

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

SYLLABUS (CBCS) FOR S. Y. B. Sc. BOTANY (w.e.f. June, 2020)

Academic Year 2020-2021

Semester	Paper Code	Paper Title	Credit
III	BOT 2301	Taxonomy of Angiosperms	03
	BOT 2302	Plant Physiology	03
	BOT 2303	Practical based on BOT 2301 and BOT 2302	02
IV	BOT 2401	Anatomy and Embryology	03
	BOT 2402	Plant Ecology	03
	BOT 2403	Practical based on BOT 2401 and BOT 2402	02

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.

Class : **S. Y. B. Sc. (Semester - III)**

Paper Code: **BOT 2301**

Paper : **I**

Title of Paper : **Angiosperms Taxonomy**

Credit : **3**

No. of lectures:48

A) Learning Objectives:

1. To study the comparative account of plant families.
2. To give knowledge of identification of plants and their nomenclature.

B) Course 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 (14 L)

Unit – 1

1. Introduction to Plant Taxonomy (4L)

- 1.1 Definition, scope, objectives and importance
- 1.2 Identification, classification, nomenclature
- 1.3 Concept of Systematics

2. Systems of classification (7L)

- 2.1 Types of systems with their merits and limitations- a)Artificial system- Carl Linnaeus , b) Natural system -Bentham and Hooker, c) Phylogenetic system- Engler and Prantl

3. Taxonomic literature (3L)

Flora, monograph, revisions, manuals, journals, periodicals and references books.

Credit - II (13 L)

Unit – 2

4. Sources of data for Systematics (6L)

- 4.1 Morphology
- 4.2 Anatomy
- 4.3 Cytology
- 4.4 Embryology
- 4.5 Phytochemistry
- 4.6 Molecular biology

5. Botanical Nomenclature (7L)

- 5.1 History
- 5.2 Binomial nomenclature
- 5.3 ICN - principles
- 5.4 Rules of nomenclature
- 5.5 Coining of generic names and specific epithets.
- 5.6 Ranks and endings of taxa names
- 5.7 Principle of priority
- 5.8 Effective and valid publications
- 5.9 Single and double authority citation
- 5.10 *Nomina conservanda*

Credit - II (21 L)

Unit – 3

6. Study of Plant Families (13L)

Study of following families with reference to systematic position, salient features, floral formula, floral diagram and any five examples with their economic importance - Annonaceae, Meliaceae, Myrtaceae, Rubiaceae, Solanaceae, Apocynaceae, Euphorbiaceae and Amaryllidaceae

7. Computer in taxonomy (8L)

- 7.1 Concept of herbarium their advantages and limitations
- 7.2 Digital /e-herbarium and their advantages
- 7.3 Data bases: concept and needs.
- 7.4 Use of computer in plant classification
- 7.5 APG system
- 7.6 Plant identification – key to groups upto family.

References :

Almeida, M.R. 1996, 1998, 2001a, 2001b, 2003a, 2003b 2009. *Flora of Maharashtra*. Vol. 1(Ranunculaceae to Connaraceae), 294 pp.; Vol. 2(Fabaceae to Apiaceae), 372 pp.; Vol. 3a (Rubiaceae to Ehretiaceae)300 pp.; Vol. 3b(Cuscutaceae to Martyniaceae) 301–464 pp.; Vol. 4a (Acanthaceae to Balanophoraceae)278 pp.; Vol. 4b(Bischofiaceae to Ceratophyllaceae)

- 279–399 pp. and Vol. 5a(Hydrocharitaceae to Typhaceae) 1–245 pp. St. Xavier's College, Mumbai.
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- Yadav S.R. and Sardesai M.M.- Flora of Kolhapur District. Shivaji University, Kolhapur.

IMPORTANT WEBSITES

THE FAMILIES OF FLOWERING PLANTS- L. Watson and M.J. Dallwitz

<https://www.delta-intkey.com/angio/index.htm>

ANGIOSPERM PHYLOGENY WEBSITE, version 14.

<http://www.mobot.org/MOBOT/research/APweb/>

THE PLANTS OF THE WORLD ONLINE PORTAL

<http://www.plantsoftheworldonline.org/>

INTERNATIONAL PLANT NAME INDEX (IPNI)

<https://www.ipni.org/>

TROPICOS

<https://www.tropicos.org/home>

BIODIVERSITY HERITAGE LIBRARY

<https://www.biodiversitylibrary.org/>

BOTANICUS DIGITAL LIBRARY

<https://www.botanicus.org/>

INTERNET ARCHIVE- DIGITAL LIBRARY

<https://archive.org/>

DATABASE OF PLANTS OF INDIAN SUBCONTINENT

<https://sites.google.com/site/efloraofindia/>

BOTANICAL SURVEY OF INDIA

https://bsi.gov.in/content/1416_1_FloraofIndia.aspx

FLOWERS OF INDIA

<http://www.flowersofindia.net/>

eFLORAS OF WORLD

<http://www.efloras.org/>

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

Class: S.Y. B. Sc. (Sem. III)

Subject: Botany

Course: Angiosperm Taxonomy

Course Code: BOT 2301

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								3
CO 2	3	2							3
CO 3	3								
CO 4	3	2				3		3	
CO 5	3	2				3			
CO 6	3			2	2	2			2
CO 7	3		3			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.

