

Rayat Shikshan Sanstha's  
**SADGURU GADGE MAHARAJ COLLEGE, KARAD**

(An Autonomous College - Affiliated to Shivaji University, Kolhapur)

**Accredited By NAAC with A<sup>+</sup> Grade (CGPA 3.63)**

**National Education Policy (NEP- 3.0)**

**Syllabus for**

**B.Sc. Part -I**

**BOTANY**

**Syllabus to be implemented from July 2024 onwards of**

**Academic Year 2024-25**

**Department of Botany**  
**Syllabus for B.Sc.-I BOTANY**  
**B. Sc. Part-I, Semester-I**

**DSC- I: BBT24-101: Diversity of Cryptogams (Credits: 02)**  
**w.e.f. July-2024**

**Learning Objectives: Students will be able to-**

1. State basic knowledge of different plant groups.
2. Generalize knowledge, importance and biodiversity of lower plant groups.
3. Illustrate the knowledge of economic importance of lower plant groups.
4. Apply the knowledge of opportunities for a career in the uses of lower plant groups.

|                 |          |  |           |
|-----------------|----------|--|-----------|
| <b>Unit I</b>   | <b>:</b> | <b>Introduction to Plant Kingdom and Bacteria</b>  | <b>08</b> |
|                 |          | Systems of classification (Two, Three and Five kingdom systems), General outline of plant kingdom.<br>Bacteria: Discovery, General characters, Cell structure, Types<br>Modes of reproduction – Vegetative, Asexual, Sexual –<br>Conjugation. Economic Importance. |           |
| <b>Unit II</b>  | <b>:</b> | <b>Algae</b>   | <b>08</b> |
|                 |          | General Characters of Algae.<br>Classification System of Algae (by G. M. Smith)<br>Economic Importance of Algae<br>Morphology and life cycles (excluding developmental stages) of <i>Nostoc</i> and <i>Spirogyra</i>   |           |
| <b>Unit III</b> | <b>:</b> | <b>Fungi</b>   | <b>08</b> |
|                 |          | General Characters of Fungi<br>Classification System of Fungi (by G. C. Ainsworth)<br>Economic Importance of Fungi<br>Morphology and life cycle (excluding developmental stages) of <i>Mucor</i> and <i>Penicillium</i>  |           |
| <b>Unit IV</b>  | <b>:</b> | <b>Lichens</b>   | <b>06</b> |
|                 |          | General characters of Lichens<br>Types of Lichens based on thallus morphology<br>Methods of reproduction<br>Economic Importance of Lichens   |           |

**Reference books-**

1. Ainsworth GG and AS Sussman, The Fungi Vols. I, II, III, IV- A and IV-B (Unit III)
2. Alexopoulos CJ (1960) Introductory Mycology (Unit III)
3. Awasthi DD (2000) A handbook of Lichens (Unit IV)
4. Dube HC (1990) An Introduction to Fungi, Vikas Publishing House Pvt. Ltd., Delhi (Unit III, IV)
5. Kumar HD (1990) Introductory Phycology. East Western Press. New Delhi (Unit II)

6. Sharma OP(1992) Textbook of Thallophytes. McGraw Hill Pub. Co. (Unit II)
7. Sharma OO (1989)Textbook of Fungi (Unit III)
8. Sharma PD (1991) The Fungi. Rastogi and Company, Meerut. (Unit III)
9. VashishthaBR and Sinha AK, Botany for degree students – fungi (Unit III)
10. Vashishtha BR (1976) Botany for Degree Students Part I Algae. S. Chand and Company, New Delhi. (Unit II)
11. Smith G M(1971) Cryptogamic Botany. Vol. I Algae and Fungi. Tata McGraw Hill Publishing Co. New Delhi. (Unit II)

**Learning Outcomes:**

**After successful completion of the course, Student will be able to:**

1. Apply the features and uses of lower cryptogams.
2. Implement the knowledge of lower cryptogams.
3. Give knowledge about the plant diversity of lower cryptogams.
4. Use to know the career opportunities in academics, research and entrepreneurship with respect to lower cryptogams.

