



M. C. E. Society's

Abeda Inamdar Senior College

Of Arts, Science and Commerce, Camp, Pune-1

(Autonomous) Affiliated to Savitribai Phule Pune University

NAAC accredited 'A' Grade

F.Y.B.Sc Botany

(CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Plant Diversity-I : Diversity and Classification of the Plant Kingdom
Course Code	21SBBO111
Semester	I
No. of Credits	2 (36 Lectures of 50 Minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To enrich students to classify Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms.
2.	Aware students about applications of different plants in various industries.
3.	Create potential among students to become an entrepreneur.
4.	Equip the students with skills related to laboratory as well as field based studies.
5.	Develop foundation for further studies in Botany.

Expected Course Specific Learning Outcome

Sr. No.	Learning Outcome
1.	Students will become aware about general characters and brief life history of Plant Kingdom.
2.	Students will become aware about general account of structure and reproduction of Cryptogams and Phanerogams.
3.	Students will understand nomenclature and classification of Cryptogams and Phanerogams.

Syllabus

Unit No	Title with Contents	No. of Lectures
I	<p>Introduction To Plant Diversity</p> <p>i. Introduction, concept, definition, scope and importance of plant diversity studies.</p> <p>ii. General outline of plant kingdom (Lower Cryptogams: Thallophytes- Algae, Fungi & Lichens; Higher Cryptogams: Bryophytes and Pteridophytes; Phanerogams: Gymnosperms and Angiosperms- Dicotyledon and Monocotyledons).</p> <p>iii. Distinguishing characters of these groups and mention few common examples from each.</p>	5
II	<p>Algae</p> <p>i. General characters of algae.</p> <p>ii. Study of diversity in algae - Cell structure and Components, Range of thallus organization. Pigment system, Reserve food, Mode of reproduction in Algae.</p> <p>iii. Outline classification of algae (by Bold and Wynne 1978) upto class with reason.</p> <p>iv. Study of life cycle <i>Spirogyra</i></p> <p>v. Utilization of Algae in Biofuel Industry, Agriculture, Pharmaceuticals, Food and Fodder.</p>	9
III	<p>Lichens</p> <p>i. General characters of lichen.</p> <p>ii. Study of diversity in Lichen- Nature of Association, forms Crustose, Foliose and Fructose.</p> <p>iii. Ecological and Economic Importance of Lichen.</p>	4
IV	<p>Fungi</p> <p>i. General characters of Fungi.</p> <p>ii. Study of diversity in Fungi- Thallus organization, cell wall composition, reproduction, mode of nutrition.</p> <p>iii. Classification of Fungi (Ainsworth, 1973) upto class with</p>	9

	<p>reasons.</p> <p>iv. Economic importance of fungi- in Industry, Agriculture, Food and Pharmaceuticals.</p>	
V	<p>Bryophytes</p> <p>i. General characters of Bryophytes.</p> <p>ii. Study of diversity in Bryophytes- Gametophyte, Sporophytes bodies and Rhizoids.</p> <p>iii. Outline classification of Bryophytes (G.M. Smith 1955) upto class with reasons.</p> <p>iv. Study of life cycle of <i>Funaria</i>.</p> <p>v. Utilization of Bryophytes as ecological indicators, agriculture, fuel, industry and medicine.</p>	9

References:

1. Fungi by Vashishta, P.C. (1992). S. Chand & Company Ltd. New Delhi.
2. Bryophyta by Vashishta, B.R., Sinha, A.K. and Kumar, A. (1992). S. Chand & Company Ltd. New Delhi.
3. Algae by Vashishta, B.R., Sinha, A.K. and Singh, V.P. (2008). S. Chand & Company Ltd. New Delhi.
4. Botany Vol. II by Pandey, S.N., Trivedi, P.S. and Mishra, S.P. (1994) Vikas Publishing House Pvt. Ltd. New Delhi
5. Angiosperm Taxonomy by Lawrance, G.H.M. (1951). The Macmillan Compnay New York, 823 pp.
6. Angiosperm Taxonomy by Pandey, B.P. (1999). S. Chand and Company, Pvt. Ltd., New Delhi, 600 pp.
7. Angiosperm Taxonomy by Singh, V. and Jain, D.K. (1981). Deep and Deep Publications, 489 pp.
8. An Introduction to Taxonomy of Angiosperms by Shukla, P. & Misra, S.C. (1991). Vikas Publishing House, Pvt. Ltd. (576, Masjid Road, Jangpura, New Delhi-110014).
9. The Gymnosperm by Bishvas, C. and Johri, B.M. Narora Publishing House, New Delhi.
10. Morphology of Gymnosperms by Sporne, K.R. Hutchinson and Company (Publisher) Ltd., London.

