

**Anekant Education of Society's  
Tuljaram Chaturchand College of Arts, Science and  
Commerce, Baramati**

**Autonomous**

**Course Structure for F. Y. B. Sc. BOTANY**

<b>Class</b>	<b>Semester</b>	<b>Paper</b>	<b>Title of Paper</b>	<b>Credits</b>
<b>F.Y.B.Sc.</b>	<b>I</b>	BOT 1101	Plant Diversity	02
		BOT 1102	Applications of Botany - I	02
		BOT 1103	Practical based on BOT 1101 and BOT 1102	02
	<b>II</b>	BOT 1201	Angiosperm Morphology	02
		BOT 1202	Applications of Botany - II	02
		BOT 1203	Practical based on BOT 1201 and BOT 1202	02
<b>S.Y.B.Sc.</b>	<b>III</b>	BOT2301	Angiosperms Taxonomy	03
		BOT2302	Plant Physiology	03
	<b>IV</b>	BOT2401	Anatomy and Embryology	03
		BOT2402	Plant Ecology	03
	<b>Annual</b>	BOT2403	Practical based on BOT2301, BOT2302, BOT2401 and BOT2402	04
<b>T.Y.B.Sc.</b>	<b>V</b>	BOT3501	Cryptogamic Botany (Algae, Fungi, Bryophytes and Pteridophytes)	03
		BOT3502	Spermatophyta and Palaeobotany	03
		BOT3503	Cell and Molecular Biology	03
		BOT3504	Industrial Botany	03
		BOT3505	Biostatistics	03
		BOT3506	Research Methodology	03
	<b>VI</b>	BOT3601	Plant Physiology and Biochemistry	03
		BOT3602	Plant Biotechnology	03
		BOT3603	Genetics and Plant Breeding	03
		BOT3604	Plant Pathology	03
		BOT3605	Pharmacognosy	03
		BOT3606	Botanical Techniques	03
	<b>Annual</b>	BOT3607	Practical based on BOT3501 to BOT3506	04
	<b>Annual</b>	BOT3608	Practical based on BOT3601 to BOT3606	04
	<b>Annual</b>	BOT3609	Project	04

## Program Outcomes (Pos) for B. Sc. Program

PO1	<b>Disciplinary Knowledge:</b> Demonstrate comprehensive knowledge of the disciplines that form a part of a graduate programme. Execute strong theoretical and practical understanding generated from the specific graduate programme in the area of work.
PO2	<b>Critical Thinking and Problem solving:</b> Exhibit the skills of analysis, inference, interpretation and problem-solving by observing the situation closely and design the solutions.
PO3	<b>Social competence:</b> Display the understanding, behavioural skills needed for successful social adaptation , work in groups, exhibit thoughts and ideas effectively in writing and orally
PO4	<b>Research-related skills and Scientific temper :</b> Develop the working knowledge and applications of instrumentation and laboratory techniques. Able to apply skills to design and conduct independent experiments, interpret, establish hypothesis and inquisitiveness towards research.
PO5	<b>Trans-disciplinary knowledge:</b> Integrate different disciplines to uplift the domains of cognitive abilities and transcend beyond discipline-specific approaches to address a common problem
PO6	<b>Personal and professional competence:</b> Performing dependently and also collaboratively as a part of a team to meet defined objectives and carry out work across interdisciplinary fields. Execute interpersonal relationships, self-motivation and adaptability skills and commit to professional ethics.
PO7	<b>Effective Citizenship and Ethics:</b> Demonstrate empathetic social concern and equity centred national development, and ability to act with an informed awareness of moral and ethical issues and commit to professional ethics and responsibility.
PO8	<b>Environment and Sustainability:</b> Understand the impact of the scientific solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.
PO9	<b>Self-directed and Life-long learning:</b> Acquire the ability to engage in independent and life-long learning in the broadest context of socio-technological changes.

