

University of Mysore

**FRAMING OF DURATION FOR DEGREE PROGRAMME AND REVISION OF
SYLLABUS FOR UNDERGRADUATE COURSES &
CONTINUOUS ASSESSMENT AND GRADING PATTERN (CGPA)
(Ref: Govt. order No. ED 166 UNE 2023, Bengaluru, dated 05-05-2024)**

FOR UNDERGRADUATE PROGRAMS

B.Sc. BOTANY

Syllabus and Scheme of Examination

2026 – 2027

PROGRAM DETAILS

Program Name: Bachelor of Science (B.Sc.)

Nature of the Program: Undergraduate Degree Program (Choice-Based Credit System - CBCS)

Duration of the Program: Three academic years, consisting of six semesters, or as prescribed by the University from time to time.

Eligibility for Admission: Candidates who have completed their Pre-University course in accordance with the norms prescribed by the University.

Medium of Instruction: English

Program Structure: The Program comprises a structured combination of discipline core courses, Botany (DSCB), discipline elective Botany (DSEB), discipline compulsory course Botany (DCB), Practical Courses, and other components as prescribed by the University of Mysore, distributed across semesters in accordance with the Choice Based Credit System (CBCS) and University regulations in force from time to time.

Credits: Credits are assigned to each course based on instructional hours, learning activities, and expected learner effort, in conformity with the Choice-Based Credit System (CBCS) norms prescribed by the University.

ACADEMIC REGULATIONS

The academic regulations of the B.Sc. The program shall be governed by the rules and ordinances of the University of Mysore and shall conform to the Choice Based Credit System (CBCS) and UGC-LOCF framework in force from time to time.

Attendance Requirements: Students shall be required to maintain a minimum percentage of attendance as prescribed by the University of Mysore to become eligible to appear for the end- of-semester examination in each course. Condonation of the shortage of attendance, if any, shall be governed by the rules and procedures notified by the University from time to time.

Assessment and Evaluation Scheme: Evaluation of student performance shall be based on a combination of Continuous Internal Assessment (CIA) and End-of-Semester Examination (ESE), as prescribed under the CBCS framework of the University of Mysore.

The components of assessment may include:

- Internal tests
- Assignments
- Seminars/ presentations
- Practical / laboratory work
- Hands-on exercises

- Fieldwork/field visit reports
- Project work

The distribution of marks between Continuous Internal Assessment and End of Semester Examination shall be as per the University regulations.

Passing Criteria: A student shall be declared to have passed a course if he/she secures:

- The minimum prescribed marks in the Continuous Internal Assessment.
- The minimum prescribed marks in the End-of-Semester Examination, and
- The aggregate minimum marks as stipulated by the University.

Grading System: The grading of students shall be carried out using the grading system adopted by the University of Mysore under CBCS, with letter grades and grade points assigned based on performance in each course. The computation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA) shall be done in accordance with university regulations.

SCHEME OF EXAMINATION

A. Theory Courses

Component	Nature of Assessment	Marks
Continuous Internal Assessment (CIA) C1 (10) + C2 (10)	Tests/ Assignment/ Seminars/ Presentations	20
End-of-Semester Examination (ESE)	University Examination	80
Total		100

B. Practical Courses

Component	Nature of Assessment	Marks
Continuous Internal Assessment (CIA) C1 (5) + C2 (5)	Practical work/ Records	10
End-of-Semester Examination (ESE)	Practical Examination	40
Total		50

PROGRAM LEARNING OUTCOMES (PLOs)

On successful completion of the B.Sc. Botany program, graduates will be able to:

PLO 1: Botanical Knowledge

Demonstrate in-depth knowledge and integrate concepts across various domains of plant science to understand plant systems holistically.

PLO 2: Scientific Inquiry and Research Skills

Formulate hypotheses, design experiments, and interpret data using appropriate scientific approaches in plant science.

PLO 3: Advanced Laboratory and Field Competencies

Employ standard and modern techniques in plant analysis, documentation, and field-based studies.

PLO 4: Environmental and Sustainability Challenges

Apply botanical knowledge to biodiversity conservation, ecosystem management, and sustainable utilization of plant resources.

PLO 5: Communication and Documentation Skills

Effectively communicate research findings through scientific writing, presentations, and documentation techniques.

PLO 6: Ethical and Professional Standards

Practice integrity, professional ethics, and responsibility in scientific and professional activities.

PLO 7: Emerging Trends in Plant Sciences

Understand and apply recent advancements and innovations in botany and allied fields.

PLO 8: Higher Education and Employability

Demonstrate readiness for advanced studies, research, and diverse career opportunities in plant sciences and related sectors.

GRADUATE ATTRIBUTES

Graduates of the Bachelor of Science program will exhibit the following key attributes.

GA 1: Scientific Knowledge

Possess a strong understanding of core scientific principles and their applications in the subjects of study.

GA 2: Critical Thinking and Problem-Solving Skills

Apply logical, critical, and analytical thinking to identify, evaluate, and solve complex biological and environmental problems related to plants and ecosystems using appropriate tools and techniques.

GA 3: Practical and Technical Competence

Demonstrate competence in modern instrumentation, tools, and techniques to solve field problems.

GA 4: Communication Skills

Communicate scientific ideas effectively through oral, written, and visual means.

GA 5: Environmental Awareness and Responsibility

Show commitment to environmental protection and responsible use of natural resources.

GA 6: Ethical and Professional Values

Exhibit integrity, honesty, and ethical behaviour in academic and professional contexts.

GA 7: Teamwork and Leadership

Work effectively in teams, demonstrate leadership, and manage scientific tasks in academic and research settings.

GA 8: Adaptability and Lifelong Learning

Exhibit lifelong learning and adaptability, with preparedness for higher studies, research, teaching, and diverse career opportunities.

