbert Method and Sanger’s method</li> <li>• Polymerase Chain reaction</li> <li>• DNA barcoding: Basic features, nuclear genome sequence, chloroplast genome sequence, <i>rbcL</i> gene sequence, <i>matK</i> gene sequence, present status of barcoding in plants</li> </ul>		15 Lectures
<p><b>Unit II: Plant Geography</b></p> <ul style="list-style-type: none"> <li>• <b>Phytogeographical regions of India.</b></li> <li>• <b>Biodiversity:</b> <ul style="list-style-type: none"> <li>▪ Definition, diversity of flora found in various forest types of India</li> <li>▪ Evolution of biodiversity with one example of an evolutionary tree</li> <li>▪ Levels of biodiversity</li> <li>▪ Importance and status of biodiversity</li> <li>▪ Loss of biodiversity</li> <li>▪ Conservation of biodiversity</li> <li>▪ Genetic diversity- Molecular characteristics</li> </ul> </li> </ul>		15 Lectures
<p><b>Unit III: Economic Botany</b></p> <ul style="list-style-type: none"> <li>• <b>Essential Oils:</b> Extraction, perfumes, perfume oils, oil of rose, sandalwood, patchouli, champa, grass oils: <i>Citronella</i>, Vetiver.</li> <li>• <b>Fatty oils :</b> Drying oil (linseed and soyabean oil), semidrying oils (cotton seed, sesame oil) and non-drying oils (olive oil and peanut oil),</li> <li>• <b>Vegetable Fats:</b> Coconut and Palm oil</li> </ul>		15 Lectures
<p><b>Unit IV: Post Harvest Technology</b></p> <p><b>Storage of Plant Produce - Preservation of Fruits and Vegetables</b></p> <ul style="list-style-type: none"> <li>• Drying (Dehydration)- (Natural conditions – Sun drying; Artificial drying- hot air drying, Vacuum drying, Osmotically dried fruits, Crystallized or Candied fruits, Fruit Leather, Freeze Drying)</li> <li>• Freezing (Cold air blast system , Liquid immersion method, Plate freezers, Cryogenic Freezing, Dehydrofreezing)</li> <li>• Canning</li> <li>• Pickling (in brine, in vinegar, Indian pickles)</li> <li>• Sugar Concentrates (Jams, Jellies, Fruit juices)</li> <li>• Use of Chemical preservatives and antioxidants in preservation</li> </ul>		15 Lectures

**SEMESTER VI**  
**PRACTICAL**

Semester VI	Cr
<b>PRACTICAL PAPER I – PLANT DIVERSITY III SIUSBOTP61</b>	<b>1.5</b>
<p><b>Bryophyta</b> Study of stages in the life cycle of the following Bryophyta from fresh / preserved material and permanent slides</p> <ul style="list-style-type: none"> <li>▪ <i>Marchantia</i></li> <li>▪ <i>Pellia</i></li> <li>▪ <i>Funaria</i></li> </ul>	
<p><b>Pteridophyta</b> Study of stages in the life cycles of the following Pteridophytes from fresh / preserved material and permanent slides</p> <ul style="list-style-type: none"> <li>▪ <i>Lycopodium</i></li> <li>▪ <i>Equisetum</i></li> <li>▪ <i>Adiantum</i></li> <li>▪ <i>Marsilea</i></li> </ul>	
<p><b>Bryophytes and Pteridophytes: Applied aspects</b></p> <ul style="list-style-type: none"> <li>• Economic importance of Bryophyta</li> <li>• Economic importance of Pteridophyta</li> <li>• Types of sporophytes in Bryophyta (from Permanent slides)</li> <li>• Types of sori and soral arrangement in Pteridophytes</li> </ul>	
<p><b>Gymnosperms</b></p> <ul style="list-style-type: none"> <li>• Study of stages in the life cycles of the following Gymnosperms from fresh / preserved material and permanent slides <ul style="list-style-type: none"> <li>▪ <i>Thuja/ Biota</i></li> <li>▪ <i>Gnetum</i></li> <li>▪ <i>Ephedra</i></li> </ul> </li> <li>• Economic importance of Gymnosperms</li> </ul>	
<b>PRACTICAL PAPER II – PLANT DIVERSITY IV SIUSBOTP62</b>	<b>1.5</b>
<p><b>Angiosperms</b></p> <ul style="list-style-type: none"> <li>• Study of one plant from each of the following Angiosperm families <ul style="list-style-type: none"> <li>▪ Combretaceae</li> <li>▪ Rhamnaceae</li> <li>▪ Asclepiadaceae</li> <li>▪ Labiatae</li> <li>▪ Euphorbiaceae</li> <li>▪ Cannaceae</li> </ul> </li> <li>• Morphological peculiarities and economic importance of the members of the above mentioned Angiosperm families</li> <li>• Identify the genus and species with the help of flora</li> </ul>	
<p><b>Anatomy</b> Study of Ecological Anatomy of</p> <ul style="list-style-type: none"> <li>• Hydrophytes: <i>Hydrilla</i> stem, <i>Nymphaea</i> petiole, <i>Eichhornia</i> offset</li> <li>• Epiphytes: Orchid</li> <li>• Sciophytes: <i>Peperomia</i> leaf</li> <li>• Xerophytes: <i>Nerium</i> leaf, <i>Opuntia</i> phylloclade</li> <li>• Halophytes: <i>Avicennia</i> leaf and pneumatophore, <i>Sesuvium / Sueda</i> leaf</li> <li>• Mesophytes: <i>Vinca</i> leaf</li> </ul>	
<p><b>Embryology</b></p> <ul style="list-style-type: none"> <li>• Study of various stages of Microsporogenesis, Megasporogenesis and Embryo Development with the help of permanent slides / photomicrographs</li> <li>• Mounting of Monocot (Maize) and Dicot (Castor and Gram) embryo</li> <li>• <i>In vivo</i> growth of pollen tube in <i>Portulaca/Vinca</i></li> </ul>	



