

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

UG Syllabus : w.e.f. 2022-23 to 2024-25

Preamble

The first year B.Sc. syllabus including fundamental as well as advanced concepts in the Botany. After studying the syllabus, students shall inspire for pursuing higher studies in Botany and becoming an entrepreneur. This syllabus can helpful to understand diversity in plant groups and plant science related industries. The practical course is aimed to equip the students with skills required for plant identification, description, classification and also applications of these plants in various industries.

Program Outcomes (Pos) for B. Sc. Program

PO1	Disciplinary Knowledge: 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	Critical Thinking and Problem solving: Exhibit the skills of analysis, inference, interpretation and problem-solving by observing the situation closely and design the solutions.
PO3	Social competence: Display the understanding, behavioural skills needed for successful social adaptation , work in groups, exhibit thoughts and ideas effectively in writing and orally
PO4	Research-related skills and Scientific temper : 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	Trans-disciplinary knowledge: Integrate different disciplines to uplift the domains of cognitive abilities and transcend beyond discipline-specific approaches to address a common problem
PO6	Personal and professional competence: 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	Effective Citizenship and Ethics: 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	Environment and Sustainability: Understand the impact of the scientific solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.
PO9	Self-directed and Life-long learning: Acquire the ability to engage in independent and life-long learning in the broadest context of socio-technological changes.

SYLLABUS (CBCS) FOR F. Y. B. Sc. BOTANY
(w. e. from June, 2022)
Academic Year 2022-2023

Class : **F. Y. B. Sc. (Semester - II)**

Paper Code: **USBT121**

Paper : **I**

Title of Paper: **Diversity of Phanerogams**

Credit : **2**

No. of lectures: **36**

A) Learning Objectives:

1. To understand the plant diversity with special reference to phanerogams diversity.
2. To give idea of conservation and economic importance of phanerogams.
3. To in carve the external characteristics of flowering plants in mind of students.
4. 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 (16 L)

Unit - I

1.1 Gymnosperms : Occurrence and General characters, Life cycle of *Cycas*, Economic importance of Gymnosperms. **(6L)**

1.2 Angiosperms : Occurrence and General characters, means of evolutionary success of Angiosperms, comparative account of monocotyledons and dicotyledons. **(4L)**

1.3 Types and modifications of root, stem and leaf. **(6L)**

Credit - II (20 L)

Unit - II

2.1 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)

2.2 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, petaloid, 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)

2.3 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. (5L)

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15. Swingle D.B. 1946. A Text book of Systematic Botany. McGraw Hill Book Co. New York.
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17. Gurucharan Singh 2005- Plant systematics
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19. Shivrajan V.V. -Introduction to Principles plant taxonomy
20. Sharma O.P. Plant Taxonomy Tata McGraw-Hill Education

Choice Based Credit System Syllabus (2022 Pattern)

Mapping of Program Outcomes with Course Outcomes

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

Subject: Botany

Course: Diversity of Phanerogams

Course Code: USBT 121

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 : **USBT 122**
Paper : **II** Title of Paper : **Industrial Botany - II**
Credit : 2 No. of lectures : 36

A) Learning Objectives:

1. To give knowledge about organic farming with respect to biopesticides and biofertilizers.
2. To give knowledge of medicinal plants and their uses.
3. 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 Biopesticides 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 biofertilizer 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 *Jatropha*. Commercial significance. **(6L)**
- 1.2 **Bio-pesticide Industry**: Concept of bio-control; Integrated Pest Management (IPM). Importance of bio pesticides. Types of bio pesticides: Indiar, Azadiractin and *Trichoderma*. Commercial significance. **(6L)**
- 1.3 **Industrial Mycology** : Introduction, Important genera of fungi used in various industries and their products. 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, Chips and ketchups). Packing industry. **(6L)**
- 2.3 **Pharmaceutical Industry** : Concept of nutraceuticals and cosmeceuticals and their advantages. Types of pharmaceutical products: Churna, Asava and Arishta. Drug plants with reference to botanical source, active principles and medicinal uses of *Withania somnifera*, *Tinospora cordifolia* and *Asparagus racemosus*. **(6L)**

References :

1. The Complete Book on Organic Farming and Production of Organic Compost (2008) : NPCS Board of Consultants & Engineers, Asia Pacific Business Press.
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 23. The Complete Technology Book on Biofertilizer and Organic Farming. (2013) :
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Choice Based Credit System Syllabus (2022 Pattern)

Mapping of Program Outcomes with Course Outcomes

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

Subject: Botany

Course: Industrial Botany II

Course Code: USBT 122

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 : **USBT123**
Paper : **III** Title of Paper : **Practical - II**
Credit : **2** No. of Practicals : **11**

A) Learning Objectives :

1. To give knowledge of handling of microscope and identification of higher plants.
2. To introduce the students with botanical terms for description of flowering plants.
3. To give hands-on training of production of agro products.

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 biopesticides
- CO7. Get knowledge of preparation of pharmaceutical products.

1. Study of *Cycas*. 1P
2. Modifications of root and stem. 1P
3. Study of leaf (types: simple and compound; sessile and petiolate; venation: parallel and reticulate and modifications). 1P
4. Study of Inflorescence a) Racemose: Raceme, Spike, Spadix, Catkin, Umbel and Capitulum. b) Cymose: Solitary cyme, Uniparous cyme: helicoid and scorpiod, Biparous cyme and Multiparous cyme. c) Special type: Verticillaster, Hypanthodium and Cyathium. 1P
5. Study of flower with respect to Calyx, Corolla and Perianth. 1P
6. Study of flower with respect to Androecium and Gynoecium. 1P
7. 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
8. Study of Biopesticides. 1P

9. Study of industrially important fungi and their products : *Ganoderma*: *Ganoderma* tablets, *Aspergillus* : citric acid; *Yeast*: Bakery products; *Penicillium*: Penicillin 1P
10. Study of Biofertilizers. 1P
11. One botanical excursion to study phanerogam's diversity / Visit of Agrobased Industry (Study / visit report is compulsory). 1P

(Note: Visit mentioned in the practical No. 11 is compulsory. It carries 10 marks at the time of practical examination).

Choice Based Credit System Syllabus (2022 Pattern)

Mapping of Program Outcomes with Course Outcomes

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

Subject: Botany

Course: Botany Practical - II

Course Code: UBT 123

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.