

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

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

Paper Code: **BOT 2301**

Paper : **I**

Credit : **3**

Title of Paper : **Angiosperms Taxonomy**

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) Learning Outcome:

Development of plant taxonomists and expert in identification of local flora.

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 ICBN- 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, Asclepiadaceae, 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.

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2. Cronquist, A. 1968. The Evolution and Classification of Flowering Plants. Thomas Nel and Sons Ltd. London.
3. Datta S.C.- A Hand Book of Systematic Botany
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5. Gurucharan Singh 2005- Systematics theory and practice (Oxford IBH)
6. Heywood V.H 1967. Plant Taxonomy, London.
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8. Lawrence G.H.M 1955. An Introduction to Plant Taxonomy N.Y.
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12. Rendle A.B. 1925. The Classification of flowering plants. 2 Vols. London.
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15. Sharma O.P, Plant taxonomy (Tata Mc grow Hill)
16. Stewart W.N. and Rathwell G.W. 1993. Paleobotany and the Evolution of plants. Cambridge University Press.
17. Swingle D.B. 1946. A Text book of Systematic Botany. Mc Graw Hill Book Co. New York.
18. Takhtajan A. 1969. Flowering Plants; Origin and Disposal.
19. Theodore Cooke(1903)- The flora of The Presidency of Bombay Vol. I, II, III
20. V.V.Shivrajan-Introduction to Principles plant taxonomy
21. Yadav S.R. and Sardesai M.R.- Flora of Kolhapur District.

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) Learning Outcome:

Development of expertise in plant physiology

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
- 2.2 Membrane structure, 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 Methods to break seed dormancy

6.3 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

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, devernialization

References:

1. Bidwell, R.G.S. 1974. Plant Physiology. Macmillan Pub. Co., N.Y.
2. Devlin, R.M. And F.H. Witham. 1983. Plant Physiology. Willard Grant Press. U.S.A.
3. Hans-Walter Heldt. 1997. Plant Biochemistry And Molecular Biology. Oxford University Press, New York. Usa.
4. Moore, T.C. 1979. Biochemistry And Physiology Of Plant Hormones. Springer-Verlag. Berlin.
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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) Learning Outcome:

Development of research attitude in students.

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) (01 P) : Curling Experiment, Imbibition in seeds, Arc Auxanometer, Effect of auxins on rooting, Transpiration pull, Spectrophotometer, Portable leaf area meter, Conductivity meter, Centrifuge.
- 9) Assessing seed viability by TTC method (01 P)

N.B. Botanical excursion tour and submission of at least five correctly identified wild plant photographs is compulsory.

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

Paper Code: **BOT 2401**

Paper : **I**

Title of Paper : **Plant Anatomy and Embryology**

Credit : **3**

No. of lectures : **48**

A) Learning Objectives:

1. To introduce students with internal structure of plant and its organs.
2. To study developmental aspects of male gamete, female gamete, fertilization and embryo development.

B) Learning Outcome:

Awareness about the internal structure and tissue system in plant along with embryogenesis

Credit - I (14 L)

Unit – 1

1. Plant anatomy introduction (2L)

Definition, scope of plant anatomy and types of tissues

2. Epidermal tissue system (4L)

Structure and function of epidermal tissue system, uniseriate and multiseriate epidermis, stomata: structure, types and functions, epidermal outgrowth: glandular and non-glandular

3. Mechanical tissue system (4L)

Principles involved in distribution of mechanical tissues – inflexibility, incompressibility, inextensibility and shearing stress, tissues providing mechanical support, their distribution in leaf, stem and root of dicots and monocots.

4. Vascular tissue system (4L)

Structure and function of xylem, phloem and cambium

Credit - II (16 L)

Unit – 2

5. Normal secondary growth (5L)

Introduction, cambium and its role, process in stems of *Helianthus annuus* and *Annona squamosa*, extrastelar and intrastelar secondary growth, annual rings, periderm, bark, tylosis and lenticel

6. Anomalous secondary growth (5L)

Introduction, causes, anomalous secondary growth in dicot stem (*Bignonia*) dicot root (*Raphanus*) and monocot stem (*Dracaena*).

7. Plant embryology introduction (1L)

Definition and scope of plant embryology

8. Microsporangium and male gametophyte (5L)

- a) Microsporangium: structure of tetrasporangiate anther, types of tapetum, sporogenous tissue.
- b) Microsporogenesis: process and its types, types of microspore tetrad.
- c) Male gametophyte: structure and development of male gametophyte.

Credit - III (18 L)

Unit – 3

09. Megasporangium and female gametophyte: (7L)

- a) Megasporangium: structure, types of ovules – anatropous, orthotropous, amphitropous,
- b) campylotropous, circinotropous.
- c) Megaspороgenesis: tenuinucellate and crassinucellate ovules, types of megaspore tetrads.
- d) Female gametophyte: structure of typical embryo sac, types of embryo sacs with examples – monosporic, bisporic and tetrasporic.

10. Fertilization: (5L)

Mechanism of pollination- entomophily, anemophily, hydrophily, zoophily, germination of pollen grain, double fertilization (syngamy and triple fusion) and its significance.

11. Endosperm and embryo (6L)

- a) Endosperm: Types – nuclear, helobial and cellular.
- b) Embryogeny: structure of dicot and monocot embryo and seed formation.