F.Y.B.Sc Botany
(CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Plant Morphology and Ecology
Course Code	21SBBO112
Semester	I
No. of Credits	2 (36 Lectures of 50 Minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	Understand the morphology of Angiosperms.
2.	Learn about vegetative structure of Angiosperms.
3.	Understand the detailed study of plant ecology.
4.	Understand plant communities and ecological adaptations in plants.

Expected Course Specific Learning Outcomes

Sr. No.	Learning Outcome
1.	Provides the knowledge of Plant Morphology and Ecology.
2.	Knowledge of Morphology of Reproductive parts of flower.
3.	Deals with different types of Fruits.
4.	Provide knowledge of Ecosystem and ecological adaptations of plants.

Syllabus

Unit No	Title with Contents	No. of Lectures
I	Morphology i. Introduction, definition, descriptive and interpretative morphology. ii. Scope and Importance of Morphology: Identification, nomenclature, classification, phylogeny and Plant breeding.	2

<p>II</p>	<p>Basic Plant Body of a Flowering Plant</p> <p>i. Study of Roots- Characteristic, functions and types of root system (Tap root and adventitious root)</p> <p>ii. Study of Stem- Characteristic functions Stem, Characteristics and functions underground and Aerial.</p> <p>iii. Study of Leaf- Structure and functions, types of phyllotaxy, venation, types of leaves (simple and compound)</p>	<p>4</p>
<p>III</p>	<p>Inflorescence</p> <p>i. Introduction and definition, parts of inflorescence</p> <p>ii. Types of Inflorescence: - Outline classification of inflorescence</p> <p>a) Racemose -Raceme, Spike, Spadix, Corymb, Umbel, Catkin and Capitulum.</p> <p>b) Cymose -Solitary, Monochasial- Helicoid and scorpioid; Dichasial and Polychasial.</p> <p>c) Special types -Verticillaster, Cyathium and Hypanthodium.</p> <p>iii. Significance.</p>	<p>4</p>
<p>IV</p>	<p>Flowers</p> <p>i. Introduction and definition</p> <p>ii. Parts of a typical flower: Bract, Pedicel, Thalamus- forms, Perianth- Calyx and Corolla, Androecium and Gynoecium.</p> <p>iii. Symmetry: Actinomorphic and zygomorphic, Sexuality- Unisexual and bisexual, Insertion of floral whorls on thalamus- Hypogyny, Epigynae and perigynae, Merous condition- Trimerous, tetramerous and pentamerous.</p> <p>iv. Floral whorls:</p> <p>a) Calyx: Nature- Polysepalous, Gamosepalous; Aestivation- types, Modifications of Calyx- Pappus, Petaloid and Spurred.</p> <p>b) Corolla: Forms of Corolla</p> <p>i) Polypetalous- Cruciform and Papilionaceous.</p> <p>ii) Gamopetalous- Infundibuliform, Bilabiate, Tubular and Campanulate.</p> <p>iii) Aestivation- types and significance.</p>	<p>5</p>