**Department of Botany**  
**Syllabus for B.Sc.-I BOTANY**

**B. Sc. Part-I, Semester-I**

**DSC- II: BBT24-102: Plant Morphology (Credits: 02)**

**w.e.f. July-2024**

**Learning Objectives: Students will be able to-**

1. Generalize the knowledge of diversity in vegetative and reproductive parts of plants.
2. Apply the basic knowledge of plant identification.
3. Interpret basic knowledge of plant morphology.
4. Explain the knowledge of morphology and reproductive plant parts.

|                |          |   |          |
|----------------|----------|---|----------|
| <b>UnitI</b>   | <b>:</b> | <b>Morphology of Vegetative Parts</b>   | <b>7</b> |
|                |          | <p><b>Root Morphology:</b> Types of root- Tap root and adventitious roots; modifications for storage.</p> <p><b>Stem Morphology:</b> Nature of branching (monopodial and sympodial), modification of stem (Runner, Rhizome, Tuber and Bulb).</p> <p><b>Leaf:</b> Typical leaf, Types (simple and compound), Types of phyllotaxy, venation and modification of leaf (Tendrils and phyllodes)</p> |          |
| <b>UnitII</b>  | <b>:</b> | <b>Inflorescence</b>  | <b>8</b> |
|                |          | <p>Inflorescence: Definition</p> <p>Racemose -Raceme, Spike, Spadix, Corymb, Umbel, Catkin and Capitulum.</p> <p>Cymose -Solitary, Monochasial- Helicoid and scorpioid; Dichasial and Polychasial.</p> <p>Special types -Verticillaster, Cyathium and Hypanthodium. Significance of inflorescence.</p>  |          |
| <b>UnitIII</b> | <b>:</b> | <b>Flower</b>   | <b>8</b> |
|                |          | <p>Definition, Structure of typical flower, Types of Thalamus.</p> <p>Calyx and corolla- types of corolla, cohesion and aestivation; Perianth.</p> <p>Androecium: Structure of typical stamen, Variations- cohesion and adhesion.</p> <p>Gynoecium: Structure of typical carpel, number, position, cohesion and adhesion; placentation- types and significance.</p>                             |          |
| <b>UnitIV</b>  | <b>:</b> | <b>Fruits</b>   | <b>7</b> |
|                |          | <p>Introduction, Parts of fruit, Classification of fruits: a) Simple: Indehiscent, Dehiscent and Fleshy, b) Aggregate: Etaerio of Berries and Etaerio of Follicles. c) Multiple/ Composite fruits: Syconus and Sorosis.</p>   |          |

## Reference books-

1. Gurucharan Singh (2009) Plant systematics an integrated approach (Third edition), Science publisher.
2. A. C. Dutta (1964) Botany for degree students, Oxford University press, Bombay, Calcutta, Madras.
3. Gurucharan Singh: Plant Systematics (2004) An Integrated Approach, Science Publishers.
4. Annie Ragland, V. Kumaresan: Taxonomy of Angiosperms, Saras Publication (ISBN : 9789382459668)
5. George H. M. Lawrence (1955) An introduction to plant taxonomy, central book depot, Allhabad.
6. B.P. Pandey (2001) Taxonomy of Angiosperms, S. Chand Publishing,.
7. Kumar A.: Advanced Morphology of Angiosperm.
8. Vasistha P. C. Taxonomy of Angiosperms.
9. Sachdeva S.K. (1990) Angiosperms – Morphology, Anatomy, Taxonomy, Evolution, Kalyani Publication, Ludhiana.
10. Pandey S.N. Mishra S.P. (2009) Taxonomy of Angiosperms, Ane Books Pvt. Ltd., New Delhi.
11. Singh M.P. Sharma A.K. (2002) Textbook of Botany, Anmol Publication, Pvt. Ltd., New Delhi.

## Learning Outcomes:

**After successful completion of the course, Student will be able to:**

1. Apply the knowledge about vegetative and reproductive parts of plants.
2. Implement the knowledge of plant identification.
3. Execute the knowledge in finding range of variations found in different species of plants.
4. Distinguish structure of typical flower, inflorescence and fruits.