Class : **F. Y. B. Sc. (Semester - II)**  
Paper Code : **BOT 1201**  
Paper : **I** Title of Paper : **Angiosperm Morphology**  
Credit : **2** No. of lectures : **36**

**A) Learning Objectives:**

1. To incarve the external and internal characteristics of flowering plants in mind of students.
2. To create awareness of local flora

**B) Learning Outcome:**

By the end of the course, students will be able to:

- CO1. Describe the morphology and reproductive structure of Phanerogams.
- CO2. Identify, describe and study in detail life cycle of Phanerogams.
- CO3. Know scope of the Phanerogams diversity with special reference to Gymnosperms and Angiosperms.
- CO4. Know different methods of conservation of Phanerogams.
- CO5. Study the applications of cryptogams.
- CO6. Describe and identify flowering plants.
- CO7. Understand the local flora with respect to Phanerogams.

**Credit - I**

**Unit - 1 (24L)**

- 1.1 Types and modifications of root, stem and leaf **(5L)**
- 1.2 **Morphology of Inflorescence:** Types and significance of inflorescence: Racemose (raceme, spike, corymb, umbel, catkin, spadix and capitulum), Cymose (solitary, monochasial, dichasial, polychasial), Special types (Verticillaster, Cyathium, and Hypanthodium). **(5L)**
- 1.3 **Morphology of Flower:** Parts of typical flower, Types of flower (complete, incomplete), insertion of floral whorls. Floral whorls: Calyx, corolla, perianth, aestivation, modifications of calyx (pappus, petalloid, spurred). Forms of corolla : polypetalous (cruciform and papilionaceous) gamopetalous (infundibuliform, bilabiate), Androecium : structure of stamen, fixation, cohesion and adhesion of anthers; Gynoecium : structure of carpel. Types of placentation. **(10L)**
- 1.4 **Morphology of Fruit:** Types of fruits: Simple and dry: Achene, Cypsela, Legume, Follicle and Capsule, Fleshy: Drupe, berry, Hesperidium and pepo. Aggregate: Etaerio of berries and Etaerio of follicles. Multiple fruits: Syconus and Sorosis. **(4L)**

**Credit - II**

**Unit - 2 (12L)**

- 2.1 Introduction to internal morphology (**1L**)
- 2.2 **Types of tissues** : Outline with brief description (**6L**)  
**Meristematic tissues** : Meristem, characters and types based on origin, position and plane of division, functions of meristematic tissues.  
**Vascular tissues** : Components of xylem and phloem, types of vascular bundles, functions of vascular tissues.  
**Epidermal tissues** : Epidermis, structure of typical stomata, trichomes, motor cells, functions of epidermal tissues.  
**Mechanical tissues** : Collenchyma, sclerenchyma and xylem, functions of mechanical tissues.
- 2.3 **Anatomy** : Introduction, Definition and importance (**2L**)
- 2.4 **Internal morphology** : Internal morphology of root, stem and leaf of dicot and monocot (**3L**)

### References :

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Choice Based Credit System Syllabus (2019 Pattern)

**Mapping of Program Outcomes with Course Outcomes**

**Class:** F.Y.B. Sc. (Sem. II)

**Subject:** Botany

**Course:** Angiosperm Morphology

**Course Code:** BOT 1201

**Weightage:** 1= weak or low relation, 2= moderate or partial relation, 3= strong or direct relation

Course Outcomes	Programme Outcomes (POs)								
	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9
CO 1	3		2			1			3
CO 2	3		2			1			3
CO 3	3				2	1	1	1	1
CO 4		3	1	1			1		
CO 5					1				1
CO 6	3				1				1
CO 7		3				2			

**Justification for the mapping**

**PO1: Disciplinary Knowledge**

CO1. Describe the morphology and reproductive structure of Phanerogams.

CO2. Identify, describe and study in detail life cycle of Phanerogams.

CO3. Know scope of the Phanerogams diversity with special reference to Gymnosperms and Angiosperms.

CO6. Describe and identify the flowering plants.

**PO2: Critical Thinking and Problem Solving**

CO4. Know different methods of conservation of Phanerogams.

CO7. Understand the local flora with respect to Phanerogams.

**PO 3: Social competence**

- CO1. Describe the morphology and reproductive structure of Phanerogams.
- CO2. Identify, describe and study in detail life cycle of Phanerogams.
- CO4. Know different methods of conservation of Phanerogams.