ALLOCATION OF CREDITS (2026-27 onwards)						
Sem	Course Code	Practical / Theory	TITLE OF THE COURSE (COMPULSORY)	Hrs./ Week L: T:P	Credits	Max marks
I	DSCB*-1.1	Theory	Diversity of Microbes, Algae, Fungi & Phytopathology	3 Hrs.	3	80+20
		Practical	Diversity of Microbes, Algae, Fungi & Phytopathology	4 Hrs.	2	40+10
II	DSCB*-2.1	Theory	Bryophytes, Pteridophytes, Gymnosperms, Paleobotany & Anatomy of Angiosperms	3 Hrs.	3	80+20
		Practical	Bryophytes, Pteridophytes, Gymnosperms, Paleobotany & Anatomy of Angiosperms	4 Hrs.	2	40+10
III	DSCB* - 3.1	Theory	Reproductive Biology, Plant Ecology, Biodiversity & Conservation	3 Hrs.	3	80+20
		Practical	Reproductive Biology, Plant Ecology, Biodiversity & Conservation	4 Hrs.	2	40+10
	DSEB - 3.1a	Elective	Horticulture and Flower Gardening	2 Hrs.	2	40+10
	DSEB - 3.1b	Elective	Mushroom culture technology & Biofertilizers	2 Hrs.	2	40+10
IV	DSCB*-4.1	Theory	Plant Physiology & Metabolism, Cell Biology & Molecular Biology	3 Hrs.	3	80+20
		Practical	Plant Physiology & Metabolism, Cell Biology & Molecular Biology	4 Hrs.	2	40+10
	DCB**-4.1	Compulsory Practical	Nursery, Gardening & Landscaping	4 Hrs.	2	40+10
	DSEB - 4.1	Elective	Medicinal Plants & Herbal Technology	2 Hrs.	2	40+10
V	DSCB - 5.1	Theory	Morphology of Angiosperms, Taxonomy, Economic Botany & Ethnobotany	3 Hrs.	3	80+20
		Practical	Morphology of Angiosperms, Taxonomy, Economic Botany & Ethnobotany	4 Hrs.	2	40+10
	DSCB - 5.2	Theory	Plant Breeding and Phytogeography	3 Hrs.	3	80+20
	DSEB - 5.1	Theory	Floriculture	2 Hrs.	2	40+10
	DSCB - 6.1	Theory	Genetics, Genetic Engineering, Plant Biotechnology & Evolution	3 Hrs.	3	80+20
		Practical	Genetics, Genetic Engineering, Plant Biotechnology & Evolution	4 Hrs.	2	40+10

VI	DSCB - 6.2	Theory	Phytochemistry and Bioanalytical Techniques	3 Hrs.	3	80+20
	DSEB - 6.1	Theory	Botanical products	2 Hrs.	2	40+10
DSCB* Discipline Core Course Botany; DSEB* Discipline Elective Botany; DCB* Discipline Compulsory Course Botany. Note: Any one of DSEB 3.1a or DSEB 3.1b may be selected as an elective						

Dr. K.N. Amruthesh
CHAIRMAN
Board of Studies in Botany (UG)

COURSE DETAILS

Semester No.: 1

Course No.: 1

No. of Credits: 3

Course Title: Diversity of Microbes, Algae, Fungi & Phytopathology

Course Code: DSCB*-1.1

COURSE LEARNING OUTCOMES (CLOs)

After completing this course, students will be able to:

CLO 1: Explain microbial diversity, classification systems, and the structure and significance of major microbial groups.

CLO 2: Describe the characteristics, classification, structure, reproduction, and importance of algae, cyanobacteria, and lichens.

CLO 3: Analyze the classification, characteristics, and life cycles of fungi with their economic importance.

CLO 4: Evaluate plant diseases, their causes, symptoms, management, and key phytopathological concepts.

COURSE CONTENT:

Unit I: Microbial diversity A brief account of microbes in soil, air, food, and water. Brief account of five kingdom (Whittaker) and three domain (Carl Woese) system of classification.

Virology: History, general characters, classification, ultrastructure, and multiplication of TMV and Bacteriophage (T4); Transmission of Viruses. **Viroids:** General characters and fine structure of PSTVd. **Prions:** General characteristics and diseases [Creutzfeldt-Jakob disease (CJD), Bovine spongiform encephalopathy (BSE)]. **Mycoplasma:** History and general characters. **Phytoplasma:** Introduction, classification, and diseases (Sandal spike disease). **Bacteriology:** Introduction, classification (based on nutrition); Ultrastructure and reproduction (Budding, fission, and endospore formation); Genetic recombination (Conjugation, transduction, and transformation), and economic importance.

Teaching hours: 16

Unit II: Algae and Lichens: Cyanobacteria: General characters and economic importance of Cyanobacteria. Type study: *Nostoc*. General characters, classification, and economic importance of algae. Type study: *Chlorella*, *Oedogonium*, *Caulerpa*, *Diatom* (Pennales), *Sargassum*, and *Polysiphonia*. **Lichens:** General characters, classification (based on morphology and fungal component), structure, reproduction, and Economic importance.

Teaching hours: 16

Unit III: Fungi and Phytopathology: Fungi: General characters, classification (Ainsworth's), and economic importance. Type study: *Rhizopus*, *Albugo*, *Penicillium*, *Puccinia*, and *Fusarium*. **Phytopathology:** Introduction, classification (based on causal organism), and disease triangle. **Plant diseases:** Host, causal organism, symptoms, and management of Little leaf of

brinjal, Tobacco mosaic disease, Citrus canker, Tikka disease of groundnut, Late blight of potato, Coffee rust, and Algal rust; Biopesticides.