**Department of Botany**  
**Syllabus for B.Sc.-I BOTANY**  
**B. Sc. Part-I, Semester-I,**  
**DSC Practical I: BBP24-103 (Credits: 02)**  
**w.e.f. July-2024**

**Practical based on theory paper I (Diversity of Cryptogams) and II (Plant Morphology)**

|           |  |
|-----------|--|
| 1         | Study of forms of bacteria based on their shape (Permanent slide/ Photograph).     |
| 2 and 3   | Study of life cycle of <i>Nostoc</i> and <i>Spirogyra</i> .                        |
| 4 and 5   | Study of life cycle of <i>Mucor</i> and <i>Penicillium</i> .                       |
| 6         | Study of Types of lichens (Based on morphology).                                   |
| 7         | Study of different root modification.  |
| 8         | Study of nature of branching, modification of stem.                                |
| 9 and 10  | Study of leaf: Types (simple and compound), phyllotaxy, venation and modification. |
| 11 and 12 | Inflorescence: Racemose, Cymose and special type.                                  |
| 13        | Structure of typical flower and variation in Thalamus.                             |
| 14 and 15 | Study of different types of fruit.   |

**Department of Botany**  
**Syllabus for B.Sc.-I BOTANY**  
**B. Sc. Part-I, Semester-II**  
**DSC- III: BBT24-201: Diversity of Archegoniate (Credits: 02)**

**Learning Objectives:** Students will be able to-

1. State basic knowledge of different plant groups.
2. Generalize knowledge, importance and biodiversity of vascular and non-vascular plant groups.
3. Illustrate the knowledge of economic importance of vascular and non-vascular plant groups.
4. Apply the knowledge of opportunities for a career in the uses of vascular and non-vascular plant groups.

|                 |          |  |          |
|-----------------|----------|--|----------|
| <b>Unit I</b>   | <b>:</b> | <b>Bryophytes</b>  | <b>7</b> |
|                 |          | General characters, Alteration of Generation, Economic importance, Morphology, anatomy and life cycle (excluding developmental stages) of <i>Riccia</i> and <i>Funaria</i> .                               |          |
| <b>Unit II</b>  | <b>:</b> | <b>Pteridophytes</b>   | <b>8</b> |
|                 |          | General characters, Economic importance, Morphology, anatomy and life cycles (excluding developmental stages) of Lycopsida – <i>Selaginella</i> , Pteropsida – <i>Pteris</i> ; Heterospory and seed habit. |          |
| <b>Unit III</b> | <b>:</b> | <b>Gymnosperms</b>   | <b>7</b> |
|                 |          | General characters; Classification (up to order) Economic importance; Morphology, anatomy (Leaf and Stem) and life cycle (excluding developmental stages) of Gnetopsida – <i>Gnetum</i> .                  |          |
| <b>Unit IV</b>  | <b>:</b> | <b>Introductory Taxonomy</b>   | <b>8</b> |
|                 |          | Introduction, Scope of Taxonomy, functions of taxonomy: Classification, Identification, Nomenclature, Binomial Nomenclature; Ranks, Categories and taxonomic groups.                                       |          |

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## Reference books:

1. Parihar NS (1962) Bryophyta. Central Book Depot, Allahabad (Unit I)
2. Kashyap SR (1929) Liverworts of Western Himalayas and the Punjab Plains Part I and II (Unit I)
3. Jermy AG (1973) The Phylogeny and Classification of ferns. (Unit II)  
Parihar NS (1959) An Introduction to Pteridophyta (Unit II)
4. Bierhorst DW (1971) Morphology of Vascular plants (Unit II, III)
5. Chamberlain CJ (1966) Gymnosperms, Structure and Evolution (Unit III)
6. Coulter and Chamberlain JM, Morphology of Gymnosperms (Unit III)
7. Bhatnagar SP and Moitra A (1996) The Gymnosperms. (Unit III)
8. Foster AS and Gifford EM (1959) Comparative morphology of vascular plants (Unit III)
9. Rashid A (1978) An introduction to Pteridophytes (Unit II)
10. Ramanujan CGK (1979) Indian Gymnosperms in Time and Space (Unit III)
11. Smith GM (1971) Cryptogamic Botany. Vol. II Tata McGraw Hill Publishing Co. New Delhi. (Unit I)
13. Spome KR (1966) Morphology of Pteridophytes (Unit II)
14. Sporne KR (1967) Morphology of Gymnosperms (Unit III)
15. Surange KR (1968) Indian Fossil Pteridophytes (Unit IV)
16. Trivedi AN (2002) Advances in Pteridology (Unit II)
17. Vashishta BR (1996) Botany for degree students – Pteridophytes (Unit II)
18. Vashistha PC (1976) The Gymnosperms (Unit III)
19. Watson EV (1971) The structure and life of Bryophytes. Hutchinson and Co., London (Unit I)

## Learning Outcomes:

### After successful completion of the course, Student will be able to:

1. Apply the knowledge of features and uses of vascular and non-vascular plants.
2. Describe the concepts regarding vascular plants and non-vascular plants.
3. Interpret knowledge about plant diversity of vascular and non-vascular plants.
4. Express terminologies about taxonomy.