**PO 4: Research-related skills and Scientific temper**

- CO4. Know different methods of conservation of Phanerogams.

**PO5: Trans-disciplinary Knowledge**

- CO3. Know scope of the Phanerogams diversity with special reference to Gymnosperms and Angiosperms.
- CO5. Study the applications of Phanerogams.
- CO6. Describe and identify the flowering plants.

**PO6: Personal and Professional Competence**

- CO1. Describe the morphology and reproductive structure of Phanerogams.
- CO2. Identify, describe and study in detail life cycle of Phanerogams.
- CO3. Know scope of the Phanerogams diversity with special reference to Gymnosperms and Angiosperms.
- CO7. Understand the local flora with respect to Phanerogams.

**PO 7: Effective Citizenship and Ethics**

- CO3. Know scope of the Phanerogams diversity with special reference to Gymnosperms and Angiosperms.
- CO4. Know different methods of conservation of Phanerogams.

**PO 8: Environment and Sustainability**

- CO3. Know scope of the Phanerogams diversity with special reference to Gymnosperms and Angiosperms.

**PO 9: Self-directed and Life-long Learning**

- CO1. Describe the morphology and reproductive structure of Phanerogams.
- CO2. Identify, describe and study in detail life cycle of Phanerogams.
- CO3. Know scope of the Phanerogams diversity with special reference to Gymnosperms and Angiosperms.
- CO5. Study the applications of Phanerogams.
- CO6. Describe and identify the flowering plants.

Class : **F. Y. B. Sc. (Semester - II)**  
Paper Code : **BOT 1202**  
Paper : **II** Title of Paper : **Applications of Botany - II**  
Credit : 2 No. of lectures : 36

**A) Learning Objectives:**

1. To give knowledge about organic farming and pharmacognosy.
2. To make students experts to setup agro-industry.

**B) Learning Outcome:**

By the end of the course, students will be able to:

- CO1. Get knowledge of Biopesticide and Biofertilizer.  
CO2. Acquire knowledge of organic farming with respect to Biopesticide and Biofertilizers.  
CO3. Know scope of the industrially important fungi and their applications.  
CO4. Get knowledge of Pharmaceutical Industry.  
CO5. Know career opportunities in biopesticide and biofertilizers industry.  
CO6. Get expertise in preparation of biopesticides and biofertilizers.  
CO7. Get expertise in the field of Pharmaceutical industry.

**Credit - I**

**Unit - 1 (18L)**

- 1.1 **Bio-fuel Industry** : Introduction and advantages. Concept of biofuel and its need. Plants used for biofuel production. Biodiesel production from Castor. Commercial significance. **(6L)**
- 1.2 **Bio-pesticide Industry** : Concept of bio-control; Integrated Pest Management (IPM). Importance of bio pesticides. Types of bio pesticides : Indiarin, Azadiractin and *Trichoderma*. Commercial significance. **(6L)**
- 1.3 **Industrial Mycology** : Introduction, Important genera of fungi used in various industries and their products. Products and applications of *Penicillium*, *Aspergillus* and yeast. Commercial significance. **(6L)**

**Credit - II**

**Unit - 2 (18L)**

- 2.1 **Bio-Fertilizer Industry** : Bio fertilizers : concept and need. Types of bio-fertilizers: Nitrogen fixing biofertilizer: *Rhizobium*, Blue green algae. *Anabaena* associated with *Azolla*. Phosphate solubilizing Biofertilizer : Bacteria and Fungi. Commercial significance. **(6L)**

- 2.2 **Fruit Processing Industry** : Fruit processing: concept and need. Types of fruit preservations. Type of processed products (canned fruits, fruit pulp, squash, jam, jelly, pickle and ketchups). Packing industry. (6L)
- 2.3 **Pharmaceutical Industry** : Concept and advantages. Types of pharmaceutical products: Churna, Asava and Arishta. Drug plants with reference to botanical source, active principles and medicinal uses of *Adhatoda zeylanica*, *Tinospora cordifolia* and *Asparagus racemosus*. Manufacture of *Churna (Triphala churna)*, *Arishta (Ashokarishta)* and *Asava (Kumariasava)*. Concept of nutraceuticals and cosmeceuticals. Commercial importance of Amla and *Aloe*. (6L)

