

**The Kelkar Education Trust's  
V. G. Vaze College of Arts, Science and Commerce  
(Autonomous)**

---



**The Kelkar Education Trust's  
V G Vaze College of Arts, Science and Commerce  
(Autonomous)**

**Syllabus for SYBSc.**

**(June 2020 Onwards)**

**Program: B.Sc.**

**Semester IV**

**Course Title: BOTANY**

**Semester IV**

<b>Course Code</b>	<b>Paper Title</b>	<b>Credits</b>
<b>SBO401</b>	<b>PLANT DIVERSITY</b>	<b>02</b>
<b>SBO402</b>	<b>FORM AND FUNCTION II</b>	<b>02</b>
<b>SBO403</b>	<b>CURRENT TRENDS IN PLANT SCIENCES I</b>	<b>02</b>
<b>SBOP401</b>	<b>Practical's based on paper (401 &amp; 402)</b>	<b>03</b>

**The Kelkar Education Trust's**  
**V. G. Vaze College of Arts, Science and Commerce**  
**(Autonomous)**

---

**1. Syllabus as per Choice Based Credit system**

- i.** Name of the program: : S. Y. B. Sc Botany
  - ii.** Course code: : SBO401
  - iii.** Course title: : Botany I (Plant diversity)
  - iv.** Semester wise course content : Copy of syllabus enclosed
  - v.** References & additional references : Enclosed in syllabus
  - vi** **Credit Structure**
    - No. of credits per semester : (02+01)= 03
  - vii.** No. of lectures per unit : 15
  - viii.** No. of lectures per week : 03
  - ix.** No. of tutorials per week : ---
  - x.** No. of practicals per week : 01
- 2. Scheme of Examination** : Internal Examination (40 marks)  
External Examination (60 marks)
- 3. Special notes if any** : No
- 4. Eligibility, if any for admission** : As laid down in the college brochure/website
- 5. Fee structure** : As per college fee structure specifications
- 6. Special ordinances/resolution (if any)** : No

**The Kelkar Education Trust's  
V. G. Vaze College of Arts, Science and Commerce  
(Autonomous)**

**Program:** S. Y. B. Sc  
**Course:** Plant Diversity II

**Semester:** IV  
**Course Code:** SBO401

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA) 40 marks					Semester End Examination	Total
L	T	P	C	CIA-1	CIA-2	CIA-3	CIA-4	Lab	Written	
3	-	1	3	20	15	05		-	60	100
<b>Max. Time: Semester End Examination (Theory).</b>									<b>2Hrs</b>	

**Course Objectives:**

To study the general characters, morphology, structure, life cycle and economic importance of the organisms belonging to Fungi, Pteridophytes and Gymnosperms

To understand the basic terminology of plant pathology, symptoms and control measures of plant diseases.

To understand the basics of Palaeobotany, concept of Geological timescale and geological time period of various groups of organisms and the formation of fossils and its types.

**The Kelkar Education Trust's**  
**V. G. Vaze College of Arts, Science and Commerce**  
**(Autonomous)**

Unit No.	Module No	Content	Lectures
<b>Paper I Course : Plant Diversity II</b>			
<b>1.</b>	<b>Thallophyta: Fungi, Plant Pathology and Lichens Fungi</b>		<b>15</b>
	<b>I</b>	<ul style="list-style-type: none"> <li>• General characters of Ascomycetae</li> <li>• Structure, life cycle and systematic position of <i>Aspergillus</i> and <i>Xylaria</i></li> </ul>	
	<b>II</b>	<ul style="list-style-type: none"> <li>• Plant Pathology- Introduction to Plant Diseases, General Symptoms &amp; control measures of Plant Diseases,</li> <li>• Symptoms, causative organism, disease cycle and control measures of Powdery mildew of Pea</li> </ul>	
	<b>III</b>	<ul style="list-style-type: none"> <li>• Lichens- Classification, Structure, Method of Reproduction, Economic Importance and Ecological Significance of Lichens.</li> </ul>	
<b>2.</b>	<b>Pteridophyta and Paleobotany Pteridophyta-</b>		<b>15</b>
	<b>I</b>	Salient features and classification upto orders (with examples of each) of <i>Calamophyta</i> and Lepidophyta (G. M. Smith's system of classification to be followed)	
	<b>II</b>	Structure, life cycle and systematic position of <i>Equisetum</i> Structure, life cycle and systematic position of <i>Selaginella</i>	
	<b>III</b>	Paleobotany: The geological time scale; Formation and types of fossils;	
	<b>IV</b>	Structure and systematic position of form genus <i>Rhynia</i>	
<b>3.</b>	<b>Gymnosperms</b>		<b>15</b>
	<b>I</b>	Salient features, classification up to orders (with examples of each) and economic importance of Coniferophyta (Chamberlain's system of classification to be followed)	
	<b>II</b>	Structure life cycle and systematic position of <i>Pinus</i> Structure and systematic position of the form genus <i>Cordaites</i>	

