



JAI HIND COLLEGE  
BASANTSING INSTITUTE OF SCIENCE  
&  
J.T.LALVANI COLLEGE OF COMMERCE  
(AUTONOMOUS)

"A" Road, Churchgate, Mumbai - 400 020, India.

Affiliated to  
University of Mumbai

Program: B.Sc.

Proposed Course: Botany

Semester II

Credit Based Semester and Grading System (CBGS) with effect from the  
academic year 2020 - 2021

***F.Y.BSc. BOTANY Syllabus***

**Academic year 2020-2021**

**Semester II**

<b>Course Code</b>	<b>Course Title</b>	<b>Credits</b>	<b>Lectures /week</b>
SBOT201	Bryophyta, Pteridophyta, Gymnosperms and Angiosperms	2	3
SBOT202	Anatomy, Physiology and Ethnobotany	2	3

## **PREAMBLE**

Today plant science is a fusion of the traditional components with the modern aspects of biochemistry, molecular biology and biotechnology. Over the years, Botany has shown enormous gain in information and applications owing to tremendous inputs from research in all its aspects. With global recognition of the need for conservation, ecologists have contributed significantly in assessing plant diversity. Taxonomists have explored newer dimensions for the classification of plants. New insights have been gained in functional and structural aspects of plant development by utilizing novel tools and techniques for botanical research. Challenging areas of teaching and research have emerged in ecology and reproductive biology. Concern for ever increasing pollution and climate change is at its highest than ever before. Keeping these advancements in view, the vision of the curriculum at the undergraduate level is perfectly timed. From the beginning of 2019-2020 session; the Botany students of Jai Hind College shall have the benefit of a balanced, carefully-crafted course structure taking care of different aspects of plant science, namely plant diversity, physiology, biochemistry, molecular biology, reproduction, anatomy, taxonomy, ecology, economic botany and the impact of environment on the growth and development of plants. All these aspects have been given due weightage over the six semesters. It is essential for the undergraduate students to acquaint themselves with various tools and techniques for exploring the world of plants up to the sub-cellular level. A unit on instrumentation is proposed to provide such an opportunity to the students before they engage themselves with the learning of modern tools and techniques in plant science. Keeping the employment entrepreneurship in mind, applied component has been designed. On the whole, the curriculum is a source of lot of information and is supported by rich resource materials. It is hoped that a student graduating in Botany with the new curriculum will be a complete botanist. Students are encouraged to opt for AAA courses in other subjects like Microbiology, Life Sciences, Chemistry, etc.

## Semester II – Theory

<b>Course code: SBOT 201</b>	<b>PAPER I Bryophyta, Pteridophyta, Gymnosperms and Angiosperms (Credits : 2 Lectures/Week: 3)</b>	
	<p><b>Learning Objectives:</b></p> <ul style="list-style-type: none"> <li>• Learn the classification, life-cycles and economic importance of individuals belonging to Bryophyta, Pteridophyta and Gymnosperms.</li> <li>• Learn the morphology, structure and functions of various parts of a flower in detail and explain the use of taxonomical terminology and understand the meaning of the same.</li> <li>• Understand detailed study of the classification of a few families prescribed in syllabus.</li> </ul> <p><b>Learning Outcomes:</b></p> <ul style="list-style-type: none"> <li>• Students will be able to understand the morphological, anatomical and reproductional peculiarities and differences between all three groups of plants belonging to Bryophytes, Pteridophytes and Gymnosperm. Economic importance of each group will be understood to realise the potential use of each group.</li> <li>• Basic study of parts of the flower and types variations in floral morphology along with study of few families as classified as per Bentham and Hooker’s system will help to introduce students to the branch of taxonomy.</li> </ul>	
<b>Unit I</b>	<p><b>BRYOPHYTA AND PTERIODOPHYTA</b></p> <ul style="list-style-type: none"> <li>• General characters and economic importance of Hepaticae</li> <li>• Structure, life cycle and systematic position of <i>Riccia</i> and <i>Marchantia</i></li> <li>• General characters and economic importance of Lycopsidea</li> <li>• Structure life cycle, systematic position and alternation of generations in <i>Selaginella</i>.</li> </ul>	<b>15 L</b>
<b>Unit II</b>	<p><b>GYMNOSPERMS</b></p> <ul style="list-style-type: none"> <li>• Outline of classification according to C. J. Chamberlin</li> <li>• General characters and economic importance of Coniferopsida</li> <li>• Structure life cycle systematic position and alternation of generations in <i>Thuja</i> and <i>Araucaria</i></li> </ul>	<b>15L</b>
<b>Unit III</b>	<p><b>ANGIOSPERMS : FLORAL MORPHOLOGY AND STUDY OF FAMILIES</b></p> <ul style="list-style-type: none"> <li>• Definition and aims of Taxonomy</li> <li>• Parts of a typical flower: Bracts, pedicel, thalamus</li> <li>• Floral whorls: Accessory whorls: <ul style="list-style-type: none"> <li>○ Calyx and its functions, types of calyx (polysepalous, gamosepalous, persistent and caducous)</li> <li>○ Corolla and its functions, polypetalous and gamopetalous corolla. Aestivation in corolla (comparison of valvate and twisted aestivation).</li> <li>○ Perianth: definition, explain terms-Polyphyllous,</li> </ul> </li> </ul>	<b>15L</b>