#### References :

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Choice Based Credit System Syllabus (2019 Pattern)  
**Mapping of Program Outcomes with Course Outcomes**

**Class:** F.Y.B. Sc. (Sem. II)

**Subject:** Botany

**Course:** Applications of Botany II

**Course Code:** BOT 1202

**Weightage:** 1= weak or low relation, 2= moderate or partial relation, 3= strong or direct relation

Course Outcomes	Programme Outcomes (POs)								
	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9
CO 1	3								1
CO 2	3	3	2	2	1		1	1	2
CO 3	3	2			1	1	1	1	1
CO 4	3		1	1	1				
CO 5		1			1				
CO 6		2		1					
CO 7		2		1					

**Justification for the mapping**

**PO1: Disciplinary Knowledge**

- CO1. Get knowledge of Biopesticide and Biofertilizer.
- CO2. Acquire knowledge of organic farming with respect to Biopesticides and Biofertilizers.
- CO3. Know scope of the industrially important fungi and their applications.
- CO4. Get knowledge of Pharmaceutical Industry.

**PO2: Critical Thinking and Problem Solving**

- CO2. Acquire knowledge of organic farming with respect to Biopesticides and Biofertilizers.
- CO3. Know scope of the industrially important fungi and their applications.
- CO5. Know career opportunities in biopesticide and biofertilizer industry.
- CO6. Get expertise in preparation of biopesticides and biofertilizers.

CO7. Get expertise in the field of Pharmaceutical industry.

**PO 3: Social competence**

CO2. Acquire knowledge of organic farming with respect to Biopesticides and Biofertilizers.

CO4. Get knowledge of Pharmaceutical Industry.

**PO 4: Research-related skills and Scientific temper**

CO2. Acquire knowledge of organic farming with respect to Biopesticides and Biofertilizers.

CO4. Get knowledge of Pharmaceutical Industry.

CO6. Get expertise in preparation of biopesticides and biofertilizers.

CO7. Get expertise in the field of Pharmaceutical industry.

**PO5: Trans-disciplinary Knowledge**

CO5. Know career opportunities in biopesticide and biofertilizer industry.

**PO6: Personal and Professional Competence**

CO3. Know scope of the industrially important fungi and their applications.

**PO 7: Effective Citizenship and Ethics**

CO3. Know scope of the industrially important fungi and their applications.

**PO 8: Environment and Sustainability**

CO2. Acquire knowledge of organic farming with respect to Biopesticides and Biofertilizers.

CO3. Know scope of the industrially important fungi and their applications.

**PO 9: Self-directed and Life-long Learning**

CO1. Get knowledge of Biopesticide and Biofertilizer.

CO2. Acquire knowledge of organic farming with respect to Biopesticides and Biofertilizers.

CO3. Know scope of the industrially important fungi and their applications.

Class : **F. Y. B. Sc. (Semester - II)**  
Paper Code : **BOT 1203**  
Paper : **III** Title of Paper : **Practical Course**  
Credit : **2** No. of Practicals : **13**

**A) Learning Objectives :**

To give hands-on training of production of agroproducts.

**B) Learning Outcome:**

By the end of the course, students will be able to:

CO1. Get expertise in handling of microscope.

CO2. Identify the Phanerogams.

CO3. Describe flowering plants using botanical terms.

CO4. Get knowledge of preparation of fungal products.

CO5. Get knowledge of preparation of bio-fertilizers.

CO6. Get knowledge of preparation of biopesticide

CO7. Get knowledge of preparation of pharmaceutical products.