**The Kelkar Education Trust's**  
**V. G. Vaze College of Arts, Science and Commerce**  
**(Autonomous)**

---

**PRACTICALS BASED ON PAPER I- Plant Diversity II**

**Program:** S. Y. B. Sc  
**Course:** Plant Diversity

**Semester:** IV  
**Course Code:** SBO402

Sr. no	Title of Experiments	Credit: 01
<b>1.</b>	<b>Fungi and Plant Pathology</b>	
	i. Study of stages in the life cycle of <i>Aspergillus</i> from fresh/ preserved material and permanent slides. ii. Study of stages in the life cycle of <i>Xylaria</i> from fresh/ preserved material and permanent slides. iii. Study of fungal diseases as prescribed for theory. iv. Study of Lichens (crustose, foliose, & fruticose).	
<b>2.</b>	<b>Pteridophyta and Palaeobotany</b>	
	i. Study of stages in the life cycle of <i>Selaginella</i> from fresh/ preserved material and permanent slides. ii. Study of stages in the life cycle of <i>Equisetum</i> from fresh/ preserved material and permanent slides. iii. Study of form genera <i>Rhynia</i> with the help of permanent slides/ photomicrographs.	
<b>3.</b>	<b>Gymnosperms</b>	
	i. Study of stages in the life cycle of <i>Pinus</i> from fresh/ preserved material and permanent slides. ii. Study of the form genus <i>Cordaites</i> with the help of permanent slide/ photomicrographs	

**The Kelkar Education Trust's**  
**V. G. Vaze College of Arts, Science and Commerce**  
**(Autonomous)**

---

**1. Syllabus as per Choice Based Credit system**

- i.** Name of the program: : S. Y. B. Sc Botany
  - ii.** Course code: : SBO402
  - iii.** Course title: : Botany II ( FORM AND FUNCTION- II)
  - iv.** Semester wise course content : Copy of syllabus enclosed
  - v.** References & additional references : Enclosed in syllabus
  - vi** **Credit Structure**
    - No. of credits per semester : (02+01)= 03
  - vii.** No. of lectures per unit : 15
  - viii.** No. of lectures per week : 03
  - ix.** No. of tutorials per week : ---
  - x.** No. of practicals per week : 01
- 2. Scheme of Examination** : Internal Examination (40 marks)  
External Examination (60 marks)
  - 3. Special notes if any** : No
  - 4. Eligibility, if any for admission** : As laid down in the college brochure/website
  - 5. Fee structure** : As per college fee structure specifications
  - 6. Special ordinances/resolution (if any)** : No

**The Kelkar Education Trust's**  
**V. G. Vaze College of Arts, Science and Commerce**  
**(Autonomous)**

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

**Semester:** IV

**Course:** FORM AND FUNCTION II

**Course Code:** SBO402

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA) 40 marks					Semester End Examination	Total
L	T	P	C	CIA-1	CIA-2	CIA-3	CIA-4	Lab	Written	
3	-	1	3	20	15	05		-	60	100
<b>Max. Time: Semester End Examination (Theory).</b>									<b>2Hrs</b>	

**Course Objectives:**

To understand the concept of secondary growth, mechanical tissue system and their importance, different terminologies related to secondary growth and mechanical tissue system of plants.

