

UNIVERSITY OF PUNE
BOARD OF STUDIES IN BOTANY
Proposed Revised Syllabus for F. Y. B. Sc. (Botany)
To be implemented from June, 2013
F. Y. B. Sc. (Botany) New Syllabus

- 1. Fundamentals of Botany: PAPER – I**
Term- I: Plant Diversity

- 2. Botany Theory Paper II**
Term I – Industrial Botany

- 3. Fundamentals of Botany: PAPER - I**
Term- II: Morphology and Anatomy

- 4. Botany Theory Paper II**
Term- II – Industrial Botany

- 5. F. Y. B. Sc. Botany Practical Paper - III based on Theory Paper I
and Paper II**

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PAPER – I
FUNDAMENTALS OF BOTANY
Term – I: Plant Diversity (36 Lectures)

1. **Introduction:** General outline of plant kingdom, Introduction to plant diversity with reference to following groups:-
Cryptogams: Thallophyta (Algae, Fungi, Lichens, And Bacteria), Bryophyta and Pteridophyta, Phanerogams: Gymnosperms and Angiosperms. **3L**
 2. **Algae:** General characters, Outline classification according to G.M. Smith (1955) up to classes with reasons. Life cycle of *Spirogyra*. **6L**
 3. **Fungi:** General characters, Outline classification according to G.M. Smith (1955) up to classes with reasons. Life cycle of *Cystopus (Albugo)*. **5L**
 4. **Lichens:** General characters, Nature of Association, Types of Lichens on the basis of thallus morphology, Economic importance of lichens. **3L**
 5. **Bryophytes:** General characters, Outline classification according to G.M. Smith (1955) up to classes with reasons. Life cycle of *Riccia*. **5L**
 6. **Pteridophytes:** General characters, Outline classification according to G.M. Smith (1955) up to classes with reasons. Life cycle of *Nephrolepis*. **6L**
 7. **Gymnosperms:** General characters, Outline classification according to Chamberlain (1934) up to classes with reasons. Life cycle of *Cycas*. **5L**
 8. **Angiosperms:** General characters, Causes of evolutionary success of Angiosperms, comparative account of monocotyledons and dicotyledons. **3L**
- (Note: Development of sex organs not expected, for all the above mentioned life cycles)**

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PAPER – I
FUNDAMENTALS OF BOTANY
Term – II: Morphology and Anatomy (36 Lectures)

- 1. Morphology:** **4L**
1.1: Introduction, Definition and Scope. 1.2: Descriptive and Interpretative.
1.3: Importance in identification, nomenclature, classification, phylogeny and Plant breeding.
- 2. Morphology of Vegetative Parts:** **8L**
2.1: **Root:** Types of roots, Modifications of roots: Epiphytic, Respiratory (Pneumatophores), Parasitic and Storage roots (conical, fusiform and napiform) with examples; functions of root.
2.2: **Stem:** Modifications of Stem: Phylloclade, Runner, Stolon, Suckers, Offsets, Rhizome, Corm, Tuber and Bulb with examples. Functions of stem.
2.3: **Leaf:** Parts of typical leaf: petiole, lamina; leaf margins and apices. Types of leaves: simple, compound, venation, phyllotaxy. Modifications: tendrils, spines, scale leaves, phyllode, reproductive and trap leaves (mechanism of trapping in *Nepenthes* only) with examples. Functions of leaf.
- 3. Morphology of Reproductive Parts:** **10L**
3.1: **Inflorescence:** Types of inflorescence: Racemose (raceme, spike, corymb, umbel, catkin, spadix and capitulum), Cymose (solitary, monochasial, dichasial, polychasial), Special types (Verticillaster, Cyathium, and Hypanthodium) Significance.
3.2: **Flower:** Parts of typical flower, Types of flower (complete, incomplete), symmetry of flower and 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 of anthers, cohesion and adhesion; Gynoecium: structure of carpel. Types of placentations.
3.3: **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.
3.4: **Seed:** Parts, types, structural modifications for seed dispersal.
- 4. Anatomy:** **2L**
Introduction, Definition, Importance in taxonomy, physiology, ecological interpretations, pharmacognosy and wood identification.
- 5. Types of tissues:** Outline with brief description. **6L**
5.1: **Meristmatic tissues:** - Meristem, characters and types based on origin, position and plane of division, functions.
52: **Vascular tissues:-** Components of xylem and phloem, types of vascular bundles, functions.
53: **Epidermal tissues:-** Epidermis, structure of typical stomata, trichomes, motor cells; functions.
54: **Mechanical tissues:-** Collenchyma, sclerenchyma and xylem with functions.