<b>Biostatistics</b> <ul style="list-style-type: none"> <li>• <i>t</i>-test (paired and unpaired)</li> <li>• Problems based on regression analysis</li> <li>• ANOVA</li> </ul>	
<b>PRACTICAL PAPER III – Form and function III SIUSBOTP63</b>	<b>1.5</b>
<b>Plant Biochemistry</b> <ul style="list-style-type: none"> <li>• Estimation of proteins by Biuret method</li> <li>• Effect of temperature on the activity of amylase</li> <li>• Effect of pH on the activity of amylase</li> <li>• Effect of substrate variation on the activity of amylase</li> </ul>	
<b>Plant Physiology</b> <ul style="list-style-type: none"> <li>• Determination of alpha-amino nitrogen</li> <li>• Effect of GA on seed germination</li> <li>• Estimation of reducing sugars by DNSA method</li> </ul>	
<b>Genetics</b> <ul style="list-style-type: none"> <li>• Problems based on three point crosses, construction of chromosome maps</li> <li>• Identification of types of mutations from given DNA sequences</li> <li>• Study of mitosis using pre-treated root tips of <i>Allium</i></li> </ul>	
<b>Bioinformatics</b> <ul style="list-style-type: none"> <li>• BLAST: nBLAST, pBLAST</li> <li>• Multiple sequence alignment</li> <li>• Phylogenetic analysis</li> <li>• RASMOL/ SPDBV</li> </ul>	
<b>PRACTICAL PAPER IV - CURRENT TRENDS IN PLANT SCIENCES SIUSBOTP64</b>	<b>1.5</b>
<b>Plant Biotechnology II</b> <ul style="list-style-type: none"> <li>• DNA sequencing (Sanger's Method)</li> <li>• DNA barcoding of plant material by using suitable data</li> </ul>	
<b>Plant Geography</b> <ul style="list-style-type: none"> <li>• Study of phytogeographic regions of India</li> <li>• Preparation of vegetation map using Garmin's GPS Instrument</li> <li>• Problems based on Simpson's diversity Index</li> </ul>	
<b>Economic Botany</b> <ul style="list-style-type: none"> <li>• Demonstration : Extraction of essential oil using Clevenger</li> <li>• Thin layer chromatography of essential oil of patchouli and <i>Citronella</i></li> <li>• Saponification value of palm oil</li> </ul>	
<b>Post-Harvest Technology</b> Preparation of the following: <ul style="list-style-type: none"> <li>• Squash</li> <li>• Jam</li> <li>• Jelly</li> <li>• Pickle</li> </ul>	

**Note:**

1. A minimum of four field excursions (with at least one beyond the limits of Mumbai) for habitat studies are compulsory. Field work of not less than eight hours duration is equivalent to one period per week for a batch of fifteen students.
2. A candidate will be allowed to appear for the practical examinations only if he/she submits a certified journal of TYBSc Botany and the Field Report or a certificate from the Head of the Department/Institute to the effect that the candidate has completed the practical course of TYBSc Botany as per the minimum requirements. In case of loss of journal a candidate must produce a certificate from the Head of the Department/ Institute that the practical for the academic year were completed by the student. However such a candidate will be allowed to appear for the practical examination but the marks allotted for the journal will not be granted.

**SIES COLLEGE OF ARTS, SCIENCE&COMMERCE**

Sion (W), Mumbai-400 022

**Fifth/Sixth Semester**

**Class: T.Y.B.Sc**

**Sub: Botany**

**Paper: I/II/III/IV**

**Day:**

**Date:**

**Time:**

**Marks: 60**

**N.B.:**

- 1) **All questions are Compulsory.**
- 2) **Figures to the right indicate marks.**
- 3) **Draw neat labelled diagrams wherever necessary.**

- Q.1** a) Unit I: Long answer question (10)  
OR  
a) Unit I: Long answer question (10)  
b) Write note on **any one** of the following: (05)  
i Unit I  
ii Unit I
- Q.2** a) Unit II: Long answer question (10)  
OR  
a) Unit II: Long answer question (10)  
b) Write note on **any one** of the following: (05)  
i Unit II  
ii Unit II
- Q.3** a) Unit III: Long answer question (10)  
OR  
a) Unit III: Long answer question (10)  
b) Write note on **any one** of the following: (05)  
i Unit III  
ii Unit III
- Q.4** a) Unit IV: Long answer question (10)  
OR  
a) Unit IV: Long answer question (10)  
b) Write note on **any one** of the following: (05)  
i Unit IV  
ii Unit IV