To understand the process and mechanism of respiration, photoperiodism and Vernalization

To understand the concept of biogeochemical cycle, difference between gaseous and sedimentary cycles. Basics of Pedology, importance of various ecological factors

**The Kelkar Education Trust's**  
**V. G. Vaze College of Arts, Science and Commerce**  
**(Autonomous)**

Unit No.	Module No	Content	Lectures
<b>Paper II Course: FORM AND FUNCTION II</b>			
<b>1.</b>		<b>Anatomy</b>	<b>15</b>
	<b>I</b>	Normal Secondary Growth in Dicotyledonous stem and root.	
	<b>II</b>	Growth rings, periderm, lenticels, tyloses, heart wood and sap wood	
	<b>III</b>	Mechanical Tissue system <ul style="list-style-type: none"> <li>• Tissues providing mechanical strength and support and their disposition</li> <li>• I-girders in aerial and underground organs</li> </ul>	
<b>2.</b>		<b>Plant Physiology and Plant Biochemistry</b>	<b>15</b>
	<b>I</b>	<b>Respiration: Aerobic:</b> Glycolysis, TCA Cycle, ETS & Energetic of respiration; Anaerobic respiration	
	<b>II</b>	<b>Photorespiration :</b> Site of Photorespiration and photorespiration in C3 Plants	
	<b>III</b>	<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,	
	<b>IV</b>	<b>Vernalization</b> mechanisms and applications.	
<b>3.</b>		<b>Ecology and Environmental Botany.</b>	<b>15</b>
	<b>I</b>	Biogeochemical Cycles- Carbon, Nitrogen and Water	
	<b>II</b>	Ecological factors: <b>Concept of environmental factors</b> <b>Soil as an edaphic factor, Soil composition, types of soil, soil formation, soil profile.</b> <b>Water : States of water in the environment, Precipitation types</b> <b>Light and Temperature : Variation, Optimal and limiting factors, Shelford law of tolerance</b>	
	<b>III</b>	Community ecology- Characters of community – <b>Quantitative characters (Density, Frequency and Abundance)</b> <b>Qualitative characters (Growth forms, Phenology, Physiognomy, Stratification )</b>	



**The Kelkar Education Trust's**  
**V. G. Vaze College of Arts, Science and Commerce**  
**(Autonomous)**

---

**PRACTICALS BASED ON PAPER II- FORM AND FUNCTION II**

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

**Semester:** IV

**Course:** FORM AND FUNCTION II

**Course Code:** SBO402

Sr. no	Title of Experiments	Credit: 01
<b>1.</b>	<b>Anatomy</b>	
	i.	Study of normal secondary growth in the stem and root of a Dicotyledonous plant
	ii.	Types of mechanical tissues, mechanical tissue system in aerial, underground organs
	iii.	Study of conducting tissues- Xylem and phloem elements in Gymnosperms and Angiosperms as seen in LS and through maceration technique.
	iv.	Study of different types of vascular bundles.
v.	Growth rings, periderm, lenticels, tyloses, heart wood and sap wood.	
<b>2.</b>	<b>Plant Physiology and Plant Biochemistry</b>	
	i.	Q <sub>10</sub> – germinating seeds using Phenol red indicator.
	ii.	NR activity – <i>in-vivo</i>
iii.	Estimation of proteins by Lowry's method (Prepare standard graph).	
<b>3.</b>	<b>Ecology and Environmental Botany</b>	
	i.	Study of the working of the following Ecological Instruments- Soil thermometer, Soil testing kit, Soil pH, Wind anemometer.
	ii.	Mechanical analysis of soil by the sieve method & pH of soil.
	iii.	Quantitative estimation of organic matter of the soil by Walkley and Blacks Rapid titration method.
iv.	Study of vegetation by the list quadrat method	