Teaching hours: 16

LEARNING RESOURCES

- 1) Alexopolous, J. & Charles, W. M. 1988. *Introduction to Mycology*. Wiley Eastern, New Delhi.
- 2) Chopra, G. L. 1973. *Textbook of Algae*. S. Nagin and Co., Jalandhar.
- 3) Dube, H. C. 1983. *An Introduction to Fungi*. Vikas Publication House, New Delhi.
- 4) Dutta, A. C. 1998. *Botany for Degree Students*. Oxford University Press.
- 5) Ganguli, H. C., Das, K. S. & Datta, C. 1935. *College Botany (Vol. II)*. New Central Book Agency (P) Ltd.
- 6) Mehrotra, R. S. & Aneja, K. R. 1990. *An Introduction to Mycology*. Wiley Eastern Ltd.
- 7) Pandey, B. P. 2001. *College Botany Vol. I: Algae, Fungi, Lichens, Bacteria, Viruses, Plant Pathology, Industrial Microbiology and Bryophyta*. S. Chand and Company Ltd., New Delhi.
- 8) Pandey, B. P. 2007. *Botany for Degree Students: Diversity of Microbes, Cryptograms, Cell Biology and Genetics*. S. Chand and Company Ltd., New Delhi.
- 9) Pelczar, M. J. 2001. *Microbiology*, 5th edition. Tata McGraw-Hill Co., New Delhi.
- 10) Prescott, L., Harley, J. & Klein, D. 2005. *Microbiology*, 6th edition. Tata McGraw-Hill Co., New Delhi.
- 11) Sambamurthy, A. V. S. S. 2006. *A Textbook of Algae*. I. K. International Pvt. Ltd., New Delhi.
- 12) Sambamurthy, A. V. S. S. 2006. *A Textbook of Plant Pathology*. I. K. International Pvt. Ltd., New Delhi.
- 13) Sharma, O. P. 2006. *A Textbook of Thallophyta*. McGraw-Hill Publishing Co., New Delhi.
- 14) Singh, R. S. 1984. *Introduction to Principles of Plant Pathology*. Oxford & IBH Publication Co. Pvt. Ltd., New Delhi.
- 15) Singh, V., Pande, P. C. & Jain, D. K. 2006. *A Textbook of Botany*. Rastogi Publications, Meerut.
- 16) Smith, G. M. 1955. *Cryptogamic Botany: Algae, Fungi and Lichens, Vol. I*. McGraw-Hill Book Co., New York.
- 17) Srivastava, H. N. 1993. *Fungi*. Pradeep Publications, Allahabad.
- 18) Srivastava, H. N. 1998. *Algae*. Pradeep Publications, Jalandhar.
- 19) Sundarajan, S. 1998. *College Microbiology, Vol. I*. Vardhana Publications, Bangalore.
- 20) Sundararajan, S. 1993. *College Botany, Vols. I & II*. Himalaya Publishing Company, Bangalore.
- 21) Vashishta, B. R., Sinha, A. K. & Singh, V. P. 2008. *Botany for Degree Students: Algae*. S. Chand and Company Ltd., New Delhi.

Scheme of Question Paper (2025-26 onwards)
(Theory)
B.Sc. Degree I Semester Examination
Diversity of Microbes, Algae, Fungi and Phytopathology
Code:

Time: 3 hours

Max. Marks: 80

- I. Define/Explain any EIGHT the following** **8X1=08**
5 From Unit I
3 From Unit II
2 From Unit III
- II. Write short notes on any FIVE of the following** **5X3=15**
2 From Unit I
3 From Unit II
2 From Unit III
- III. Answer any FIVE of the following** **5X5=25**
2 From Unit I
2 From Unit II
3 From Unit III
- IV. Describe any FOUR of the following in detail** **4X8=32**
2 From Unit I
2 From Unit II
2 From Unit III

Unit	1Mark	3 Marks	5 Marks	8 Marks	Total
I	1X5=5	3X2=6	5X2=10	8X2=16	37
II	1X3=3	3X3=9	5X2=10	8X2=16	38
III	1X2=2	3X2=6	5X3=15	8X2=16	39

Assessment method

Assessment		Marks
C1	Assignment	10
C2	Test	10
C3	Semester-end exam	80

Theory Model Question Paper (2025-26 onwards)
I Semester-Paper I (DSCB 1.1)
Diversity of Microbes, Algae, Fungi and Phytopathology
Code:

Time: 3 Hrs.

Max. Marks: 80

Instruction: Draw neat, labelled diagrams wherever necessary

I. Define/Explain any EIGHT of the following

8X1= 8

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

II. Write short notes on any FIVE of the following

5X3=15

- 11.
- 12.
- 13.
- 14.
- 15.
- 16.
- 17.

III. Answer any FIVE of the following

5X5=25

- 18.
- 19.
- 20.
- 21.
- 22.
- 23.
- 24.

IV. Describe any FOUR of the following in detail

4X8=32

- 25.
- 26.
- 27.
- 28.
- 29.
- 30.

Practical Syllabus (2025-26 onwards)
I Semester-Paper I (DSCB 1.1)
Diversity of Microbes, Algae, Fungi and Phytopathology
Code:

Time-64 Hrs (1 Practical of 4 Hrs/ week: 2 Credits)

1. Equipments used in Microbiology lab: Inoculation loop & needle, Hot air oven, Incubator, Pressure cooker, Laminar air flow chamber, Hemocytometer, Colony counter.
2. Photographs/Charts of Microbiologists and their contribution.
3. Staining of bacteria: Simple (positive and negative) and Gram staining.
4. Structure and reproduction of *Nostoc* and *Chlorella*
5. Structure and reproduction of *Oedogonium*
6. Structure and reproduction of *Caulerpa* and *Sargassum*
7. Structure and reproduction of *Polysiphonia* and Pennate Diatom
8. Structure and reproduction of *Rhizopus*, *Albugo*
9. Structure and reproduction of *Penicillium* and *Puccinia*,
10. Structure and reproduction of *Fusarium* and Lichens
11. Host, causal organism, symptoms, and management of Sandal spike, TMV, Citrus canker, Algal rust (Avocado).
12. Tikka disease of Groundnut, Late blight of Potato, and Coffee rust Biopesticides (Neem, *Trichoderma*, *Bacillus subtilis*, NPV)

Assessment method

Assessment		Marks
C1	Continuous assessment (CA)	05
C2	Submission	05
C3	Semester-end exam	40

Practical Question Paper Scheme (2025-26 onwards)
I Semester-Practical I (DSCB 1.1)
Diversity of Microbes, Algae, Fungi, and Phytopathology
Code:

Time: 3 Hrs

Max. Marks: 40

- | | | |
|------|--|----|
| I. | Perform experiment A and leave for evaluation | 07 |
| II. | Prepare a temporary stained slide of the materials B & C, sketch, label, and identify with reasons. Leave the preparation for evaluation | 10 |
| III. | Write a critical comment on the materials D, E & F | 12 |
| IV. | Identify the slides G, H & I with reason | 16 |
| V. | Record | 05 |