1. Modifications of root and stem 1P
2. Study of leaf (types: simple and compound; sessile and petiolate; venation: parallel and reticulate and modifications ) 1P
3. Study of Inflorescence a) Racemose: Raceme, Spike, Spadix, Catkin, Umbel and Capitulum. b) Cymose: Solitary cyme, Uniparous cyme: helicoid and scorpioid, Biparous cyme and Multiparous cyme. c) Special type: Verticillaster, Hypanthodium and Cyathium 1P
4. Study of flower with respect to Calyx, Corolla and Perianth 1P
5. Study of flower with respect to Androecium and Gynoecium 1P
6. Study of fruits with suitable examples : Simple fruit: fleshy - Berry and Drupe; Dry: Achene, Cypsella and Legume Aggregate fruit: Etaerio of follicles and Etaerio of Berries. Multiple fruit: Syconus and Sorosis 1P
7. Study of internal primary structure of dicotyledonous root, stem and leaf. e.g. Sunflower 1P
8. Study of internal primary structure of monocotyledonous root, stem and leaf. e.g. Maize 1P
9. Preparation of Biopesticide : Azadiractin 1P
10. Study of industrially important fungi and their products : *Ganoderma*: *Ganoderma* tablets, *Aspargillus* : citric acid; *Yeast*: Bakery products; *Penicillium*: Penicillin 1P
11. Preparation of Biofertilizer - Compost and applications of microbial biofertilizers. 1P
12. Preparation of Jam, Squash and Amla Candy 1P
13. Visit to one of the industries : Pharmaceutical industry / Fruit Processing industry / Any One Agro Industry. (Study / visit report is compulsory).

**(Note: Visits mentioned in the practical No. 13 is compulsory. It carries 10 marks at the time of practical examination).**

Choice Based Credit System Syllabus (2019 Pattern)

**Mapping of Program Outcomes with Course Outcomes**

**Class:** F.Y.B. Sc. (Sem. II)

**Subject:** Botany

**Course:** Practical Course

**Course Code:** BOT 1203

**Weightage:** 1= weak or low relation, 2= moderate or partial relation, 3= strong or direct relation

Course Outcomes	Programme Outcomes (POs)								
	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9
CO 1	3								
CO 2	3	3				3			1
CO 3	3	2							1
CO 4	3		3						
CO 5	3	1		1	1		1	1	2
CO 6	3	1		1	1		1	1	2
CO 7	3	1		1	1		1	1	2

**Justification for the mapping**

**PO1: Disciplinary Knowledge**

- CO1. Get expertise in handling of microscope.
- CO2. Identify the Phanerogams.
- CO3. Describe flowering plants using botanical terms.
- CO4. Get knowledge of preparation of fungal products.
- CO5. Get knowledge of preparation of bio-fertilizers.
- CO6. Get knowledge of preparation of biopesticides
- CO7. Get knowledge of preparation of pharmaceutical products.

**PO2: Critical Thinking and Problem Solving**

- CO2. Identify the Phanerogams.
- CO3. Describe flowering plants using botanical terms.
- CO5. Get knowledge of preparation of bio-fertilizers.
- CO6. Get knowledge of preparation of biopesticides
- CO7. Get knowledge of preparation of pharmaceutical products.

**PO 3: Social competence**

- CO4. Get knowledge of preparation of fungal products.

**PO 4: Research-related skills and Scientific temper**

- CO5. Get knowledge of preparation of bio-fertilizers.
- CO6. Get knowledge of preparation of biopesticides
- CO7. Get knowledge of preparation of pharmaceutical products.

**PO5: Trans-disciplinary Knowledge**

- CO5. Get knowledge of preparation of bio-fertilizers.
- CO6. Get knowledge of preparation of biopesticides
- CO7. Get knowledge of preparation of pharmaceutical products.

**PO6: Personal and Professional Competence**

- CO2. Identify the Phanerogams.

**PO 7: Effective Citizenship and Ethics**

- CO5. Get knowledge of preparation of bio-fertilizers.
- CO6. Get knowledge of preparation of biopesticides
- CO7. Get knowledge of preparation of pharmaceutical products.

**PO 8: Environment and Sustainability**

- CO5. Get knowledge of preparation of bio-fertilizers.
- CO6. Get knowledge of preparation of biopesticides
- CO7. Get knowledge of preparation of pharmaceutical products.

**PO 9: Self-directed and Life-long Learning**

- CO2. Identify the Phanerogams.
- CO3. Describe flowering plants using botanical terms.
- CO5. Get knowledge of preparation of bio-fertilizers.
- CO6. Get knowledge of preparation of biopesticides
- CO7. Get knowledge of preparation of pharmaceutical products.