	<p>c) Perianths: Nature- Polysepalous, Gamosepalous.</p> <p>d) Androecium: Structure of typical stamen, Variations- cohesion and adhesion.</p> <p>e) Gynoecium: Structure of typical carpel, number, position, cohesion and adhesion; placentation- types.</p>	
V	<p>Fruits</p> <p>i. Introduction and definition</p> <p>ii. Types of fruits:- Outline classification</p> <p>a) Simple: Indehiscent - Achene, Cypsela, Nut and Caryopsis. Dehiscent - Legume, Follicle and Capsule,</p> <p>b) Fleshy: Drupe, Berry, Hesperidium and Pepo.</p> <p>c) Aggregate: Etaerio of Berries and Etaerio of Follicles.</p> <p>d) Multiple fruits: Syconus and Sorosis.</p>	3
VI	<p>Introduction to Plant Ecology</p> <p>i. Definition, concept, types (Autecology and Synecology), Scope and importance of ecological Studies.</p> <p>ii. Multidisciplinary approach of plant ecology.</p>	3
VII	<p>Ecosystem</p> <p>i. Meaning, Definition, Concept of population, community and ecosystem</p> <p>ii. Structure and Function of Ecosystem (Biotic and Abiotic components)</p> <p>iii. Processes within ecosystem- Food chain, food web, energy flow, homeostasis and ecological pyramids.</p> <p>iv. Nutrient cycling with reference to carbon, nitrogen and Sulphur.</p>	9
VIII	<p>Ecological Adaptation in Plants</p> <p>i. Introduction, concept and definition of Ecological adaptation in plants.</p> <p>ii. Ecological classification of plants- Hydrophytes, Mesophytes, Xerophytes and Halophytes with Examples (Warming-1909)</p> <p>iii. Study of ecological adaptation in hydrophytes, xerophytes and halophytes with suitable example.</p>	6

References:

- 1 Lawrence, G.H.M. (2012). Taxonomy of vascular Plants. Scientific Publishers (India) Jodhpur.
- 2 Naik, V.N. (1994). Taxonomy of Angiosperms. Tata McGraw Hill Publishing Comp., New Delhi.
- 3 Pandey, B.P. (2009). A Text Book of Botany- Angiosperms. S. Chand and Co. Ltd. New Delhi.
- 4 Radford, Albert E. (1986). Fundamentals of Plant Systematics. Publ. Harper and Row, New York.
- 5 Sharma, O.P. (1993). Plant Taxonomy. 2nd Edition, McGraw Hill Education, New Delhi.
- 6 Singh, Gurucharan (2005). Systematics- Theory and Practice. Oxford IBH.
- 7 Balfour Austin (2016). Plant Taxonomy. Syrawood Publishing House
- 8 Chapman, J.L. and Reiss, M.J. (1998). Ecology: Principles and applications. Cambridge, University Press.
- 9 Kormondy Edward (1995). Concepts of Ecology, Pearson Publ.
- 10 Michael P. (1984). Ecological Methods for field and Laboratory investigations TMH Co. ltd. Bombay.
- 11 Text book of Environmental Biology, Imtiyaz Hussain Zaheed (2013), Discovery publishing house PVT.LTD, ISBN 978-93-5056-231-4

F.Y.B.Sc Botany

(CBCS – Autonomy 21 Pattern)

Course/ Paper Title	PRACTICALS BASED ON 21SBBO111 & 21SBBO 112
Course Code	21SBBO113
Semester	I
No. of Credits	1.5 (46.8 Lectures of 50 Minutes)

Syllabus

Expt. No.	Title with Contents	No. of Practical
1.	Study of Life Cycle of <i>Spirogyra</i> .	1 P
2.	Study of Mushroom Cultivation- <i>Pleurotus</i>	2 P
3.	Study of forms of Lichens- Crustose, Foliose and fruticose	1 P
4.	Study of Life Cycle of <i>Funaria</i>	1 P
5.	Study of Inflorescence. a. Racemose: Raceme, Spike, Spadix, Catkin, Corymb, Umbel and Capitulum b. Cymose: Solitary cyme, Uniparous cyme: helicoid and scorpioid, Biparous cyme and Multiparous cyme. c. Special type: Verticillaster, Hypanthodium and Cyathium.	2 P
6.	Study of flower with respect to Calyx, Corolla and Perianths, Androecium and Gynoecium.	2 P
7.	Study of floristic key preparation with the help of 3-4 types of flower (1 from each class)	1 P
8.	Study of placentation with suitable example	1 P
9.	Study of fruits with suitable examples. a) Simple fruit: Dry: Achene, Cypsella and Legume; Fleshy: Berry and Drupe. b) Aggregate fruit: Etaerio of follicles and Etaerio of Berries. c) Multiple fruit: Syconus and Sorosis.	1 P
10.	Study of adaptation in Hydrophytes – Eichhornia.	1 P
11.	Study of adaptation in Xerophytes- Alove vera/ Casurina.	1 P
12.	One day visit to study Algae, Fungi, Bryophytes and Lichens.	1 P