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<p style="text-align: center;"><b>SIES COLLEGE OF ARTS, SCIENCE &amp; COMMERCE</b>  <b>T.Y.B.Sc. BOTANY SEMESTER V</b>  <b>PLANT DIVERSITY III</b>  <b>PRACTICAL I</b></p> <p style="text-align: center;"><b>Duration: 3 hours</b> <span style="float: right;"><b>Max. Marks : 50</b></span></p>		
<b>Q.1</b>	Perform the given Microbiological experiment <b>A</b> .	<b>12M</b>
<b>Q.2</b>	Identify, classify and describe specimen <b>B, C</b> and <b>D</b> . Sketch neat and labelled diagrams of morphological/microscopical structures seen in the specimens.	<b>24M</b>
<b>Q.3</b>	Identify and describe slides/ specimens <b>E, F</b> and <b>G</b> .	<b>09M</b>
<b>Q.4</b>	Journal.	<b>05M</b>
	Key:- A- Any one experiment out of four as prescribed in syllabus B & C- Algae D- Fungi E, F & G – (Plant Pathology, Algae or Fungi not asked above) in random order	

<p style="text-align: center;"><b>SIES COLLEGE OF ARTS, SCIENCE &amp; COMMERCE</b>  <b>T.Y.B.Sc. BOTANY SEMESTER V</b>  <b>PLANT DIVERSITY IV</b>  <b>PRACTICAL II</b></p> <p style="text-align: center;"><b>Duration: 3 hours</b> <span style="float: right;"><b>Max. Marks : 50</b></span></p>		
<b>Q.1A</b>	Classify specimen <b>A</b> up to its family giving reasons. Give floral formula. Sketch and labelled L.S. of flower and T.S. ovary.	<b>10M</b>
<b>Q.1B</b>	Identify genus and species of specimen <b>B</b> using flora.	<b>05M</b>
<b>Q.2</b>	Make a temporary double stained preparation of T.S. specimen ' <b>C</b> ' and comment on the type of secondary growth.	<b>08M</b>
<b>Q.3</b>	Perform the Palynology experiment <b>D</b> allotted to you.	<b>07M</b>
<b>Q.4</b>	Identify and describe slide/ specimen <b>E, F, G</b> and <b>H</b> .	<b>12M</b>
<b>Q.5</b>	Field report	<b>05M</b>
<b>Q.6</b>	Viva voce (based on Paper I and Paper II).	<b>03M</b>
	Key: A – Families of T.Y.B.Sc only B – Plants from F.Y & S.Y. B. Sc Families to be included C- Anatomy- Anomalous Secondary Growth D- As per slip E, F, G & H Fossils, Types of Stomata, Morphology of Fruits – in random order	

<p style="text-align: center;"><b>SIES COLLEGE OF ARTS, SCIENCE &amp; COMMERCE</b>  <b>T.Y.B.Sc. BOTANY SEMESTER V</b>  <b>FORMS AND FUNCTIONS III</b>  <b>PRACTICAL III</b></p> <p style="text-align: center;"><b>Duration: 3 hours</b> <span style="float: right;"><b>Max. Marks : 50</b></span></p>		
<b>Q.1</b>	Make a smear preparation of material <b>A</b> and show the slide to the Examiner. Comment on your observation/ Expose the giant Chromosomes from the salivary glands of Chironomous larva.	<b>08M</b>
<b>Q.2</b>	Perform the experiment <b>B</b> allotted to you (Physiology).	<b>12M</b>
<b>Q.3</b>	Perform the experiment <b>C</b> allotted to you (Ecology).	<b>12M</b>
<b>Q.4</b>	Calculate the _____ of the given solution <b>D</b> to prepare the required solution	<b>07M</b>
<b>Q.5</b>	Identify and describe slide/specimen <b>E &amp; F</b> .	<b>06M</b>
<b>Q.6</b>	Journal	<b>05M</b>
	<p>Key:</p> <p>B: Physiology experiment</p> <p>C: Ecology experiment</p> <p>D: Plant tissue culture</p> <p>E &amp; F: Multiple shoot culture, hairy root culture, somatic embryogenesis, amino acid sequencing.</p>	

<p style="text-align: center;"><b>SIES COLLEGE OF ARTS, SCIENCE &amp; COMMERCE</b>  <b>T.Y.B.Sc. BOTANY SEMESTER V</b>  <b>CURRENT TRENDS IN PLANT SCIENCE II</b>  <b>PRACTICAL IV</b></p> <p style="text-align: center;"><b>Duration: 3 hours</b> <span style="float: right;"><b>Max. Marks : 50</b></span></p>		
<b>Q.1</b>	Perform the experiment <b>A</b> – growth curve of <i>E-coli</i> / Isolate plasmid DNA and separate using AGE.	<b>12M</b>
<b>Q.2</b>	Perform the experiment <b>B</b> allotted to you.	<b>10M</b>
<b>Q.3</b>	Describe macroscopical/microscopical character with the help of neat and labelled sketches of specimens <b>C</b> and <b>D</b> . Perform the chemical test/ TLC to identify the active constituents.	<b>14M</b>
<b>Q.4</b>	Identify and explain the specimens/ photographs <b>E, F</b> and <b>G</b> .	<b>09M</b>
<b>Q.5</b>	Journal	<b>05M</b>
	<p>Key-</p> <p><b>B</b> – experiment based on Beer- Lambert’s Law  Experiment on separation of dyes/pigments using silica gel column chromatography</p> <p><b>C &amp; D</b>- <i>Allium sativum</i>, <i>Acorus calamus</i>, <i>Curcuma longa</i>, <i>Senna angustifolia</i>, <i>Strychnos nux-vomica</i>, <i>Eugenia caryophyllata</i></p> <p><b>E, F &amp; G</b> - any stage of mushroom cultivation, any Plant from ethnobotany, problems on restriction mapping</p>	