	<p style="text-align: center;"><b>Gamophyllous, Sepaloid and Petaloid perianth</b></p> <ul style="list-style-type: none"> <li>• Essential whorls: <ul style="list-style-type: none"> <li>○ Androecium and its functions, union of stamens-cohesion (e.g. Monoadelphous stamens); adhesion (e.g. epipetalous and epiphyllous stamens).</li> <li>○ Gynoecium and its functions, apocarpous and syncarpous</li> </ul> </li> </ul>	
	<p style="text-align: center;">gynoecium;</p> <ul style="list-style-type: none"> <li>○ Placentation- definition, comparison of axile and parietal placentation.</li> <li>○ Representation of floral characters in the form of a floral formula.</li> <li>○ Classification of the following families as per Bentham and Hooker's system of classifications: Magnoliaceae, Malvaceae, Leguminosae, Solanaceae and Amaryllidaceae.</li> </ul> <p>Economic importance of plants belonging to the above mentioned families.</p>	
<p><b>References:</b></p> <ul style="list-style-type: none"> <li>• Vashishta B. R. &amp; Sinha A. K., Botany for degree students Bryophyta, S. Chand, 1st Edition, 2010</li> <li>• Vashishta B. R. &amp; Sinha A. K., Botany for degree students Pteridophyta S. Chand, 1st Edition, 2010</li> <li>• Vashishta B. R. &amp; Sinha A. K., S. Chand, Botany for degree students Gymnosperms, 1st Edition, 2010</li> <li>• Gangulee, Das and Dutta, College Botany –Volume II, New Central Book Agency, 2006</li> <li>• Chopra G. L., Angiosperms, S. Nagin &amp; Co., 1969</li> <li>• Sharma O. P., Plant Taxonomy, Tata Mc Graw – Hill Publishing Co. Ltd., 1993</li> <li>• Gurucharan S., Plant systematic, Oxford &amp; IBH publishing Co. Pvt. Ltd., 3<sup>rd</sup> edition, 2012</li> <li>• Davis P. H. &amp; Heywood V. H., Principles of Angiosperm Taxonomy, Scientific Publishers, 2011</li> </ul>		