**Department of Botany**  
**Syllabus for B.Sc.-I BOTANY**  
**B. Sc. Part-I, Semester-II**

**DSC- IV: BBT24-202: Plant Resources and Pharmaceutical Industry (Credits: 02)**

**Learning Objectives:** Students will be able to:

1. Impart the knowledge plants role in human welfare.
2. Make aware of the industrial applications of plant resources.
3. Update about plant dependent industries.
4. Encourage and think about entrepreneurship and start-ups.

|                 |          |   |           |
|-----------------|----------|---|-----------|
| <b>Unit I</b>   | <b>:</b> | <b>Plant Resources</b>  | <b>08</b> |
|                 |          | Introduction, Concept of natural resources, biological resources, plants as natural resources, Utilization.<br>Bioenergy, food, fodder, fibre, medicine and essences with suitable examples.<br>Plant Resources Processed: Jam, jelly, squash, ketchup, pickles and rubber<br>Unprocessed: Honey, timber, wood and tannins.   |           |
| <b>Unit II</b>  | <b>:</b> | <b>Flower Arrangement</b>   | <b>07</b> |
|                 |          | Introduction, principles and basic elements of art in flower arrangement.<br>Flowers and foliage suitable for Flower arrangement.<br>Types: Western, eastern, modern and loose flower arrangement, requirements.<br>Flower arrangement as a business.   |           |
| <b>Unit III</b> | <b>:</b> | <b>Plant resources used in cosmetics, aromatics and pharmaceuticals</b>   | <b>07</b> |
|                 |          | Introduction<br>Scope of Herbal preparations.<br>Methods of extraction: Maceration, digestion, decoction, extracts and tinctures.<br>i) Aloe ii) Henna iii) Lemon grass iv) Rose v) Turmeric vi) Ginger vii) Neem viii) Holy basil ix) Amala with reference to part used, products and uses.  |           |
| <b>Unit IV</b>  | <b>:</b> | <b>Plant Pharmaceutical Industry</b>  | <b>08</b> |
|                 |          | Concept and advantages.<br>Types of pharmaceutical products: Churna, Asava, and Arishta.<br>Manufacture of Churna (Triphala churna), Arishta (Ashokarishta), and Asava (Kumariasava).<br>Drug plants with reference to the botanical name, source, active principles and medicinal uses of <i>Adathoda zeylanica</i> , <i>Tinospora cordifolia</i> , and <i>Asparagus racemosus</i> . |           |

**Reference books:**

1. A Textbook of Economic Botany. Sambamurthy, A.V.S.S., Subramanyam, N.S., Wiley Eastern Ltd., New Delhi. (1989)
2. Ayurvedic Useful Plants in India. Drury, C. H. Asiatic Publishing House, New Delhi. (2006).
3. Economic Botany - Plants in Our World. Simpson, B.B., Conner-Ogorzaly, M., McGraw Hill, New York. (1986)
4. Economic Botany in Tropics. Kocchar, S.L., 4th Edition. Macmillan India Ltd., New Delhi. (2011)
5. Indian Materia Medica Vol. I and II. Nadkarni, K. M. Popular Prakashan, Mumbai. (2002)
6. Banker G S and Rhode C T Modern Pharmaceutics, Marcel Dekker Inc., NY.
7. Bean H S, Beckett A H, and Carless A H Advances in Pharmaceutical Sciences, Vol 1-4 Academic Press, London.
8. Cartstensen J T, Drug Stability, Marcel Dekker Inc NY.
9. Thakur, R.S., Puri, H.S. and Husain, A. (1969). Major medicinal plants of India, Central Institute of medicinal and aromatic plants, Lucknow.
10. Sharma, O.P. (1996). Hills Economic Botany, Tata McGraw Hill co., Ltd., New Delhi
11. Kocchar, S.L. (1998). Economic Botany of the tropics, II Ed. MacMillan India Ltd.

**Learning Outcomes:**

**After successful completion of the course, Student will be able to:**

1. Analyze the role of plants in human welfare.
2. Know the industrial applications of plant resources.
3. Recognize the plant dependent industries.
4. Discuss ideas related to plant based entrepreneurship and start-ups.