<p style="text-align: center;"><b>SIES COLLEGE OF ARTS, SCIENCE &amp; COMMERCE</b>  <b>T.Y.B.Sc. BOTANY SEMESTER VI</b>  <b>PLANT DIVERSITY III</b>  <b>PRACTICAL I</b></p> <p style="text-align: center;"><b>Duration: 3 hours</b> <span style="float: right;"><b>Max. Marks : 50</b></span></p>		
<b>Q.1</b>	Identify, classify and describe specimen <b>A</b> and <b>B</b> . Sketch neat and labelled diagrams of morphological/microscopical structures seen in the specimens.	<b>10M</b>
<b>Q.2</b>	Identify, classify and describe specimen <b>C</b> and <b>D</b> . Sketch neat and labelled diagrams of morphological/microscopical structures seen in the specimens.	<b>10M</b>
<b>Q.3</b>	Identify, classify and describe specimen <b>E</b> . Sketch neat and labelled diagrams of morphological/microscopical structures seen in the specimens.	<b>07M</b>
<b>Q.4</b>	Identify and describe slides/specimen <b>F, G, H, I &amp; J</b> .	<b>15M</b>
<b>Q.5</b>	Journal.	<b>05M</b>
<b>Q.6</b>	Field report	<b>03M</b>
	<p><b>Key:</b></p> <ul style="list-style-type: none"> <li>• <b>A &amp; B</b> - <i>Marchantia, Pellia &amp; Sphagnum</i></li> <li>• <b>C &amp; D</b>- <i>Lycopodium, Equisetum, Adiantum &amp; Marsilea</i></li> <li>• <b>E</b>-Gymnosperm- <i>Thuja, Gnetum &amp; Ephedra</i></li> <li>• <b>F, G, H, I &amp; J</b>- [In random order]</li> <li>• Economic importance of Bryophytes</li> <li>• Economic importance of Pteridophytes</li> <li>• Types of sporophytes in Bryophyta</li> <li>• Types of Sori in Pteridophytes</li> <li>• Soral arrangement in Pteridophytes</li> <li>• Economic importance of Gymnosperms</li> </ul>	

<p style="text-align: center;"><b>SIES COLLEGE OF ARTS, SCIENCE &amp; COMMERCE</b>  <b>T.Y.B.Sc. BOTANY SEMESTER VI</b>  <b>PLANT DIVERSITY IV</b>  <b>PRACTICAL II</b></p> <p style="text-align: center;"><b>Duration: 3 hours</b> <span style="float: right;"><b>Max. Marks : 50</b></span></p>		
<b>Q.1</b>	From the given data/ material <b>A</b> determine test of significance using students t-test/ Regression Analysis/ ANOVA	<b>10M</b>
<b>Q.2A</b>	Classify specimen <b>B</b> up to its family giving reasons. Give floral formula. Sketch and labelled L.S. of flower and T.S. ovary.	<b>10M</b>
<b>Q.2B</b>	Identify genus and species of specimen <b>C</b> using flora.	<b>05M</b>
<b>Q.3</b>	Make a stained preparation of specimen <b>D</b> and comment on its ecological anatomy.	<b>08M</b>
<b>Q.4</b>	Identify and describe slide/specimen <b>E, F, G</b> and <b>H</b> .	<b>12M</b>
<b>Q.5</b>	Viva voce (based on Paper III and paper IV)	<b>05M</b>
	<p><b>Key -</b></p> <ul style="list-style-type: none"> <li>• <b>A</b> - Problem on Biostatistics</li> <li>• <b>B</b> - Families of T.Y.B.Sc only</li> <li>• <b>C</b> - Plants from F.Y., S.Y. &amp; T.Y.B.Sc. SEM V Families to be included</li> <li>• <b>D</b> - Ecological anatomy</li> <li>• <b>E, F, G &amp; H</b> [In random order], Economic importance of specimen from prescribe families (Sem VI only) &amp; Embryology</li> </ul>	

<p style="text-align: center;"><b>SIES COLLEGE OF ARTS, SCIENCE &amp; COMMERCE</b>  <b>T.Y.B.Sc. BOTANY SEMESTER VI</b>  <b>FORMS AND FUNCTIONS III</b>  <b>PRACTICAL III</b></p> <p style="text-align: center;"><b>Duration: 3 hours</b> <span style="float: right;"><b>Max. Marks : 50</b></span></p>		
<b>Q.1</b>	Perform the experiment <b>A</b> allotted to you.	<b>10M</b>
<b>Q.2</b>	Perform the experiment <b>B</b> allotted to you.	<b>10M</b>
<b>Q.3</b>	Make a squash preparation to show the stage of mitosis from pre-treated root tips <b>C</b> .	<b>06M</b>
<b>Q.4</b>	Construct a chromosome map from the given data <b>D</b> / Identify the type of mutation and comment on them (any two types of mutations).	<b>12M</b>
<b>Q.5</b>	Perform the given analysis of data <b>E</b> using computer (Bioinformatics).	<b>07M</b>
<b>Q.6</b>	Journal.	<b>05M</b>
	Key -	
	<ul style="list-style-type: none"> <li>• A: Plant Biochemistry Experiment</li> <li>• B: Plant Physiology Experiment</li> </ul>	