6. Internal Organization of Primary Plant Body:

6L

6.1 : Internal structure of dicotyledon and monocotyledon root.

6.2: Internal structure of dicotyledon and monocotyledon stem.

6.3: Internal structure of dicotyledon and monocotyledon leaf.

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PAPER- II

Term I – INDUSTRIAL BOTANY (36 Lectures)

- 1. Introduction to Industrial Botany** **2L**
 - 1.1 Concept of Industrial Botany.
 - 1.2 Plant resources and industries: Food, fodder, fibers, medicines, timber, dyes, gum, tannins. (Two examples of each resource and the relevant industries with which they are associated).
- 2. Floriculture Industry** **8L**
 - 2.1 Introduction to floriculture.
 - 2.2 Important floricultural crops, open cultivation practices, harvesting and marketing of Tuberose.
 - 2.3 Greenhouse technology: Concept, advantages and limitations.
 - 2.4 Cultivation practices (greenhouse technology), harvesting and marketing of Rose and *Gerbera*.
- 3. Plant Nursery Industry** **8L**
 - 3.1 Concept and types of nurseries: ornamental plant nursery, fruit plant nursery, medicinal plant nursery, vegetable plant nursery, orchid nursery, forest nursery (with reference to infrastructure required, outputs, commercial applications and profitability).
 - 3.2 Propagation methods: Seed propagation, natural vegetative propagation and artificial vegetative propagation (Cutting: Stem, Layering: Air layering, Grafting: Stone grafting and Approach grafting, Budding : T-budding).
- 4. Plant Tissue Culture Industry** **6L**
 - 4.1 Concept of tissue culture.
 - 4.2 Culture techniques: Types of explants, preparation of media, methods of sterilization, inoculation techniques, incubation and hardening.
 - 4.3 Commercial significance
- 5. Agri industries:** **8L**
 - 5.1 Organic Farming: Concept, need of organic farming, types of organic fertilizers, advantages and limitations.

5.2 Seed industries: Importance of seed industries, seed production, seed processing and seed marketing with reference to cotton. Major seed industries and corporations of India.

6. Mushroom Industries:

4L

Mushroom cultivation: Plant resources, cultivation practices of Oyster mushroom, uses of mushrooms, value added products, commercial significance.

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PAPER- II

Term- II: INDUSTRIAL BOTANY (36 Lectures)

- 1. Bio-fuel Industry** **6L**
 - 1.1 Introduction and advantages.
 - 1.2 Concept of biofuel and its need.
 - 1.3 Plants used for biofuel production.
 - 1.4 Biodiesel production from Caster.
 - 1.5 Commercial significance.

- 2 Bio-pesticide Industry** **6L**
 - 2.1 Concept of bio-control; Integrated Pest Management (IPM).
 - 2.2 Importance of bio pesticides.
 - 2.3 Types of bio pesticides: Indiara, Azadiractin.
 - 2.4 Commercial significance.

- 3. Industrial Mycology** **6L**
 - 3.1 Introduction
 - 3.2 Important genera of fungi used in various industries and their products.
 - 3.3 Products and applications of *Trichoderma*, *Penicillium*, *Aspergillus* and yeast.
 - 3.4 Commercial significance.