<b>Course code:</b> <b>SBOT 202</b>	<b>PAPER II Anatomy, Physiology and Ethnobotany</b> <b>(Credits: 2 Lectures/Week: 3)</b>	
	<p><b>Learning Objectives:</b></p> <ul style="list-style-type: none"> <li>• The primary anatomical structure and functions of various tissues system in plants.</li> <li>• Primary Structure of Dicot and Monocot Stem, leaf and root.</li> <li>• To study Carbohydrate structure, classification and its importance as a primary metabolite in plants.</li> <li>• To learn the basic physiological process of light harvesting mechanisms for the synthesis of carbohydrates in various groups of higher plants. Study the role of photorespiration in plants.</li> <li>• Study the use of plants for food, medicine, etc from past data in literature. Relate the same to present experimental evidence and future advances in the same.</li> </ul> <p><b>Learning Outcomes:</b></p> <ul style="list-style-type: none"> <li>• Students will understand anatomical structure and functions of various types of basic tissue systems present in plants.</li> <li>• Students will understand the basic concept of light harvest mechanism, pigments involved, photosynthesis as a process as well as variations seen in carbohydrate accumulation in higher plant species. They will understand the negative role played by photorespiration in reducing the crop yield.</li> <li>• Students will be able to understand the potential of plants from medicinal and economical aspect.</li> </ul>	
<b>Unit I</b>	<p><b>ANATOMY</b></p> <ul style="list-style-type: none"> <li>• Simple and complex tissues, meristematic and permanent tissues.</li> <li>• Wall ingrowths and transfer cells, adcrustation and incrustation, Ergastic substances, lithocytes and laticifers</li> <li>• Primary structure of dicot and monocot root, stem and leaf</li> <li>• Epidermal tissue system, types of hair, stomata and types of stomata.</li> </ul>	<b>15 L</b>
<b>Unit II</b>	<p><b>PHYSIOLOGY</b></p> <ul style="list-style-type: none"> <li>• Carbohydrates: Basic Nomenclature, Classification, (Monosaccharides, Disaccharides, Oligosaccharides and Polysaccharides). Appropriate examples of class along with its use as Structural and storage Polysaccharides.</li> <li>• Structure and function of chloroplast, pigments associated with photosynthesis and basic light trapping and energy transfer mechanisms.</li> <li>• Photosynthesis: Light reactions, photolysis of water photophosphorylation (cyclic and non-cyclic), carbon fixation phase (C3, C4 and CAM pathways).</li> <li>• Photorespiration: Process and significance.</li> </ul>	<b>15 L</b>
<b>Unit III</b>	<p><b>MEDICINAL BOTANY/ ETHNOBOTANY</b></p> <ul style="list-style-type: none"> <li>• Ethnobotany - Definition, history, sources of data and methods of study</li> <li>• Applications of Ethnobotany:</li> </ul>	<b>15 L</b>

	<ul style="list-style-type: none"> <li>i) Ethnomedicines</li> <li>ii) Agriculture</li> <li>iii) Edible plants</li> <li>iv) Famine related plants,</li> <li>v) Toxic plants and Antidotes</li> <li>• Traditional medicines 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>• Role of ethnobotany in current scenario</li> </ul>	
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**References:**

- Pandey B. P., Plant anatomy, S. Chand & Co. Ltd., 2012
- Fahn A., Plant anatomy, Pergamon Press, 1967
- Esau K., Plant anatomy, John Wiley & Sons, 1953
- Roy P., Plant anatomy, New Central Book Agency, 2006
- Taiz L. & Zeiger E., Plant Physiology, Sinauer Associates Inc. Publishers, 5<sup>th</sup> edition, 2010
- Lehninger, Principles of Biochemistry, D. Nelson & M. Cox, W. H. Freeman & Co., 4th edition, 2005
- Jain S.K., Manual of Ethnobotany NBRI, Lucknow, 2nd edition
- Khandelwal K.R., Practical Pharmacognosy, Nirali Publication, 1998

## Semester II – Practical

Course Code: SBOT2PR	Practical Paper I & II (Credits:2 2 Practicals/Week:)
	<p><b>Learning Objectives:</b></p> <ul style="list-style-type: none"> <li>• The students will perform sectioning of fresh and preserved specimens of Bryophytes, Pteridophytes and Gymnosperms and observe microscopic details to understand their structural variations.</li> <li>• The students will observe specimens to study floral morphology.</li> <li>• The students will section specimens to study and compare anatomical differences in dicotyledonous and monocotyledonous plants.</li> <li>• Students will study differences in epidermal outgrowths as a taxonomic character and they will also classify different adaptations to defence and storage.</li> <li>• The students will understand the principle of working of a colorimeter based on Beer Lambert's law and will apply it for analyzing plant pigments.</li> </ul> <p><b>Learning Outcomes:</b></p> <ul style="list-style-type: none"> <li>• Study of morphological characters will help them to easily identify the field plants.</li> <li>• Students will understand the use of anatomical variations to classify plants.</li> <li>• Students will learn the importance of Ethno-medicinal plants for various ailments.</li> </ul>
	<ol style="list-style-type: none"> <li>1. Study of stages in the life cycle of <i>Riccia</i> from fresh/ preserved material and permanent slide</li> <li>2. Study of stages in the life cycle of <i>Marchantia</i> from fresh/ preserved material and permanent slide</li> <li>3. Study of stages in the life cycle of <i>Selaginella</i> from fresh/ preserved material and permanent slide</li> <li>4. Study of stages in the life cycle of <i>Thuja</i> from fresh/ preserved material and permanent Slides</li> <li>5. Study of stages in the life cycle of <i>Araucaria</i> from fresh/ preserved material and permanent Slides</li> <li>6. Floral morphology- calyx and corolla</li> <li>7. Floral morphology - androecium and gynaecium and positions of ovary, placentation</li> <li>8. Study of the family: Magnoliaceae Malvaceae Leguminosae Solanaceae. Amaryllidaceae.</li> </ol>
	<ol style="list-style-type: none"> <li>9. Primary structure of dicot and monocot root.</li> <li>10. Primary structure of dicot and monocot stem.</li> <li>11. Primary structure of dicot and monocot leaf.</li> <li>12. Study of dicot and monocot stomata.</li> <li>13. Study of simple and complex tissues(Identification with permanent slides)</li> <li>14. Epidermal outgrowths with the help of mountings Unicellular: <i>Gossypium/ Radish</i>.</li> </ol>