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.

PO2: Critical Thinking and Problem Solving

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

CO4. Know different methods of conservation of Phanerogams.

CO5. Study the applications of cryptogams.

PO 3: Social competence

CO7. Understand the local flora with respect to Phanerogams.

PO 4: Research-related skills and Scientific temper

CO6. Describe and identify flowering plants.

PO5: Trans-disciplinary Knowledge

CO6. Describe and identify flowering plants.

PO6: Personal and Professional Competence

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.

PO 8: Environment and Sustainability

CO4. Know different methods of conservation of Phanerogams.

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.

CO6. Describe and identify flowering plants.

CO7. Understand the local flora with respect to Phanerogams.

Class : **S. Y. B. Sc. (Semester - III)**

Paper Code: **BOT 2302**

Paper : **II**

Credit : **3**

Title of Paper : **Plant Physiology**

No. of lectures:**48**

A) Learning Objectives:

1. To understand physiology of plants.
2. To study the physiological processes occurring in plants.

B) Course Outcome:

- CO1. Use knowledge for improvement of agricultural yield
- CO2. Students aware about the plant to response environmental conditions.
- CO3. Students get knowledge of internal activities in plant.
- CO4. Development of expertise in plant physiology.
- CO5. Get knowledge of plant metabolism.
- CO6. Students get knowledge of plant cycle.
- CO7. Students get knowledge of biomolecules.

Credit - I (15 L)

Unit – 1

1. Introduction to Plant Physiology (3L)

Brief history, Scope and applications of plant physiology

2. Plant – Water relations (8L)

- 2.1 Structure of cell and types of tissue – cellular and organism level.
- 2.2 Membrane structure (Fluid Mosaic Model), permeability and aquaporin
- 2.3 Diffusion – Definition, factors affecting diffusion, importance of diffusion in plants
- 2.4 Osmosis – Definition, types of solutions – hypotonic, hypertonic and isotonic, endosmosis and exosmosis, concept of osmotic pressure (OP), turgor pressure (TP), wall pressure (WP), Diffusion pressure deficit (DPD), relation between OP, TP and DPD, role of osmosis in plants.
- 2.5 Plasmolysis – Definition, mechanism, deplasmolysis, significance of plasmolysis
- 2.6 Imbibition – Concept, mechanism and significance

3. Absorption of water (4L)

- 3.1 Role of water in plants
- 3.2 Concept of water potential and capillary water
- 3.3 Mechanisms of water absorption (Accepted mechanism only)
- 3.4 Factors affecting rate of water absorption

Credit - II (17 L)

Unit – 2

4. Ascent of sap (5L)

- 4.1 Introduction and definition.
- 4.2 Theories of ascent of sap
- 4.3 Vital theories: Jamin – Chame theory and Bose theory
- 4.3.1 Physical force theories: a) Capillary theory, b) Imbibitional theory, c) Atmospheric pressure theory,
- 4.3.2 Transpiration pull or cohesion-tension theory, evidences and objections
- 4.4 Factors affecting ascent of sap

5. Transpiration (7L)

- 5.1 Definition
- 5.2 Types of transpiration – cuticular, lenticular and stomatal
- 5.3 Structure of stomata
- 5.4 Mechanism of opening and closing of stomata –Steward’s hypothesis, active K⁺ transport mechanism
- 5.5 Factors affecting the rate of transpiration
- 5.6 Significance of transpiration
- 5.7 Antitranspirants
- 5.8 Guttation
- 5.9 Exudation

6. Seed dormancy and germination (5L)

- 6.1 Definition and types of seed dormancy
- 6.2 Factors causing seed dormancy
- 6.3 Methods to break seed dormancy
- 6.4 Metabolic changes during seed germination

Credit - III (16 L)

Unit – 3

7. Plant growth and plant growth regulators (8L)

- 7.1 Introduction
- 7.2 Phases of growth and plant growth curve.
- 7.3 Measurement of growth- Arc auxanometer, Bose crescograph, fresh and dry weight method
- 7.4 Factors affecting growth