Practical Question Paper Scheme (SEB)
I Semester-Practical I (DSCB 1.1)
Diversity of Microbes, Algae, Fungi, and Phytopathology
Code:

Time: 3 Hrs

Max. Marks: 40

- | | | |
|------|---|----|
| I. | Perform experiment A and leave for evaluation
[Simple staining (positive and negative)/ differential staining] (Principle- 1; Procedure- 2; Performance with result- 4) | 07 |
| II. | Prepare a temporary stained slide of the materials B & C, sketch, label, and identify with reasons. Leave the preparation for evaluation.
(1 from Cyanobacteria/ Algae, 1 from Fungi)
(Identification-1; Preparation- 2; Reasons with labelled diagram- 2) | 10 |
| III. | Write a critical comment on the materials D, E & F
(1 each from Fungi, Virus / Bacteria/ Mycoplasma disease, and Algae/Lichen) (Identification- 1, Causal organism- 1, Symptoms and Management- 2) | 12 |
| IV. | Identify the slides G, H & I with reason
(1 each from Algae/ Cyanobacteria, Fungi/ Lichen, and Bryophyte)
(Identification- 1; Reasons with labeled diagram- 3) | 16 |
| V. | Record | 05 |

Note: Each student shall bring the practical record to the practical Examination for evaluation, without which he/ she shall not be allowed to appear for the practical examination.

COURSE DETAILS

Semester No.: 2

Course No.: 1

No. of Credits: 3

Course Title: Bryophytes, Pteridophytes, Gymnosperms, Palaeobotany & Anatomy of Angiosperms

Course Code: DSCB*- 2.1

COURSE LEARNING OUTCOMES (CLOs)

After completing this course, students will be able to:

- CLO 1: Summarize the characteristics, classification, and importance of bryophytes and key paleobotanical concepts.
- CLO 2: Explain the features, classification, stellar evolution, and representative types of pteridophytes.
- CLO 3: Describe the characteristics, classification, and significance of gymnosperms.
- CLO 4: Analyze plant tissue structure and anatomy of roots, stems, and leaves, including secondary growth and anomalies.

COURSE CONTENT:

Unit I: Bryophytes: General characters, classification, and economic importance of Bryophytes Type Study *Riccia*, *Marchantia*, *Anthoceros*, and *Polytrichum* (Developmental details not required). **Paleobotany:** Geological timescale, fossils and fossilization; Types of fossils. Type study: *Rhynia* and *Cycadeoidea*. **Teaching hours: 16**

Unit II: Pteridophytes: General characters, classification, and economic importance. Stellar Evolution. Type study: *Psilotum*, *Selaginella*, *Equisetum*, *Pteris*, and *Marsilea* (Developmental details not required); Heterospory and seed habit (Brief account). **Teaching hours: 16**

Unit III: Gymnosperms: General characters, classification, and economic importance of Gymnosperms. Type study: *Cycas*, *Pinus*, and *Gnetum*. **Anatomy of Angiosperms:** Epidermal tissue system (Epidermis, trichomes, Stomata, and hydathodes) and Secretory tissue (Laticiferous tissues). Vascular bundles, types of vascular bundles. Anatomy of monocot and dicot root, stem, and leaf. Secondary growth in the dicot stem and Anomalous secondary growth in the *Dracaena* stem. **Teaching hours: 16**

LEARNING RESOURCES

- 1) Andrews, H. N. (1961). *Studies in Paleobotany*. John Wiley, New York.
- 2) Bhatnagar, S. P., & Mitra, A. (1966). *Gymnosperms*. New Age International (P) Ltd., Publishers.
- 3) Bierhorst, D. W. (1971). *Morphology of Vascular Plants*. The MacMillan Co., New York; Collier-MacMillan Ltd., London.
- 4) Chamberlain, C. J. (1935). *Gymnosperms: Structure and Evolution*. Chicago Press.
- 5) Chestor, A. A. (1947). *Introduction to Palaeobotany*. McGraw-Hill, London.
- 6) Coulter, J. M., & Chamberlain, C. J. (1964). *Morphology of Gymnosperms*. Central Book Depot, Allahabad.

- 7) Dutta, A. C. (1998). *Botany for Degree Students*. Oxford University Press.
- 8) Dutta, S. C. (1966). *An Introduction to Gymnosperms*. Asia Publications House, Mumbai.
- 9) Eames, A. J. (1936). *Morphology of Vascular Plants (Lower Groups)*. McGraw-Hill, New York.
- 10) Esau, K. (1979). *Anatomy of Seed Plants*. Wiley Eastern Ltd., New Delhi.
- 11) Fahn, A. (1969). *Plant Anatomy* (2nd ed.). Wiley, New York.
- 12) Frank, C. (1990). *The Inter-relationships of the Bryophytes*. New Phytologist; Today and Tomorrow's Printers and Publishers.
- 13) Gangulee, H. C., & Kumar, A. (1982). *College Botany, Vol. II*. Central Book Agency, Calcutta.
- 14) Pandey, S. N., & Chadha, A. (2009). *Plant Anatomy and Embryology*. Vikas Publishing House Pvt. Ltd.
- 15) Pandey, S. N., Mishra, S. P., & Trivedi, P. S. (2007). *A Textbook of Botany, Vol. II*. Rastogi Publications, Meerut.
- 16) Rashid, A. (1999). *An Introduction to Pteridophyta*. MKM Publisher Pvt. Ltd.
- 17) Shripad, N. A. (1995). *Paleobotany*. Oxford & IBH, New Delhi.
- 18) Singh, V., Pande, P. C., & Jain, D. K. (2005). *Diversity and Systematics of Seed Plants*. Rastogi Publications, Meerut.
- 19) Singh, V., Pande, P. C., & Jain, D. K. (2006). *A Textbook of Botany*. Rastogi Publications, Meerut.
- 20) Sporne, K. R. (1971). *The Morphology of Gymnosperms: The Structure and Evolution of Primitive Seed Plants*. Hutchinson University Library, London.
- 21) Sporne, K. R. (1974). *Morphology of Pteridophytes*. Hutchinson & Co., London.
- 22) Tayal, M. S. (2004). *Plant Anatomy*. Rastogi Publications.
- 23) Vashishta, P. C. (1982). *Pteridophyta*. S. Chand & Co. Ltd., New Delhi.