<p style="text-align: center;"><b>SIES COLLEGE OF ARTS, SCIENCE &amp; COMMERCE</b>  <b>T.Y.B.Sc. BOTANY SEMESTER VI</b>  <b>CURRENT TRENDS IN PLANT SCIENCE II</b>  <b>PRACTICAL IV</b></p> <p style="text-align: center;"><b>Duration: 3 hours</b> <span style="float: right;"><b>Max. Marks : 50</b></span></p>		
<b>Q.1</b>	Perform the DNA barcoding of plant material using given data <b>A</b> <b>OR</b> Perform DNA sequencing by Sanger's method of the given sequence <b>A</b> .	<b>10M</b>
<b>Q.2</b>	Calculate Simpson's Diversity Index from the given data <b>B</b> .	<b>08M</b>
<b>Q.3</b>	Mark the _____ phytogeographic region <b>C</b> in the map of India and Comment on the same.	<b>05M</b>
<b>Q.4</b>	Perform the experiment <b>C</b> allotted to you	<b>10M</b>
<b>Q.5</b>	Prepare the squash/Jam/jelly/pickle from the given material <b>D</b> .	<b>12M</b>
<b>Q.6</b>	Viva voce.	<b>05M</b>
	Key -	
	<ul style="list-style-type: none"> <li>• C - TLC of Patchauli or <i>Citronella</i> / saponification value</li> </ul>	

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**SIES**

**College of Arts,  
Science &  
Commerce**

**RISE WITH EDUCATION  
Sion (W), Mumbai -400022**

**Program: B.Sc.  
Course: AC: Horticulture & Gardening  
Syllabus for T.Y.B.Sc. (A.C.)  
To be implemented from 2018-2019**

**(Credit Based Semester and Grading System with  
effect from the academic year 2018-2019)**

## **PREAMBLE**

The existing university syllabus of T.Y.B.Sc. AC: Horticulture & Gardening was due for revision as per the CBSGS pattern will be implemented from the academic year 2018-2019 under autonomy.

In the revised autonomous syllabus, the committee has taken utmost care to maintain the continuity in the flow of information at T.Y.B.Sc. level. Hence, some of the modules of the existing university syllabus have been upgraded with the new modules in order to introduce the learners to the recent developments in various branches of Botany.

All the papers of theory and practicals (Semester - V & Semester - VI together) are compulsory to the students according to their specialization.

Each theory period shall be of 48 minutes duration. Theory component shall have 60 instructional periods/semester. Each practical will be of 4 periods and one period is of 48 minutes duration.

### **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 and half hours duration.
- ii. Theory 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 V**

Course	PAPER I		
	Internal	External	Total
Theory	40	60	100
Practicals	-	100	100

#### **Overall Examination and Marks Distribution Pattern for Semester VI**

Course	PAPER II		
	Internal	External	Total
Theory	40	60	100
Practicals	-	100	100

**T.Y.B.Sc. Applied Component –Horticulture Syllabus**  
**Credit Based and Grading System**  
**To be implemented from the Academic year 2018-2019**

**SEMESTER V**

Course Code	UNIT	TOPICS	Credits	L / Week
SIUSACHOR51	<b><u>HORTICULTURE &amp; GARDENING - I</u></b>		<b>4</b>	<b>8</b>
	<b>I</b>	<b>INTRODUCTION TO HORTICULTURE</b>	<b>2</b>	<b>1</b>
	<b>II</b>	<b>PROPAGATION PRACTICES</b>		<b>1</b>
	<b>III</b>	<b>MANURES, FERTILIZERS AND DISEASES</b>		<b>1</b>
	<b>IV</b>	<b>GARDEN OPERATIONS FOR HORTICULTURE</b>		<b>1</b>
SIUSACHORP51	<b>Practicals based on all courses in theory</b>		<b>2</b>	<b>4</b>

**SEMESTER VI**

Course Code	UNIT	TOPICS	Credits	L / Week
SIUSACHOR62	<b><u>HORTICULTURE &amp; GARDENING - II</u></b>		<b>4</b>	<b>8</b>
	<b>I</b>	<b>LANDSCAPE GARDENING</b>	<b>2</b>	<b>1</b>
	<b>II</b>	<b>HORTICULTURE PRODUCE</b>		<b>1</b>
	<b>III</b>	<b>COMMERCIAL PRODUCTION</b>		<b>1</b>
	<b>IV</b>	<b>POST HARVEST TECHNOLOGY &amp; ENTREPRENEURSHIP IN HORTICULTURE</b>		<b>1</b>
SIUSACHORP62	<b>Practicals based on all courses in theory</b>		<b>2</b>	<b>4</b>