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(CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Plant Diversity-II : Plant Diversity and Conservation
Course Code	21SBBO121
Semester	II
No. of Credits	2 (36 Lectures of 50 Minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	The paper deals with general classification of Pteridophytes, Gymnosperms and Angiosperms.
2.	Understand about natural resources and their use.
3.	Equip the students with skills related to laboratory as well as field based studies
4.	Create foundation for further studies in Botany
5.	Aware students about conservation and sustainable development.

Expected Course Specific Learning Outcome

Sr. No.	Learning Outcome
1.	Students will be acquainted with general characters and brief life history of Pteridophytes, Gymnosperms and Angiosperms.
2.	Students will learn general account of structure and reproduction of Pteridophytes and Phanerogams.
3.	Students will be acquainted with nomenclature and classification of Pteridophytes and Phanerogams.
4.	Students will understand knowledge of biodiversity and how to conserve it.

Syllabus

Unit No.	Title with Contents	No. of Lectures
I	<p>Pteridophytes</p> <p>i. General characters of Pteridophytes.</p> <p>ii. Outline classification according to Sporne (1976) up to classes with reasons.</p> <p>iii. The study of life cycle of <i>Sellaginella</i>.</p> <p>iv. Economic importance of Pteridophytes.</p>	7
II	<p>Gymnosperms</p> <p>i. General characters Gymnosperms.</p> <p>ii. Outline classification according to Sporne (1977) up to classes with reasons.</p> <p>iii. Study of life cycle of <i>Cycas</i>.</p> <p>iv. Economic importance of gymnosperms.</p>	7
III	<p>Angiosperms</p> <p>i. Introduction, general features, cosmopolitan distribution and evolutionary success of Angiosperm</p> <p>ii. Comparative account of monocotyledons and Dicotyledon w.r.t. root, stem and leaf.</p>	4
IV	<p>Biodiversity</p> <p>i. Concept of Biodiversity – importance and human dependence of Biodiversity.</p> <p>ii. Recent biodiversity concepts – India as mega diversity nation, Hotspots in India.</p> <p>iii. Levels of Biodiversity- Species diversity, genetic diversity and ecological diversity</p> <p>iv. Values and uses of biodiversity: ethical and aesthetic values</p> <p>v. Social approaches to conservation, Sustainable development.</p>	5
V	<p>Conservation of Biodiversity</p> <p>i. Introduction, concept, methods, importance of biodiversity conservation.</p>	8

	ii. In-situ conservation: Sanctuaries, Biosphere reserves, National parks. iii. Ex-situ conservation: Botanic gardens, gene banks, Seed banks, Tissue culture and Cryopreservation.	
VI	Management of Plant Biodiversity i. Introduction to management of Plant diversity. ii. Organizations associated with biodiversity management- IUCN, (International Union for Conservation of Nature), UNEP (The United Nations Environment Programme), WWF(World Wildlife Fund), NBPGR (The National Bureau of Plant Genetic Resources), BSI (Botanical Survey of India)	5

References:

1. Chamberlain, C.J. (1934). Gymnosperms- Structure and Evolution. Chicago.
2. Coulter, J.M. and Chamberlain, C.J. (1917). Morphology of Gymnosperms. Chicago.
3. Davis, P.H. and Heywood, V.H. (1963). Principles of Angiosperms taxonomy. Oliver and Boyd Publ. London.
4. Eames, E.J. (1983). Morphology of Vascular Plants. Standard University Press.
5. Gangulee and Kar (2006). College Botany. New Central Book Agency (P.) Ltd. Kolkata.
6. Naik, V.N. (1994). Taxonomy of Angiosperms. Tata McGraw Hill Publishing Comp., New Delhi.
7. Parihar, N.S. (1976). Biology and Morphology of Pteridophytes. Central Book Depot.
8. Rashid, A. (1999). An Introduction to Pteridophyta. Vikas Publishing House Pvt. Ltd. New Delhi.
9. Sharma, O.P. (1990). Text Book of Pteridophyta. McMillan India Ltd. Delhi.
10. Singh, V. and Jain, D.K. (2010). Taxonomy of Angiosperms. Rastogy Publications, Meerut.
11. Singh, V., Pande, P.C., and Jain, D.K. (2011). A Text Book of Botany: Angiosperms. Rastogy Publications, Meerut.
12. Sporne, K.R. (1986). The Morphology of Pteridophytes. Hutchinson University Library, London.
13. Sundar Rajan, S. (1999). Introduction to Pteridophyta. New Age International Publishers, New Delhi.
14. Text book of Environmental Biology, Imtiyaz Hussain Zaheed (2013), Discovery publishing house PVT.LTD, ISBN 978-93-5056-231-4

F.Y.B.Sc Botany

(CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Principles of Plant Physiology
Course Code	21SBBO122
Semester	II
No. of Credits	2 (36 Lecture of 50 Minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	The paper deals with general principles of plant physiology.
2.	To understand about nutrition in plants.
3.	To equip the students with skills of Diffusion, osmosis, transpiration etc.
4.	To create foundation for further studies in Botany
5.	The paper deals with general principles of plant physiology.

Expected Course Specific Learning Outcome

Sr. No.	Learning Outcome
1.	General metabolic processes of plants
2.	Knowledge of seed dormancy, germination and to assess viability of seeds.
3.	Knowledge of Physiology of flowering and hormones role in flowering.

Syllabus

Unit No.	Title with Contents	No. of Lectures
I	Introduction to Plant Physiology i. Introduction, definition, ii. Scope and importance of plant physiology.	2
II	Mineral Nutrition i. Macronutrients, Micronutrients and plant growth. ii. Deficiency symptoms due to macro and micronutrients, physiological role of macronutrients in plants.	4

<p>III</p>	<p>Plant Water Relation</p> <p>i. Diffusion- Definition, factors affecting diffusion, importance of diffusion in plants, imbibition as a special type of diffusion.</p> <p>ii. Osmosis – definition, types of solutions (hypotonic, isotonic, hypertonic), endosmosis, exo-osmosis, osmotic pressure, turgor pressure, wall pressure, importance of osmosis in plants,</p> <p>iii. Plasmolysis – definition, mechanism and significance,</p> <p>iv. Imbibition- definition, mechanism, significance</p>	<p>5</p>
<p>IV</p>	<p>Absorption of Water</p> <p>i. Role of water in plants.</p> <p>ii. Mechanism of water absorption with respect to crop plants.</p> <p>iii. Factors affecting rate of water absorption.</p>	<p>3</p>
<p>V</p>	<p>Ascent of Sap</p> <p>i. Introduction, concept and definition.</p> <p>ii. Theories of ascent of sap- transpiration pull theory, evidences and objections.</p> <p>iii. Factors affecting ascent of sap.</p>	<p>4</p>
<p>VI</p>	<p>Transpiration</p> <p>i. Definition, types of transpiration.</p> <p>ii. Structure of stomata, mechanism of opening and closing of stomata, Steward's hypothesis,</p> <p>iii. Factors affecting rate of transpiration,</p> <p>iv. Significance of transpiration,</p> <p>v. Antitranspirant, guttation, exudation.</p>	<p>6</p>
<p>VII</p>	<p>Nitrogen Metabolism</p> <p>i. Introduction and role of nitrogen in plants</p> <p>ii. Nitrogen fixation by <i>Rhizobium</i> and BGA</p> <p>iii. Symbiotic nitrogen fixation, nitrogenase enzyme- structure and function</p> <p>iv. Non-symbiotic nitrogen fixation</p> <p>v. Nitrogen cycle</p>	<p>5</p>