Theory Question Paper Scheme (2025-26 onwards)
II Semester-Paper II (DSCB 2.1)
Bryophytes, Pteridophytes, Gymnosperms, Palaeobotany and Anatomy of
Angiosperms Code:

Time: 3 Hrs

Max. Marks: 80

Instruction: Draw neat, labelled diagrams wherever necessary

I. Define/Explain any EIGHT of the following **8X1=08**

- 2 from Unit I
- 3 from Unit II
- 2 from Unit III
- 2 from Anatomy

II. Write short notes on any FIVE of the following **5X3=15**

- 2 from Unit I
- 2 from Unit II
- 2 from Unit III
- 1 from Anatomy

III. Answer any FIVE of the following **5X5=25**

- 2 from Unit I
- 2 from Unit II
- 2 from Unit III
- 1 from Anatomy

IV. Describe any FOUR of the following in detail **4X8=32**

- 2 from Unit I
- 2 from Unit II
- 2 from Unit III

Unit	1Mark	3 Marks	5 Marks	8 Marks	Total
I	1X5=5	3X2=6	5X2=10	8X2=16	37
II	1X3=3	3X3=9	5X2=10	8X2=16	38
III	1X2=2	3X2=6	5X3=15	8X2=16	39

Assessment method

Assessment		Marks
C1	Assignment	10
C2	Test	10
C3	Semester-end exam	80

Theory Model Question Paper (2025-26 onwards)
II Semester-Paper I (DSCB 2.1)
Bryophytes, Pteridophytes, Gymnosperms, Palaeobotany and Anatomy of
Angiosperms Code:

Time: 3 Hrs

MaxMarks:80

Instruction: Draw neat, labelled diagrams wherever necessary

I. Define/ Explain any EIGHT of the following

8X1=8

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

II. Write short notes on any FIVE of the following

5X3=15

- 11.
- 12.
- 13.
- 14.
- 15.
- 16.
- 17.

III. Answer any FIVE of the following

5X5=25

- 18.
- 19.
- 20.
- 21.
- 22.
- 23.
- 24.

IV. Describe any FOUR of the following in detail

4X8=32

- 25.
- 26.
- 27.
- 28.
- 29.
- 30.

Practical Syllabus (2025-26 onwards)
II Semester-Practical II (DSCB 2.1)
Bryophytes, Pteridophytes, Gymnosperms, Palaeobotany and Anatomy of
Angiosperms
Code:

Time: 64 Hrs. (1 practical of 4 Hrs/ week)

2 Credits

1. Meristems, simple and complex tissues
2. Anatomy of monocot and dicot root.
3. Anatomy of monocot and dicot stem.
4. Anatomy of monocot and dicot leaf.
5. Morphology, anatomy, and reproduction of *Riccia* and *Marchantia*.
6. Morphology, anatomy, and reproduction of *Anthoceros* and *Polytrichum*.
7. Morphology, anatomy, and reproduction of *Psilotum* and *Rhynia*.
8. Morphology, anatomy, and reproduction of *Selaginella* and *Equisetum*.
9. Morphology, anatomy, and reproduction of *Pteris* and *Marsilea*.
10. Morphology, anatomy, and reproduction of *Cycas* and *Cycadioidea*.
11. Morphology, anatomy, and reproduction of *Pinus*.
12. Morphology, anatomy, and reproduction of *Gnetum*.
13. Visit to a Geology Museum/ Fernarium.

Assessment method

Assessment		Marks
C1	Continuous assessment (CA)	05
C2	Submission/ Assignment	05
C3	Semester-end exam	40

Practical Question Paper (2025-26 onwards)
II Semester-Practical II (DSCB 2.1)
Bryophytes, Pteridophytes, Gymnosperms, Palaeobotany and Anatomy of
Angiosperms
Code:

Time: 3 Hrs **Max.**
Marks: 40

- | | |
|--|----|
| I. Identify the specimens A, B and C with reasons | 09 |
| II. Prepare a temporary stained slide of the material D sketch, label and identify with reasons. Leave the preparation for evaluation. | 05 |
| III. Comment on the materials E, F and G | 09 |
| IV. Identify the slides/ Chart H, I, J and K with reasons | 12 |
| VI. Record | 05 |

Practical Question Paper Scheme (2025-26 onwards)
II Semester- Practical II (DSCB 2.1)
Bryophytes, Pteridophytes, Gymnosperms, Palaeobotany and Anatomy of
Angiosperms
Code:

Time: 3 Hrs **Max.**
Marks: 40

- | | |
|--|----|
| I. Identify the specimens A, B and C with reasons.
(1 each from Bryophytes, Pteridophytes and Gymnosperms)
(Identification -1; Reasons with labeled diagram- 2) | 09 |
| II. Prepare a temporary stained slide of the material D, sketch, label, and identify with reasons. Leave the preparation for evaluation.
(1 From Anatomy)
(Mounting-3; Identification- 1; Reasons with labelled diagram- 1) | 05 |
| III. Comment on the materials E, F and G.
(1each from Bryophytes, Pteridophytes and Gymnosperms/
Paleobotany)
(Identification- 1; Reasons with labeled diagram- 2) | 09 |
| IV. Identify the slides / Chart H, I, J and K with reasons
(1 each from Bryophytes, Pteridophytes, Gymnosperms and Anatomy
of Angiosperms)
(Identification- 1; Reasons with labelled diagram- 2) | 12 |
| V. Record | 05 |

Note: Each student shall bring the practical record to the practical examination, without which he/she shall not be allowed to appear for the practical examination.

COURSE DETAILS

Semester No.: 3

Course No.: 1

No. of Credits: 3

Course Title: Reproductive Biology, Plant Ecology, Biodiversity & Conservation

Course Code: DSCB* -3.1

COURSE LEARNING OUTCOMES (CLOs)

After completing this course, students will be able to:

CLO 1: Explain angiosperm reproduction, gametophyte development, fertilization, and embryogenesis.