Course Code	Title	Credits
SIUSACHOR51	HORTICULTURE AND GARDENING – I	2 Credits (60 lectures )
<p><b>SEMESTER V - HORTICULTURE AND GARDENING – I</b></p> <p>LEARNING OBJECTIVES</p> <ul style="list-style-type: none"> <li>❖ Introduction to various branches of horticulture, Horticultural research and training institutes and schemes for strategy plantations.</li> <li>❖ Learn different propagation practices, manures, fertilizers, pests and diseases and garden operations commercially used in horticulture.</li> </ul> <p>CIA–Class Test (20M)+ Assignment/ Case Study/ Presentation (15M) + Class Participation (5M)</p>		
<p><b><u>Unit 1: INTRODUCTION TO HORTICULTURE</u></b></p> <ul style="list-style-type: none"> <li>• <b>Horticulture:</b> Definition and Objectives</li> <li>• <b>Branches of Horticulture:</b> Pomology, Olericulture, Landscape Gardening.</li> <li>• <b>Allied branches of Horticulture:</b> Apiculture and Sericulture.</li> <li>• <b>Horticulture Research Institutes:</b> National Research Centre for grapes, Pune, Horticulture Training Centre (H.T.C.) – Talegaon, Central Potato Tuber Research Institute (CPTRI) – Shimla.</li> <li>• Horticulture as Career &amp; Horticultural Consultancy</li> <li>• <b>Strategy Plantation</b>– Lakhibaug Yojana</li> </ul>		<b>15L</b>
<p><b><u>Unit 2: PROPAGATION PRACTICES</u></b></p> <ul style="list-style-type: none"> <li>• <b>By Seeds</b> Advantages and disadvantages, method of seed propagation, Production of seeds, Handling, Collection and Storage Sowing, Transplanting of seedlings and Hardening, Seed treatment to control diseases Seedling diseases and their control.</li> <li>• <b>By specialized Vegetative structures</b> Bulbs, Tubers, Corms, Rhizomes, Root stock, Runners, Offsets and Suckers.</li> <li>• <b>Artificial methods of plant propagation</b> <ul style="list-style-type: none"> <li>▪ Cutting – Root cutting, Stem cuttings, and leaf cuttings. Use of PGR's for rooting.</li> <li>▪ Layering – Definition, Types: Simple, compound, (Serpentine) Tip, Trench, Mound, Air Layering.</li> <li>▪ Grafting-Definition, advantages and disadvantages. Types: Splice, Whip/ Tongue, side, veneer, cleft, bark, epicotyls, approach, repair grafting – Enarching, bridge and bracing.</li> </ul> </li> </ul>		<b>15L</b>

<ul style="list-style-type: none"> <li>▪ Budding – Definition advantages and disadvantages. Types: T-budding, shield, patch, ring budding.</li> <li>▪ Developing new varieties: Technique of Emasculation and bagging, role of polyploidy n production of seedless varieties in plants.</li> </ul> <p>• <b>Application of Tissue Culture in relation to Horticulture</b></p>	
<p><b><u>UNIT 3: MANURES, FERTILIZERS AND DISEASES</u></b></p> <ul style="list-style-type: none"> <li>• <b>Manures:</b> Definition, importance, important manures FYM(compost), oilcakes, green manure, organic manures and vermicompost.</li> <li>• <b>Fertilizers:</b> Definition, Types – Straight, Compound and mixed. Nitrogenous (<math>(\text{NH}_4)_2\text{SO}_4</math>, Urea, Phosphatic (Superphosphate, Bone meal), Potassic (Muriate of potash, <math>\text{K}_2\text{SO}_4</math>), Advantages and disadvantages</li> <li>• <b>Biofertilizers:</b> Bacteria, Cyanobacteria, Mycorrhiza, Sea weeds.</li> <li>• <b>Diseases:</b> Horticultural plant diseases and their control. Fungal diseases-Rust, Smut, Powdery mildew. Bacterial – Citrus canker, Bacterial wilt. Viral – TMV, Leaf curl.</li> <li>• <b>Pests:</b> Common pests on horticultural crops – Aphids, beetle, stem borer, caterpillars and rats.</li> <li>• <b>Friends of farmers:</b> Earthworms and Snakes.</li> </ul>	<p><b>15L</b></p>
<p><b><u>UNIT 4: GARDEN OPERATIONS FOR HORTICULTURE</u></b></p> <ul style="list-style-type: none"> <li>• Preparation of site for garden</li> <li>• Mulching, Top-dressing, Blanching</li> <li>• Sowing, Transplanting, Harvesting</li> <li>• Weeding, Pruning.</li> <li>• Fertilizer application</li> <li>• Pest and disease management</li> <li>• Water management – Irrigation (Overhead, Surface, Underground) and conservation through horticulture</li> <li>• Soil-less cultivation</li> </ul>	<p><b>15L</b></p>

**SEMESTER V**  
**PRACTICALS**

Course Code	Title	Credits
<b>SIUSACHORP51</b>	<b>HORTICULTURE PRACTICALS</b>	<b>2 Credits</b>
1	Garden implements and their uses.	
2	Different types of pots & Potting media. Potting and repotting	
3	Propagation practices by seed, Vegetative propagation, cutting, layering, budding and grafting.	
4	Identification of the following: <ul style="list-style-type: none"> <li>• <b>Fertilizers:</b> Identification of Urea, Ammonium sulphate, Potassium sulphate, super phosphate by physical and chemical methods.</li> <li>• <b>Manures:</b> Identification of plants as green manure – <i>Glyricidia</i>, <i>Crotolaria</i>, <i>Leucaena</i>.</li> <li>• <b>Biofertilizers</b> – Identification of <i>Nostoc</i>, <i>Rhizobium</i> and VAM.</li> </ul>	
5	Testing of pH of Soil and water and checking electrical conductivity of water.	
6	Use of soil testing Kit and liquid fertilizers	
7	Identification of Diseases and Pests: <ul style="list-style-type: none"> <li>• <b>Fungal diseases:</b> Powdery mildew, Rust, Wilt, Blight and Smut.</li> <li>• <b>Bacterial diseases:</b> Canker and Wilt.</li> <li>• <b>Viral diseases:</b> Leaf curl, Yellow Vein Mosaic.</li> <li>• <b>Insect-pests:</b> Sucking, Biting, Chewing, Borers &amp; Ants.</li> <li>• <b>Non Insects-pests:</b> Nematodes and Rodents.</li> </ul>	
8	Study of the following Natural insecticides: <ul style="list-style-type: none"> <li>• Neem Arka</li> <li>• Dashparni Arka</li> <li>• Seetaphal Powder</li> <li>• Tobacco Extract</li> </ul>	
<p><b>Project Presentation:</b> Each student should individually perform, submit a report and present a ppt on a topic related to Horticulture. The report should be duly certified by the teacher in-charge and presented. Project presentation is compulsory.</p>		
<p><b>Journal &amp; Field Report:</b> Presentation of duly certified Journal and Field report of the visit to Garden, Parks, Nurseries, Exhibitions, Horticulture industries or Research Station is compulsory.</p>		