**The Kelkar Education Trust's**  
**V. G. Vaze College of Arts, Science and Commerce**  
**(Autonomous)**

---

**1. Syllabus as per Choice Based Credit system**

<b>i.</b>	Name of the program:	:	S. Y. B. Sc Botany
<b>ii.</b>	Course code:	:	SBO403
<b>iii.</b>	Course title:	:	Botany II ( Current trends in plant sciences II)
<b>iv.</b>	Semester wise course content	:	Copy of syllabus enclosed
<b>v.</b>	References & additional references	:	Enclosed in syllabus
<b>vi</b>	<b>Credit Structure</b>		
	No. of credits per semester	:	(02+01)= 03
<b>vii.</b>	No. of lectures per unit	:	15
<b>viii.</b>	No. of lectures per week	:	03
<b>ix.</b>	No. of tutorials per week	:	---
<b>x.</b>	No. of practicals per week	:	01
<b>2.</b>	<b>Scheme of Examination</b>	:	Internal Examination (40 marks) External Examination (60 marks)
<b>3.</b>	Special notes if any	:	No
<b>4.</b>	Eligibility, if any for admission	:	As laid down in the college brochure/website
<b>5.</b>	Fee structure	:	As per college fee structure specifications
<b>6.</b>	Special ordinances/resolution (if any)	:	No

**The Kelkar Education Trust's**  
**V. G. Vaze College of Arts, Science and Commerce**  
**(Autonomous)**

**Program:** S. Y. B. Sc **Semester:** IV  
**Course:** Current trends in plant science II **Course Code:** SBO403

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA) 40 marks					Semester End Examination	Total
L	T	P	C	CIA-1	CIA-2	CIA-3	CIA-4	Lab	Written	
3	-	1	3	20	15	05		-	60	100
<b>Max. Time: Semester End Examination (Theory).</b>									<b>2Hrs</b>	

**Course Objectives:**

To acquaint the basics of horticulture features and types of landscape gardening.

To introduce the plant tissue culture as non-conventional method of propagation of plants.

To acquaint the importance of techniques, vectors and enzymes involved in r-DNA technology.

To generate and test hypotheses, make observations, collect data, analyze and interpret results, derive conclusions, and evaluate their significance within a broad scientific context, using suitable statistical techniques

**The Kelkar Education Trust's**  
**V. G. Vaze College of Arts, Science and Commerce**  
**(Autonomous)**

Unit No.	Module No	Content	Lectures
<b>Paper II Course: FORM AND FUNCTION II</b>			
<b>1.</b>		<b>Horticulture and Gardening</b>	<b>15</b>
	<b>I</b>	<b>Introduction to Horticulture:</b> Branches of Horticulture <b>Gardening:</b> Features in the garden- edges, hedges, Arches & pergolas lawn, flower beds, avenue, (with names of two plants for each category).	
	<b>II</b>	<b>Types of garden</b> Formal and informal gardens Concept of Nakshatra garden	
	<b>III</b>	Botanical Garden: Veer Mata Jijabai Udyan (Victoria Garden).	
<b>2.</b>		<b>Biotechnology.</b>	<b>15</b>
	<b>I</b>	<b>Introduction to plant tissue culture</b> Laboratory organization and techniques in plant tissue culture Media composition and types of MS medium, Woody Plants Medium (WPM), Gamborg's B5 medium Totipotency, Organogenesis	
	<b>II</b>	Organ culture – root cultures, meristem cultures, anther and pollen culture, embryo culture.	
	<b>III</b>	<b>R-DNA technology</b> <ul style="list-style-type: none"> <li>• Gene cloning</li> <li>• Enzymes involved in Gene cloning</li> <li>• Vectors used for Gene cloning</li> </ul>	
<b>3.</b>		<b>Biostatistics and Bioinformatics</b>	<b>15</b>
	<b>I</b>	<b>Biostatistics:</b> <ul style="list-style-type: none"> <li>• Chi square test.</li> <li>• Correlation – Calculation of coefficient of correlation</li> </ul>	
	<b>II</b>	<b>Bioinformatics</b> <ul style="list-style-type: none"> <li>• Information technology: History and tools of IT, Internet and its use in Biological Sciences</li> <li>• Introduction to Bioinformatics- goal, need, scope</li> <li>• Aims &amp; Objectives of Bioinformatics: Data organization. Tools of Bioinformatics- tools for web search, Data retrieval tools- Entrez, BLAST</li> <li>• Bioinformatics programs &amp; Centers in India</li> </ul>	