CLO 2: Describe ecosystem structure, functions, and interactions of biotic and abiotic factors.

CLO 3: Analyze ecological processes, succession, biogeochemical cycles, pollution, and plant adaptations.

CLO 4: Evaluate biodiversity, its threats, and conservation strategies, including legislation and organizational roles.

COURSE CONTENT:

Unit I: Reproductive Biology: Introduction, scope of embryology. Structural organization of the Flower, Flower as a reproductive structure. **Microsporangium and Microsporogenesis:** Development and structure of mature anther, Anther wall, Tapetum- types, structure and functions. Development & Structure of male gametophyte, Pollen embryosac (Nemec phenomenon), Pollinia. **Palynology** Sculpturing, Apertures; A brief account of Geopalynology & Melitto palynology. **Megasporangium and Megaspороgenesis;** Structure of pistil, placentation, ovule and types; Development of female gametophyte (*Polygonum* type), structure of mature embryosac and types of embryosac. **Pollination biology:** Types, Contrivances and Significance of Self-pollination & Cross-pollination. **Fertilization:** General account on double fertilization; Postfertilization changes. Endosperm and types of endosperms, Ruminant endosperm and Biological importance of endosperm. **Embryogenesis:** Development of the Dicot embryo (*Capsella bursa-pastoris*) and Monocot (*Triticum*) embryo. **Experimental embryology:** Introduction, types and significance of Apomixis, Polyembryony and Parthenocarpy. **Contributions from embryologists:** P. Maheswari, B.G.L. Swamy, K.R. Shivanna and B.M. Johri. A brief introduction to Plant developmental biology.

Teaching hours: 12

Unit II: Plant Ecology: Introduction to Ecology, Scope and Importance. **Ecosystem:** Introduction, types, Biotic and Abiotic components, Structure of ecosystems- Terrestrial

(Grassland) and Aquatic (Pond). **Ecosystem functions and processes:** Food chain, Food web; Ecological pyramids of energy and biomass. Energy flow in the ecosystem. **Ecological factors:** **Climatic factors-** Light, Temperature, Wind, Precipitation and Atmospheric humidity **Edaphic factors-** Soil and its types, soil texture, soil profile, soil formation, soil pH, soil aeration, organic matter, soil humus and soil microorganisms. **Topographic Factors-** Altitude and Slope; **Biotic factors-** A brief account, Human as a biological factor.

Teaching hours: 12

Unit III: Plant Ecology: Bio-geochemical cycles: Carbon and Nitrogen. **Pollution:** A brief account of air, water, and soil pollution, causes and effects. **Ecological succession:** Definition, types- primary and secondary; General stages of succession. Hydrosere and Xerosere. **Ecological groups of plants and their adaptations:** Morphological and anatomical adaptations of hydrophytes, xerophytes, epiphytes, halophytes and parasites.

Teaching hours: 12

Unit IV: Biodiversity And Conservation: Introduction and concept of biodiversity. **Values of biodiversity:** Ecological, Economic and Social value. **Types of biodiversity:** Species and generic diversity. Endemism and types of endemism (Neoendemism and paleoendemism); Biodiversity hot spots and hotspots of India Brief account of Agro biodiversity, Vavilov centers of cultivated crops. **Threats to biodiversity:** IUCN threat categories and RED data book. **Principles of conservation:** *In-situ* and *Ex-situ* conservation. **Biodiversity legislation in India:** Indian Forest Conservation Act, Biodiversity Bill 2002. Earth summits, Role of organization in the conservation of biodiversity-IUCN, UNESCO, WWF and NBPGR.

Teaching hours: 12

LEARNING RESOURCES

1. Bhojwani, S. S. (2014). *Current Trends in the Embryology of Angiosperms*. Woong-Young Soh, Springer, Netherlands.
2. Bhojwani, S. S., & Bhatnagar, S. P. *Introduction to Embryology of Angiosperms*. Oxford & IBH, Delhi.
3. Chadha, A. *Plant Anatomy and Embryology*. Vikas Publication House Pvt. Ltd.; Raghavan, V. (2000). *Developmental Biology of Flowering Plants*. Springer, Netherlands.
4. Johri, B. M. (1984). *Embryology of Angiosperms*. Springer-Verlag, Netherlands.
5. Joshi, P. C., & Joshi, N. (2004). *Biodiversity and Conservation*. APH Publishing Corporation.
6. Kochhar, P. L. (1975). *Plant Ecology* (9th ed.). New Delhi, Bombay, Calcutta.
7. Krishnamurthy, K. V. *Textbook of Biodiversity*. Science Publishers, United States.

8. Kumar, H. D. (1992). *Modern Concepts of Ecology* (7th ed.). Vikas Publishing Co., New Delhi.
9. Kumar, H. D. (2000). *Biodiversity and Sustainable Conservation*. Oxford & IBH Publishing Co. Ltd., New Delhi.
10. Newman, E. I. (2000). *Applied Ecology*. Blackwell Scientific Publishers, U.K.
11. Odum, E. P. (1975). *Ecology*. Holt, Rinehart & Winston.
12. Pandey, S. N. (1997). *Plant Anatomy and Embryology*.
13. Saha, T. K. (2017). *Ecology and Environmental Biology*. Books and Allied Publishers.
14. Saxena, M. R. *Palynology: A Treatise*. Oxford & IBH, New Delhi.
15. Sharma, P. D. (2018). *Fundamentals of Ecology*. Rastogi Publications.
16. Shivanna, K. R. (2003). *Pollen Biology and Biotechnology*. Oxford & IBH Publishing Co. Pvt. Ltd., Delhi.