Multicellular: *Lantana* /Sunflower

Glandular: *Drosera* (Identification with permanent slides)

Stinging: *Urtica* (Identification with permanent slides)

Peltate: *Thespesia*

Stellate: *Erythrina*/*Sida acuta* / *Solanum* /*Helecteris*

T-shaped: *Avicennia*

15. Identification of starch grains from potato and rice.

16. Study of Beer Lambert's Law

17. Study of absorption spectrum of plant pigments.

18. Study of ergastic substances, incrustations, adcrustations, lithocysts and laticifers.

19. Identification of plants used in skin ailments, wound healing and ageing, liver ailments, fever and diabetes



JAI HIND COLLEGE, CHURCHGATE

F.Y.B.Sc. Botany Practical Paper

Semester II Paper I

Total Marks: 50

Time: 2 hrs 15min

Q. 1: Identify, classify and describe specimen A, B and C. Draw labelled sketches to support your observations. (27)

Q. 2 Classify specimen D upto its family giving reasons, morphological features & floral formula. Draw the L.S. of flower and T.S. of ovary. (10)

Q. 3 Identify and describe slide / specimen / photomicrograph E and F (08)

Q. 4 Journal (05)

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A – Bryophyta – *Riccia*, *Marchantia*

B – Pteridophyta – *Selaginella*

C – Gymnosperms – *Thuja*, *Araucaria*

D –

Magnoliaceae/Malvaceae/Papilionaceae/Cesalpinae/Mimosae/Solanaceae/Amaryllidaceae

E & F – Morphology of calyx, corolla, Androecium, Gynoecium (Any two – in random order)

JAI HIND COLLEGE, CHURCHGATE

F.Y.B.Sc. Botany Practical Paper

Semester II Paper II

Total Marks: 50

Time: 2 hrs 15min

Q. 1 Make a temporary stained preparation of T.S. of specimen 'A'. Draw a neat and labeled sketch. (12)

Q. 2 (a) Mount the epidermal outgrowth/ stomata from specimen 'B'. Comment on the slide and draw a neat labeled sketch. (07)

Q. 2 (b) Prepare a slide & comment on the given specimen 'C'. Draw a neat and labeled sketch. (07)

Q. 3 Perform the physiology experiment 'D' allotted to you. Write the principle & requirements. Record your observation and results. (12)

Q. 4 Identify and describe the specimen 'E' and 'F' giving ethnomedicinal value (06)

Q. 5 Viva – voce (06)

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A – Dicot stem/root; Monocot stem/root

B – Unicellular hair/ Multicellular hair/ stellate hair/ peltate hair/ inverted 'T' shaped hair/dicot stomata/ Monocot stomata

C –Ergastic substances/ incrustations/ adcrustations/ lithocysts/ laticifers

D – Beer – Lambert's law/ Absorption spectrum of plant pigments

E & F – *Rubiocordifolia*/ sandal wood/ *Phyllanthus sp./Andrographispaniculata/ Centellaasiatica/ Typha/ Terminalia sp/ Tridaxprocumbens/ Vitexnegundo/ Tinosporacordifolia/ Momordicacharatia/ Syzygiumcumini*(In random order)

## **Evaluation Scheme**

### **[A] Evaluation scheme for Theory courses**

#### **I. Continuous Assessment (C.A.) - 40 Marks**

- (i) C.A.-I: Test – 20 Marks of 40 mins. duration**
- (ii) C.A.-II: Assignment/Project/on the spot surprise class test - 20 Marks**

#### **II. Semester End Examination (SEE)- 60 Marks**

### **[B] Evaluation scheme for Practical courses (SEE – 50 marks)**

#### **NOTE:**

1. A minimum of TWO 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 FYBSc 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 FYBSc 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.