## SEMESTER VI - HORTICULTURE AND GARDENING – II

Course Code	Title	Credits
<b>SIUSACHOR62</b>	<b>HORTICULTURE AND GARDENING – II</b>	<b>2 Credits (60 lectures )</b>
<p><b>LEARNING OBJECTIVES</b></p> <ul style="list-style-type: none"> <li>❖ Introduction to various types and styles of gardens and important garden features.</li> <li>❖ Learn about high-tech horticultural productions and commercial cultivation of horticultural produce.</li> <li>❖ Study of post-harvest technology and business management in horticulture.</li> </ul> <p><b>CIA</b>–Class Test (20M)+ Assignment/ Case Study/ Presentation (15M) + Class Participation (5M)</p>		
<p><b><u>Unit 1: LANDSCAPE GARDENING</u></b></p> <ul style="list-style-type: none"> <li>• <b>Indoor gardens:</b> Terrarium, Dish garden, hanging baskets, Bonsai.</li> <li>• <b>Important Garden features:</b> Paths &amp; Avenues, Hedges &amp; Edges, Flower bed, Arches &amp; Pergolas, Rock garden.</li> <li>• <b>Lawn:</b> Purpose, Preparation, Management and Lawn plant.</li> <li>• <b>Styles of gardens:</b> Mughal, Buddhist, Vertical wall garden &amp; Theme park.</li> </ul>		<b>15L</b>
<p><b><u>Unit 2:HORTICULTURE PRODUCE</u></b></p> <ul style="list-style-type: none"> <li>• <b>High-tech Horticultural production using Green-house technology:</b> Meaning,types, layout &amp; construction, irrigation systems. Care &amp; attention. Hardening of plants.</li> <li>• <b>Space gardens.</b></li> <li>• <b>Floriculture:</b> Scope &amp; importance.</li> <li>• Soil and climatic requirement and cultivation practices and Economics of greenhouse production of Gerbera, Carnation, Roses, Orchids.</li> <li>• Propagation techniques, packing and marketing, enhancing and delaying period of bloom by special methods.</li> <li>• Floral decoration, Florist shop management.</li> </ul>		<b>15L</b>

**SEMESTER VI**

Course Code	Title	Credits
SIUSACHOR62	HORTICULTURE AND GARDENING - II	2 Credits (60 lectures )
<p><b><u>UNIT 3: COMMERCIAL PRODUCTION</u></b></p> <p>Commercial production in relation to propagation, post plantation care, harvesting, postharvest management &amp; varieties of the following:</p> <ul style="list-style-type: none"><li>• Tuber: Potato</li><li>• Vegetable: Tomato</li><li>• Fruits: Mango, Grapes &amp; Coconut</li><li>• Spices &amp; condiments: Chilli</li><li>• Medicinal plants: <i>Aloe vera</i>, <i>Stevia rebaurdina</i> (Madura)</li><li>• Aromatic plant-<i>Citronella</i>, Patchouli</li></ul>		<b>15L</b>
<p><b><u>UNIT 4: POST HARVEST TECHNOLOGY &amp; DEVELOPMENT OF ENTREPRENEURSHIP IN HORTICULTURE</u></b></p> <ul style="list-style-type: none"><li>• <b>Maturity:</b> Factors responsible for maturity &amp; ripening methods used for delaying ripening.</li><li>• <b>Harvest:</b> Time of harvest, harvesting and handling of harvested products</li><li>• <b>Storage of fresh produce:</b> Types of storage of fruits &amp; vegetables</li><li>• Fruit &amp; vegetables preservation technology.</li><li>• <b>Marketing:</b> grading, packing &amp; transportation. Ways of increasing the market value and shelf life of horticultural produce.</li><li>• <b>Entrepreneurship development:</b> Horticulture as a business definition and nature.</li></ul>		<b>15L</b>