7.5 Plant Growth Regulators- Introduction and definition

7.6 Specific practical applications of auxins, cytokinins, gibberellins, ethylene and abscisic acid

8. Physiology of flowering (8L)

8.1 Photoperiodism – Concept, definition, short day plants, long day plants and day neutral plants, photoperiodic induction, phytochrome and flowering

8.2 Phytohormones and initiation of flowering

8.3 Applications of photoperiodism

8.4 Vernalisation – concept and definition, mechanism of vernalisation, applications of vernalisation, devernalization.

References:

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13. Kirkham, M.B. 2004. Principles of Soil and Plant Water Relations. Elsevier, Amsterdam, Netherlands.
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Choice Based Credit System Syllabus (2019 Pattern)
Mapping of Program Outcomes with Course Outcomes

Class: S.Y. B. Sc. (Sem. III)

Subject: Botany

Course: Plant Physiology

Course Code: BOT 2302

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							
CO 3				3					
CO 4									
CO 5	2			2					
CO 6	3			3					
CO 7	3			3					

Justification for the mapping

PO1: Disciplinary Knowledge

- CO1. Use knowledge for improvement of agricultural yield.
- CO3. Students get knowledge of internal activities in plant.
- CO5. Get knowledge of plant metabolism.
- CO6. Students get knowledge of plant cycle.
- CO7. Students get knowledge of biomolecules.

PO2: Critical Thinking and Problem Solving

- CO2. Students aware about the plant to response environmental conditions.

PO 3: Social competence

- CO1. Use knowledge for improvement of agricultural yield.

PO 4: Research-related skills and Scientific temper

- CO3. Students get knowledge of internal activities in plant.
- CO5. Get knowledge of plant metabolism.
- CO6. Students get knowledge of plant cycle.
- CO7. Students get knowledge of biomolecules.

Class : **S. Y. B. Sc. (Semester - III)**

Paper Code: **BOT 2303**

Paper : **III** Title of Paper : Practical based on BOT 2301 and BOT 2302

Credit : 2 No. of Practicals : 12

A) Learning Objectives:

1. To confirm the physiological processes.
2. To study physiological processes qualitatively and quantitatively.

B) Course Outcome:

By the end of course students will be able to

CO1. Develop identification skill in cryptogams.

CO2. Train in cell biology techniques.

CO3. Understand basic knowledge about life cycle of cryptogams.

CO4. Understand Internal and external structure of cryptogams.

CO5. Explain basic knowledge about evolution of lower cryptogams.

CO6. Discuss spore dispersal mechanism.

CO7. Understand variations in Cryptogamic diversity.

Practicals :

- 1) Tools of taxonomy (01 P)
- 2) Description of flowering plant in botanical terms (02 P)
- 3) Plant identification – key to groups upto family (01 P)
- 4) Study of plant families (any six) (03 P)
- 5) Study of plasmolysis in suitable plant material (01 P)
- 6) Determination of Diffusion Pressure Deficit (DPD). (01 P)
- 7) Determine rate of transpiration under different conditions of Sunlight, Shade and wind (01 P)
- 8) Demonstration Experiments. (Compulsory Practical): Curling Experiment, Imbibition in seeds, Arc Auxanometer, Effect of auxins on rooting, Transpiration pull, Spectrophotometer, Portable leaf area meter, Conductivity meter, Centrifuge (01 P)
- 9) Assessing seed viability by TTC method (01 P)

Note : Submission of botanical excursion report and herbarium of at least five correctly identified local dominant plants is compulsory.

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

Class: S.Y.B. Sc. (Sem. III)

Subject: Botany

Course: Practical based on BOT 2301 and BOT 2302

Course Code: BOT 2303

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				2					
CO 3	3					2			
CO 4	3								
CO 5	3								
CO 6	3								
CO 7	3		2			3			2

Justification for the mapping

PO1: Disciplinary Knowledge

- CO3. Understand basic knowledge about life cycle of cryptogams.
- CO4. Internal and external structure of cryptogams.
- CO5. Explain basic knowledge about evolution of lower cryptogams.
- CO6. Discuss spore dispersal mechanism.
- CO7. Understand variations in cryptogamic diversity.

PO2: Critical Thinking and Problem Solving

- CO7. Understand variations in cryptogamic diversity.

PO 4: Research-related skills and Scientific temper

- CO1. Develop identification skill in cryptogams.
- CO2. Train in cell biology techniques.

PO6: Personal and Professional Competence

- CO3. Understand basic knowledge about life cycle of cryptogams.
- CO7. Understand variations in cryptogamic diversity.

PO 9: Self-directed and Life-long Learning

- CO7. Understand variations in cryptogamic diversity.