VIII	Seed Dormancy and Germination i. Definition, types of seed dormancy and germination ii. Methods to break seed dormancy iii. Metabolic changes during seed germination	3
IX	Physiology of Flowering i. Photoperiodism – Concept, definition, short day plants, long day plants and day neutral plants. ii. Phytochrome theory, role of phytohormones in induction and inhibition of flowering iii. Applications of photoperiodism iv. Vernalization–concept and definition, mechanism of vernalisation, applications of vernalisation and devernialization	4

References:

1. Bidwell, R.G.S. 1974. Plant Physiology. Macmillan Pub. Co., N.Y.
2. Taiz, L. and Zeiger, E. 2006. Plant Physiology. 4th Edition. Sinauer Associates, Sunderland, Massachusetts, USA
3. Salisbury F.B.& Ross C.B. 2005. Plant Physiology. 5th Edition. Wadsworth Publishing Co. Belmont CA.
4. Helgi O'Pik, Stephen A. Rolfe, Arthur J. Willis. 2005. The Physiology of Flowering Plants, Cambridge University Press, UK
5. Kirkham, M.B. 2004. Principles of Soil and Plant Water Relations. Elsevier, Amsterdam, Netherlands.
6. Dennis, D.T., Turpin, D.H., Lefebvre, D.D. and Layzell, D.B. 1997. Plant Metabolism. 2nd Edition. Longman Group, U.K.
7. Fitter, A. and Hay, R.K.M. 2001. Environmental Physiology of Plants. Academic Press, UK.
8. Press, M.C., Barker, M.G., and Scholes, J.D. 2000. Physiological Plant Ecology, British Ecological Society Symposium, Volume 39, Blackwell Science, UK.
9. Sayyed Iliyas, 2020. Steps in Plant Physiology, Lambert Academic Publishing, Mauritius.
10. Devlin, R.M. and F.H. Witham. 1983. Plant Physiology. Willard Grant Press. U.S.A.
11. Moore, T.C. 1979. Biochemistry and Physiology of Plant Hormones. SpringerVerlag. Berlin.
12. Jain, V.K. 2000: Fundamentals of Plant Physiology. S. Chand & Co, New Delhi.
13. Pandey, S.N. 1991: Plant Physiology, Vikas Publishing House (P) Ltd., New Delhi, India.

F.Y.B.Sc Botany

(CBCS – Autonomy 21 Pattern)

Course/ Paper Title	PRACTICALS BASED ON 21SBBO121 & 21SBBO 122
Course Code	21SBBO123
Semester	II
No. of Credits	1.5 (46.8 Lectures of 50 Minutes)

Syllabus

Expt. No.	Title with Contents	No. of Practical
1.	Study of life cycle of <i>Selaginella</i> .	1 P
2.	Study of life cycle of <i>Cycas</i> .	1 P
3.	Study of utilization and economic importance of Pteridophytes and Gymnosperms.	1 P
4.	Study of comparative account of Dicotyledonous and Monocotyledonous plants body.	1 P
5.	Study of utilization and economic importance of Angiosperms- food, fodder, fibres, horticulture and medicines.	1 P
6.	Study of vegetation by least count quadrat method	1 P
7.	Comparative study of soil samples	1 P
8.	Study of Physiology demonstration experiments-Curling experiment, Ringing, Imbibition, arc Auxanometer, Rhizobium and BGA.	1 P
9.	Study of rate of transpiration in shade, light and wind using burette potometer	1 P
10.	Study of plasmolysis using <i>Rhoeo</i> leaf peeling.	1 P
11.	Study of DPD with the help of potato tuber experiment	2 P
12.	Study of viability of seeds	1 P
13.	One day visit to study diversity of vegetation.	2 P