**DEPARTMENT OF BOTANY**  
**Syllabus for B.Sc.-I BOTANY**  
**B. Sc. Part-I, Semester-I,**  
**Practical II: BBP24-203 (Credits: 02)**

**Practical based on theory paper III (Diversity of Archegoniate) and  
Paper IV (Plant Resources and Pharmaceutical Industry)**

|        |  |
|--------|--|
| 1&2    | Study of life cycle of <i>Riccia</i> and <i>Funaria</i> .  |
| 3&4    | Study of life cycle of <i>Selaginella</i> and <i>Pteris</i> .  |
| 5      | Study of life cycle of <i>Gnetum</i> .   |
| 6&7    | Preparation of Jam, squash, ketchup.   |
| 8      | Plant resources-timber, wood and tannins yielding plant.   |
| 9 & 10 | Flower arrangement.  |
| 11&12  | Maceration, digestion and decoction techniques in pharmaceuticals.   |
| 13     | Medicinal plants: <i>Adathoda zeylanica</i> , <i>Tinospora cordifolia</i> , and <i>Asparagus racemosus</i> . |
| 14     | Preparation of Triphalachurna.   |
| 15     | Preparation of Ashokarishta.   |
| 16     | Preparation of Kumariasava.  |

Rayat Shikshan Sanstha's  
**Sadguru Gadge Maharaj College, Karad (Autonomous)**

**Department of Botany**  
**Evaluation Pattern: B.Sc. I Botany**  
(w.e.f. July 2024)

| Sem.         | Paper Code  | Credits   | Title of Paper                              | Evaluation Scheme (Marks) |            |            | Grand Total Marks |
|--------------|-------------|-----------|---|---------------------------|------------|------------|-------------------|
|              |             |           |   | CCE                       | SEE        | Total      |                   |
| I            | BBT24-101   | 02        | Diversity of Cryptogams                     | 10                        | 40         | 50         | 175               |
|              | BBT24-102   | 02        | Plant Morphology                            | 10                        | 40         | 50         |                   |
|              | BBP24-103   | 02        | Botany Practical I                          | -                         | 25         | 25         |                   |
|              | OEBOT24-101 | 02        | Biofertilizers and Manures                  | -                         | 50         | 50         |                   |
| II           | BBT24-201   | 02        | Diversity of Archegoniate                   | 10                        | 40         | 50         | 175               |
|              | BBT24-202   | 02        | Plant Resources and Pharmaceutical Industry | 10                        | 40         | 50         |                   |
|              | BBP24-203   | 02        | Botany Practical II                         | -                         | 25         | 25         |                   |
|              | OEBOT24-201 | 02        | Gardening techniques                        | -                         | 50         | 50         |                   |
| <b>Total</b> |             | <b>16</b> |   | <b>40</b>                 | <b>310</b> | <b>350</b> | <b>350</b>        |

**SEE**-Semester End Examination, **CCE**- Continuous Comprehensive Evaluation  
**Nature of question paper and evaluation scheme:**

❖ **Evaluation Scheme**

- Separate passing for Theory, Practical and internal examination is mandatory.
- In theory examination (**SEE**- Semester End Examination) passing for each paper is at **32** marks (40% of 80marks).
- In internal examination (**CCE**- Continuous Comprehensive Evaluation) passing for each paper is at **08** marks (40% of 20marks).
- In practical examination (**SEE**- Semester End Examination) passing is at 20

marks (40% of 50 marks).

**Department of Botany**  
**Nature of SEE Question Papers**  
**(w.e.f. July 2024)**

**Que. 1. Select correct alternative.**

**08**

1. ....  
a) ..... b) .....  
c) ..... d) .....
2. ....  
a) ..... b) .....  
c) ..... d) .....
3. ....  
a) ..... a) .....  
c) ..... c) .....
4. ....  
a) ..... a) .....  
c) ..... c) .....
5. ....  
a) ..... a) .....  
c) ..... c) .....
6. ....  
a) ..... b) .....  
c) ..... d) .....
7. ....  
a) ..... b) .....  
c) ..... d) .....
8. ....  
a) ..... b) .....  
c) ..... d) .....

**Que. 2. Attempt any two.**

**16**

- A) .....
- B) .....
- C) .....

**Que. 3. Attempt any four.**

**16**

- a) .....
- b) .....
- c) .....
- d) .....
- e) .....
- f) .....