- 4. Bio-Fertilizer Industry** **6L**
 - 4.1 Bio fertilizers : concept and need
 - 4.2 Types of bio-fertilizers: Nitrogen fixing bio fertilizer: *Rhizobium*, Blue green algae. *Anabaena* associated with *Azolla*. Phosphate solubilizing bio-fertilizer: Bacteria and Fungi.
 - 4.3 Commercial significance.

- 5 Fruit Processing Industry** **6L**
 - 5.1 Fruit processing: concept and need
 - 5.2 Cold storage.
 - 5.3 Types of fruit processing (canned fruits, dried fruit chips, fruit pulp, squash, jam, jelly, pickle and ketchups).
 - 5.4 Commercial significance.

- 6 Plant Pharmaceutical Industry** **6L**

6.1 Concept and advantages.

6.2 Types of pharmaceutical products: Churna, Asava and Arishta.

6.3 Drug plants with reference to botanical source, active principles and medicinal uses of *Adathoda zeylanica*, *Tinospora cordifolia* and *Asperagus racemosus*.

6.4 Manufacture of *Churna (Triphala churna)*, *Arishta (Ashokarishta)* and *Asava (Kumariasava)*.

6.5 Concept of nutraceuticals and cosmeceuticals.

6.6 Commercial significance of Amla and Aloe.

References:

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2. The Organic Farming Manual: A Comprehensive Guide to Starting and Running a Certified Organic Farm, Ann Larkin Hansen, Storey Publications.
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F. Y. B.Sc. BOTANY PRACTICAL PAPER – III

Based on Theory Paper I and Paper II

1. Modifications of root and stem. 1P
2. Study of leaf (parts of leaf, types: simple and compound; sessile and petiolate; venation: parallel and reticulate) (Glossary of terminologies be given with the protocol). 1P
3. Study of Inflorescence. 1P
 - 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.
4. Study of flower with respect to Calyx, Corolla and Perianth: (Glossary of terminologies is given with the protocol). 1P
5. Study of flower with respect to Androecium and Gynoecium. 1P
6. Study of fruits and seed with suitable examples. 1P

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.
Seed: parts of seed and types of seed (monocotyledonous dicotyledonous, albuminous, exalbuminous)
7. Study of internal primary structure of dicotyledonous root, stem and leaf. 1P

e.g. Sunflower.
8. Study of internal primary structure of monocotyledonous root, stem and leaf. 1P

e.g. Maize.
9. Study of *Spirogyra*. 1P
10. Study of *Cystopus (Albugo)* 1P
11. Study of *Riccia*. 1P
12. Study of *Nephorlepis*. 1P
13. Study of *Cycas*. 1P
14. Study of plant resources in industries: food, fodder, fiber, medicine, timber and gum (one example of each) 1P

15. Study of artificial plant propagation: 1P
 Stem cutting (demonstration of three subtypes)
 Air Layering, Approach grafting, and T- budding
16. Study of plant tissue culture techniques: Demonstration of various stages. 1P
17. Cultivation of Oyster mushroom and demonstration of value added mushroom products. 1P
18. Study of plant resources used in biopesticides. 1P
 (Indiara, Azadiractin)
19. Study of industrially important fungi and their products. 1P
Ganoderma: *Ganoderma* tablets, *Aspergillus*: citric acid; *Yeast*: Bakery products; *Penicillium*: Penicillin and *Trichoderma*.
20. Study of types of Biofertilizers: *Rhizobium*, *Azotobacter*, BGA, *Azolla*.
 Phosphate Solubilizing Bacteria. Green manure (preferably *Crotolaria*/
Gliricidia/locally available material). 1P
21. Preparation of Jam and Squash. 1P
22. A) One botanical excursion to study plant diversity.
 B) Visit to one of the following industries. (Study/project report is compulsory).
 1) Floriculture unit 2) Greenhouse 3) Pharmaceutical industry 4) Nursery and
 5) Mushroom cultivation unit.

(Note: Visits mentioned in the practical No. 22 (A & B) are compulsory. It carries 10 marks at the time of annual practical examination.)