Theory Question Paper Scheme (2025-26 onwards)
III Semester- Paper III (DSCB 3.1)
Reproductive Biology, Plant Ecology, Biodiversity & Conservation
Code:

Time: 3Hrs

Max.Marks:80

Instruction: Draw neat, labelled diagrams wherever necessary

- I. Define/ Explain any EIGHT of the following** **8X1 = 08**
3 from Unit I
2 from Unit II
2 from Unit III
3 from Unit IV
- II. Write short notes on any FIVE of the following** **5X3 = 15**
2 from Unit I
2 from Unit II
2 from Unit III
1 from Unit IV
- III. Answer any FIVE of the following** **5X5 = 25**
2 from Unit I
2 from Unit II
2 from Unit III
2 from Unit IV
- IV. Describe any FOUR of the following in detail** **4X8 = 32**
1 from Unit I
2 from Unit II
2 from Unit III
2 from Unit IV

Unit	1 Mark	3 Marks	5 Marks	8 Marks	Total
I	1 X3 =3	3 X2 =6	5 X2 =10	8 X2 =16	35
II	1 X2 =2	3 X2 =6	5 X2 =10	8 X2 =16	34
III	1 X2 =2	3 X2 =6	5 X2 =10	8 X2 =16	34
IV	1 X3 =3	3 X1 =3	5 X2 =10	8 X2 =16	32

Assessment method

Assessment		Marks
C1	Assignment	10
C2	Test	10
C3	Semester-end exam	80

Theory Question Paper Scheme (2025-26 onwards)
III Semester –Paper III (DSCB 3.1)
Reproductive Biology, Plant Ecology, Biodiversity & Conservation
Code:

Time: 3Hrs

Max. Marks: 80

Instruction: Draw neat, labelled diagrams wherever necessary

I. Define/Explain any EIGHT of the following. 8X1 = 08

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

II. Write short notes on any FIVE of the following. 5X3 = 15

- 11.
- 12.
- 13.
- 14.
- 15.
- 16.
- 17.

III. Answer any FIVE of the following. 5X5 = 25

- 18.
- 19.
- 20.
- 21.
- 22.
- 23.
- 24.
- 25.

IV. Describe any FOUR of the following in detail. 4X8 = 32

- 26.
- 27.
- 28.
- 29.
- 30.
- 31.
- 32.

BOTANY-III SEMESTER (2025-26 onwards)
PRACTICL-III DSCB 3.1
Practical Syllabus
REPRODUCTIVE BIOLOGY, PLANT ECOLOGY, BIODIVERSITY AND
CONSERVATION
Code:

Time: 64 Hrs. (1 practical of 4Hrs /week)

Credits: 02

1. Study of T.S. of anther. Mounting of pollen grains of *Hibiscus*, *Vinca rosea*, *Canna indica*, Honey sample and Pollinia of *Calotropis* sp.
2. Pollen germination by the hanging drop method.
3. Study of placentation (Marginal, Axile, Parietal, and Basal).
4. Endosperm (Nuclear, Cellular, Helobial, and Ruminant).
5. Structure of ovule and types of ovules (Orthotropous, Anatropous, Hemianatropous, Circinotropous, and Campylotropous).
6. Mounting of endosperm (*Cucumis*) and embryo (*Crotalaria*).
7. Study of ecological instruments- Anemometer, Hygrometer, Altimeter, and Rain gauge.
8. Determination of pH of different types of soils, Water holding capacity of Soil samples.
9. Determination of soil texture of different soil samples.
10. Morphological characters of Hydrophytes-*Hydrilla*, *Eichhornia*, *Pistia*. Anatomical characters of *Hydrilla* stem.
11. Morphological characters of Xerophytes- *Opuntia*, *Asparagus*, *Euphorbia tirucalli*, *Aloe vera*. Anatomical characters of *Casuarina* stem.
12. Morphological and anatomical characters of Epiphytes-*Vanda*; Parasites -*Cuscuta* & *Viscum*; Halophytes- Pneumatophores, Vivipary
13. Study of pond/ forest ecosystem to record different biotic and abiotic components.
14. Determination of Density and frequency of different types of vegetation samplings by the quadrat method.
15. Marking of Biodiversity Bioreserves, Hot spots of India, National parks & Sanctuaries of India and Karnataka; Vavilo centres of cultivated crop plants.
16. Application of remote sensing in vegetation analysis using satellite imagery.
17. Field visit to study different types of vegetation, and the report is to be submitted.

Assessment method

Assessment		Marks
C1	Continuous assessment (CA)	05
C2	Submission/ Assignment	05
C3	Semester-end exam	40

Practical Question Paper (2025-26 onwards)
III Semester-Practical III (DSCB 3.1)
Reproductive Biology, Plant Ecology, Biodiversity & Conservation
Code:

Time: 3 Hrs

Max. Marks: 40

- | | | |
|------|--|----|
| I. | Identify the specimens A, B, and C with reasons | 09 |
| II. | Prepare a temporary stained slide of the material D sketch, label, and identify with reasons. Leave the preparation for evaluation | 05 |
| III. | Comment on the materials E, F, and G | 09 |
| IV. | Identify the slides/ Chart H, I, J, and K with reasons | 12 |
| V. | Record | 05 |

Practical Question Paper Scheme (2025-26 onwards)
III Semester-Practical III (DSCB 3.1)
Reproductive Biology, Plant Ecology, Biodiversity & Conservation
Code:

Time: 3 Hrs

Max. Marks: 40

- | | | |
|------|---|----|
| I. | Perform the experiment A & B | 10 |
| | A- Pollen germination by Hanging drop method | |
| | B- Soil pH/ Water holding capacity of soil/ Soil texture | |
| II. | Prepare a temporary stained slide, identify and comment on material C (Hydrophyte/ Xerophyte) | 05 |
| III. | Mount the material D. Identify with reasons & leave the preparation for evaluation (Endosperm/ Embryo/ Pollen grain & pollinia) | 03 |
| IV. | Comment on E & F (1 each from Ecological adaptation, Ecological instruments) | 08 |
| V. | Mapping of the given area of G (Biodiversity hotspots / National parks/Sanctuaries/ Vavilov centers) | 05 |
| VI. | Identify H (Slide/ Chart from Reproductive biology) | 04 |
| VII. | Record | 05 |

Note: Each student should bring the valued practical record to the practical examination, without which he or she shall not be allowed to appear for the examination.