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10. Maheshwari P, An introduction to Embryology of Angiosperm
11. Nair P K K Essentials of Palynology.

Class : S. Y. B. Sc. (Semester - IV)

Paper Code: BOT 2402

Paper : II

Title of Paper : **Plant Ecology**

Credit : 3

No. of lectures : 48

A) Learning Objectives:

1. To know and understand the concepts of plant ecology
2. To study the plant relation with the environment and impact assesment

B) Learning Outcome:

The student can analyse and interpret the plant relation with the environment and impact of human interventions on ecosystem

Credit - I (16 L)

Unit – 1

1. Introduction of plant ecology (02 L)

1.1 Introduction, concept, definition, autecology and synecology, applications.

2. Ecosystem ecology (08 L)

2.1 Introduction, ecological organization, concept of population, community, ecosystem and biosphere.

2.2 Kinds of ecosystem – natural and artificial, aquatic and terrestrial.

2.3 Components of ecosystem – biotic and abiotic components.

2.4 Ecosystem dynamics – food chain, food web and ecological pyramids.

2.5 Biogeochemical cycles – carbon, nitrogen and phosphorous.

3. Population and community ecology (04 L)

3.1 Population – concept, definition, characteristics- size, density, distribution, age structure, reproductive base and ecotypes.

3.2 Community – concept, definition, characteristics-structure, dominance, diversity, periodicity, stratification, ecotone and edge structure

Credit - II (16 L)

Unit - 2

4. Ecological adaptations (04 L)

4.1 Adaptive features of plants - external and internal features.

4.2 Classification of plants and characteristics – hydrophytes, mesophytes, xerophytes.

5. Ecological succession (06 L)

5.1 Introduction, concept, definition,

5.2 Principles and types – primary and secondary.

5.3 Hydrosere, xerosere and climax community.

6. Man and Environment (06L)

6.1 Introduction, Interrelationship between the living world and the environment, components and dynamism of Ecosystem, homeostasis.

6.2 Impact of human activities on environment – Causes, Prevention and control of – Air, water and Soil Pollution

6.3 Environmental toxicology – Eutrophication, bioaccumulation and biomagnifications

6.4 Environmental Crisis-Desertification, Ozone depletion and Global warming

Credit - III (16 L)

Unit – 3

7. Environmental Impact Assessment and Environmental audit (06L)

- 7.1 EIA- concept, definition, objectives, methodology, EIS, applications
- 7.2 Environmental Audit- concept, definition, need, methodology, certification
- 7.3 difference between EIA and Environmental audit

8. Remote Sensing (4L)

- 8.1 Definition, basic principles, Process of data acquisition and interpretation,
- 8.2 Global positioning System
- 8.3 Application of Remote Sensing in ecology.

9. Biodiversity and conservation (06 L)

- 9.1 Concept, definition and types of biodiversity.
- 9.2 Methods of biodiversity conservation – *exsitu and insitu*
- 9.3 social approaches in biodiversity conservation-sacred groves, *sthalvrushas*, *chipko* movement

References:

1. **M. Anji Reddy** Textbook of Remote sensing and GIS (Third edition, 2006) by BS Publication, Hyderabad
2. **George Joseph** Fundamentals of remote sensing (Second edition, 2005) by Universities press (India) Private Ltd., Hyderabad.
3. **John R. Jensen** Remote sensing of the environment (2000), Dorling Kindersley India Pvt. Ltd,
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6. **G.J. Rau and C.D. Weeten**, "Environmental Impact Analysis Hand book, McGraw Hill, 1980.
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14. **Weaver. J.E. and Clements. S.E. 1966.** Plant Ecology. Tata McGraw Publishing Co. Ltd. Bombay.
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Class : **S. Y. B. Sc. (Semester - IV)**

Paper Code: **BOT 2403**

Paper : **III** Title of Paper : **Practical based on BOT 2401 and BOT 2402**

Credit : 2 No. of Practicals : **12**

A) Learning Objectives:

1. To study the detail developmental changes of embryological processes.
2. To study plants in relation to environment.

B) Learning Outcome:

Students should know the practical applications of anatomy, embryology and ecology in recent advances in plant sciences.

Practicals :

- 1) Study of epidermal tissue system – non-glandular and glandular trichomes, multilayered epidermis, typical stomata (dicot and monocot). (01 P)
- 2) Study of mechanical tissues and their distribution in root, stem and leaves. (01 P)
- 3) Study of normal secondary growth in dicot stem – *Annona /Moringa*. (Double stained temporary preparation). (01 P)
- 4) Study of anomalous secondary growth in *Bignonia* and *Dracaena* stem. (Double stained temporary preparation). (01 P)
- 5) Study of tetrasporangiate anther and types of ovules. (01 P)
- 6) Study of dicot and monocot embryo. (01 P)
- 7) Vegetation study by list count quadrat method (01 P)
- 8) Study of Hydrophytes (01 P)
- 9) Study of Xerophytes (01 P)
- 10) Study of Ecological instruments (01 P)
- 11) Determination of organic carbon in soil by titration method (01 P)
- 12) Interpretation of data using satellite imageries (01 P)

N.B. Visit to any aquatic / terrestrials ecosystem and submission of visit report is compulsory.