**The Kelkar Education Trust's**  
**V. G. Vaze College of Arts, Science and Commerce**  
**(Autonomous)**

---

**PRACTICALS BASED ON PAPER III- Current Trends in Plant Sciences II**  
**Program:** S. Y. B. Sc **Semester:** IV  
**Course:** Current Trends in Plant Sciences II **Course Code:** SBO402

Sr. no	Title of Experiments	Credit: 01
<b>1.</b>	<b>Horticulture</b>	
	i. Study of five examples of plants for each of the garden locations as prescribed for theory	
	ii. Preparation of garden plans – formal and informal gardens	
	iii. Bottle and dish garden, Terrarium preparation	
<b>2.</b>	<b>Biotechnology</b>	
	i. Various sterilization techniques	
	ii. Preparation of Stock solutions, Preparation of MS medium.	
	iii. Seed sterilization, callus induction	
	iv. Regeneration of plantlet from callus.	
	v. Identification of the cloning vectors – pBR322, pUC 18, Ti plasmid	
<b>3.</b>	<b>Biostatistics and Bioinformatics</b>	
	i. Chi square test	
	ii. Calculation of coefficient of correlation	
	iii. Web Search – Google, Entrez.	
	iv. p-BLAST	



Dr. Aparna Saraf  
(VC Nominee)

**The Kelkar Education Trust's**  
**V. G. Vaze College of Arts, Science and Commerce**  
**(Autonomous)**

<b>Program:</b>	<b>S. Y. B. Sc</b>	<b>Semester III</b>
<b>Course:</b>	<b>Botany</b>	<b>Course Code:</b> <b>SBO401/402/403</b>
(Internal Assessment)		<b>Marks: 40</b>
<b>1 Class Test : (Based on Theory Unit 1, 2 and 3)</b>		20 marks
<b>2 Assignment:</b>		15 marks
<b>3 Class Participation and Overall conduct</b>		05 Marks

<b>Semester IV</b>	<b>(Internal Class Test Paper Pattern)</b>
<b>Duration:</b>	<b>Marks: 20</b>
Q. 1. a) Fill in the blanks:	05 marks
Q. 1. b) Match the column/Find out the correlation / complete the chart /draw neat labeled diagram.	05 marks
Q. 2. Answer in one Sentence.	10 marks

<b>Semester IV</b>	<b>(Theory Paper Pattern)</b>
<b>Duration: 02 hrs</b>	<b>Marks: 60</b>
Q.1. Multiple choice questions / Fill in the blanks / Match the column / Define / Answer in one sentence.	12 Marks
Q.2. Answer the following: (Unit 1) OR a) Answer in brief: (Unit 1) b) Answer in brief: (Unit 1)	12 Marks  06 Marks 06 Marks
Q. 3. Answer the following: (Unit 2) OR a) Answer in brief: (Unit 2) b) Answer in brief: (Unit 2)	12 Marks  06 Marks 06 Marks
Q.4. Answer the following: (Unit 3) OR a) Answer in brief: (Unit 3) b) Answer in brief: (Unit 3)	12 Marks  06 Mark 06 Marks
Q.5. Write Short notes on: Any four	12 Marks



Dr. Aparna Saraf  
(VC Nominee)

**The Kelkar Education Trust's  
V. G. Vaze College of Arts, Science and Commerce  
(Autonomous)**

---

**Syllabus Prepared by:**

1. Dr. M A Deodhar: Chairperson, Syllabus Committee  
Head, Dept of Botany,  
V G Vaze College,  
Mulund East,  
Mumbai
2. Dr. S L Dhuri: Member, Syllabus Committee  
Associate Pofessor,  
Dept. of Botany,  
V G Vaze College,  
Mulund East,  
Mumbai
3. Dr. Ajit Kengar: Member, Syllabus Committee  
Associate Pofessor,  
Dept. of Botany,  
V G Vaze College,  
Mulund East,  
Mumbai
4. Dr. Supriya Thale: Member, Syllabus Committee  
Assistant. Pofessor,  
Dept. of Botany,  
V G Vaze College,  
Mulund East,  
Mumbai
5. Mr Jatin Vaity: Member, Syllabus Committee  
Assistant Pofessor,  
Dept. of Botany,  
V G Vaze College,  
Mulund East,  
Mumbai