### SEMESTER VI - PRACTICALS

Course Code	Title	Credits
<b>SIUSACHORP62</b>	<b>HORTICULTURE PRACTICALS</b>	<b>2 Credits</b>
1	Preparation of garden layout	
2	Identification of 2 to 3 plants suitable for different garden locations	
3	Identification of the following important horticultural plants: <ul style="list-style-type: none"> <li>• <b>Herbs</b> – foliage any 2 and flowering any 2</li> <li>• <b>Shrubs</b> – foliage any 2 flowering any 2</li> <li>• <b>Trees</b> – foliage any 2 and flowering any 2</li> <li>• <b>Climbers</b> – any 2</li> <li>• <b>Lianas</b> – any 2</li> <li>• <b>Epiphytes</b> – any 2</li> <li>• <b>Creepers</b> –any 2</li> <li>• <b>Trailers</b> – any 2</li> <li>• <b>Aquaticplants</b> – any 2 ( preferably various habitat)</li> <li>• <b>Succulents</b> – any 2</li> <li>• <b>Weeds</b> – any 5</li> </ul>	
4	Preparation of Flower arrangements: <ul style="list-style-type: none"> <li>• <b>Indian style:</b> Gajra, Veni, Garland, hand bouquet.</li> <li>• <b>Western style:</b> Basket &amp; paper bouquets, torch type &amp; centre table arrangement</li> <li>• <b>Japanese style:</b> Ikebana and Moribana.</li> </ul>	
5	Preparation of Bonsai, Bottle Garden, Dish garden and Hanging basket.	
6	Preparation of Jams, Squashes, Syrups, Pickle, Sauces	
7	Preparation of Fruit & Vegetable carving and Bio-jewellery	
8	Identification of varieties of Tomato, Chilli, Mango, Grapes & Coconut.	
9	Identification of following Green house plants with respect to their soil, temperature, irrigation, fertilizer requirements and propagation methods: <ul style="list-style-type: none"> <li>• <i>Anthurium,</i></li> <li>• <i>Gerbera,</i></li> <li>• Orchids,</li> <li>• Tuberose,</li> <li>• Carnation,</li> <li>• Roses,</li> <li>• <i>Capsicum</i></li> </ul>	
<b>Journal &amp; Field Report:</b> Presentation of duly certified Journal with organoleptic sheet and Field report of the visit to Garden, Parks, Nurseries, Exhibitions, Horticulture industries or Research Station is compulsory.		

# SIES COLLEGE OF ARTS, SCIENCE & COMMERCE

Sion (W), Mumbai-400 022

Fifth/Sixth Semester

Class: T.Y.B.Sc

Sub: Botany

Paper: AC

Day:

Date:

Time:

Marks: 60

N.B.:

- 1) All questions are Compulsory.
- 2) Figures to the right indicate marks.
- 3) Draw neat labelled diagrams wherever necessary.

- Q.1** a) Unit I: Long answer question (10)  
OR  
a) Unit I: Long answer question (10)  
b) Write note on any one of the following: (05)  
i Unit I  
ii Unit I
- Q.2** a) Unit II: Long answer question (10)  
OR  
a) Unit II: Long answer question (10)  
b) Write note on any one of the following: (05)  
i Unit II  
ii Unit II
- Q.3** a) Unit III: Long answer question (10)  
OR  
a) Unit III: Long answer question (10)  
b) Write note on any one of the following: (05)  
i Unit III  
ii Unit III
- Q.4** a) Unit IV: Long answer question (10)  
OR  
a) Unit IV: Long answer question (10)  
b) Write note on any one of the following: (05)  
i Unit IV  
ii Unit IV

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**Practical Examination**  
**TYBSc Applied Component – Horticulture and Gardening**  
**Semester V – SIUSACHORP51**

**Duration: 5 Hours**

**Maximum Marks: 100**

- Q1. Demonstrate the propagation techniques \_\_\_\_\_ and \_\_\_\_\_ using specimens **A** and **B**. [20]
- Q2. Identify the given fertilizers **C** and **D** with the help of physical and chemical tests. [10]
- Q3. Determine the pH / electrical conductivity of the given soil sample **E**. [08]  
Comment on your observations.
- Q4. Identify and comment upon the given specimens **F, G, H, I, J** and **K**. [24]
- Q5. Field report. [04]
- Q6. Journal. [05]
- Q7. Viva – voce. [04]
- Q8. Project. [25]

**Keys:**

- A, B: Any of the propagation techniques – potting, repotting, cutting, budding, grafting, layering.
- C, D: Chemical fertilizers – Urea, ammonium sulphate, single superphosphate, potassium sulphate.
- E: Soil sample.
- F: Garden implement.
- G: Manure.
- H: Biofertilizer.
- I: Horticultural plant disease.
- J: Horticultural plant pest (Insect / Non-insect)
- K: Natural insecticide.

## Practical Examination

### TYBSc Applied Component – Horticulture and Gardening

#### Semester VI – SIUSACHORP61

**Duration: 5 Hours**

**Maximum Marks: 100**

- Q1. Prepare an appropriate garden plan for the given area **A**, which will include the locations \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_. Suggest at least two names of plants for each location. [16]
- Q2. a. Use the given material **B** to make a Terrarium / Dish Garden. [05]
- b. Use the given material **C** to make a Bonsai / Hanging basket. [05]
- Q3. Use the given material **D** to create Indian / Western / Japanese flower arrangement. [07]
- Q4. Use the given material **E** to create biojewellery / fruit and vegetable carving. [07]
- Q5. Prepare jam / pickle / squash / sauce from the given material using appropriate proportions. [15]
- Q6. a. Identify the horticultural plants **F, G, H** and comment on their importance. [12]
- b. Identify the commercial varieties **I** and **J** and comment on their significance. [08]
- c. Identify the greenhouse plant **K** and comment on its propagation and requirements. [05]
- Q7. Field report. [05]
- Q8. Journal with organoleptic sheet. [05]
- Q9. Viva voce. [05]

**Keys:**

- A: Private / Public garden plan
- B: Dish garden / Terrarium
- C: Bonsai / Hanging basket
- D: Flowers and other required materials for any type of flower arrangement mentioned.
- E: Fruits and vegetables and other requirements for biojewellery and carving.
- F, G, H: Horticultural plants
- I, J: Commercial varieties
- K: Greenhouse plant.

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7. Rao K. M. (2005). Textbook of Horticulture. MacMillan India Ltd.
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