COURSE DETAILS

Semester No.: 3

Course No.: 2

No. of Credits: 2

Course Title: Horticulture and Floriculture

Course Code: DSEB -3.1a

COURSE LEARNING OUTCOMES (CLOs)

After completing this course, students will be able to:

CLO 1: Explain horticulture principles, soil types, nursery management, and propagation methods.

CLO 2: Describe cultivation practices for vegetable crops.

CLO 3: Analyze aromatic, medicinal, spice, and plantation crop production and management.

CLO 4: Apply floriculture, pomology, and olericulture techniques, including flower arrangement and bonsai.

COURSE CONTENT:

Unit I: Horticulture: Introduction, scope and importance, Soil and types of soil (black, red and sandy), Nursery- introduction, objectives, infrastructure (polyhouse, green house, mist chamber, shade house, glass house, net house), nursery beds- types (flat, raised and sunken), their merits and demerits, Media (sand, peat soil, sphagnum mass, vermiculite, perlite, leaf mold, sawdust, grain husk and coco peat), Propagation methods-sowing/raising of seeds and seedlings and transplanting of seedlings. Gardening- types (home, indoor, public, kitchen, herbal, terrace, hydroponics, water bodies, avenue, and navagraha park), Gardening operations (soil laying, manuring, watering).

Teaching hours: 12

Unit II: Horticulture Crops: Leafy vegetables (Amaranthus, Spinach, fenugreek, coriander and Dil); perennial vegetables (Drumstick, Flax, Chow-chow), **Leguminous vegetables** (french beans, cluster bean, lima bean, country bean, pigeon pea, cow pea and green pea); **Gourds** (cucumber, ridge gourd, snake gourd, bitter gourd, small gourd, pumpkin, ash gourd), **Cole crops** (cabbage, cauliflower, knoll kohl. Tuber crops (taro, elephant foot yam and yam). **Root crops** (sweet potato, tapioca, carrot, radish, turnip and beet root).

Teaching hours: 12

Unit III: Horticulture Crops: Aromatic plants (patchouli, davana, lemon grass, rosemary, geranium, chamapaka, lavancha). **Medicinal plants** (amla, ashwagandha, coleus, sarpagandha, hippali, madhunashini, brahmi, tulsi, Amrutha balli, sogadeberu, lolesara, and stevia), **Spices and condiments** (garlic, coriander, turmeric, fennel, vanilla, clove,

nutmeg, ginger, black pepper, cinnamon, tamarind, cardamom, onion, allspice), **Plantation crops** (coconut, areca nut, betel leaves). Fertilizers and manures (chemical fertilizers, compost, vermi composting, biofertilizer (*Azolla*), and jeevaamrutha/ panchagavya), Organic farming.

Teaching hours: 12

Unit IV: Floriculture & Pomology: introduction, cultivation practices and varieties of mango, banana, pomegranate, papaya, guava, citrus, grape, watermelon and muskmelon, Cut flowers - rose, carnation, gerbera, anthurium, orchids, tube rose, gladiolus and chrysanthemum, Bonsai and terrarium, **Flower arrangement:** floral greetings, bouquet, vegetable carvings and dry flowers and ikabana, flower arrangement in functions, **Olericulture:** introduction, cultivation practices of Solanaceous vegetables (tomato, chilli, brinjal, capsicum and potato).

Teaching hours: 12

LEARNING RESOURCES

1. Bose, T. K., and Mukherjee, D. (1972). *Gardening in India*. Oxford & IBH Publishing Co., New Delhi.
2. Jules, J. (1979). *Horticultural Science*. W. H. Freeman and Co., San Francisco, USA.
3. Kader, A. A. (2002). *Post-Harvest Technology of Horticultural Crops*. UCANR Publications, USA.
4. Kumar, N. (1997). *Introduction to Horticulture*. Rajalakshmi Publications, Nagercoil.
5. Randhawa, G. S., and Mukhopadhyay, A. (1986). *Floriculture in India*. Allied Publishers.
6. Swaminathan, M. S., and Kochhar, S. L. (2007). *Groves of Beauty and Plenty: An Atlas of Major Flowering Trees in India*. Macmillan Publishers, India.

Theory Question Paper Scheme (2025-26 onwards)
III Semester- Elective Paper (DSEB 3.1a)
HORTICULTURE AND FLOWER GARDENING
Code:

Time: 3Hrs

Max. Marks: 40

Instruction: Draw neat, labelled diagrams wherever necessary

I. Define/ Explain any EIGHT of the following.

8X1 = 08

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

II. Write short notes on any FIVE of the following.

4X3 = 12

- 11.
- 12.
- 13.
- 14.
- 15.
- 16.

III. Answer any FIVE of the following.

4X5 = 20

- 17.
- 18.
- 19.
- 20.
- 21.
- 22.

Theory Question Paper Scheme (2025-26 onwards)
III Semester – Elective Paper I (DSEB 3.1a)
HORTICULTURE AND FLOWER GARDENING
Code:

Time: 3 Hrs

Max. Marks: 40

Instruction: Draw neat, labelled diagrams wherever necessary

- I. Define/ Explain any EIGHT of the following** **8X1 = 08**
 2 from Unit I
 2 from Unit II
 3 from Unit III
 2 from Unit IV
- II. Write short notes on any FOUR of the following** **3X4 = 12**
 1 from Unit I
 2 from Unit II
 2 from Unit III
 1 from Unit IV
- III. Answer any FOUR of the following** **4X5 = 20**
 2 from Unit I
 1 from Unit II
 1 from Unit III
 2 from Unit IV

Unit	2 Mark	3 Mark	5 Marks	Total
I	2 X1 =02	1 X3 =03	2 X5 =10	15
II	3 X1=03	2 X3 =06	1 X5 =05	14
III	3 X1 =03	2 X3 =06	1 X5 =05	14
IV	2 X1=02	1 X3 =03	2 X5 =10	15

Assessment method

Assessment		Marks
C1	Assignment	05
C2	Test	05
C3	Semester-end exam	40

COURSE DETAILS

Semester No.: 3

Course No.: 3

No. of Credits: 2

Course Title: Mushroom Culture Technology & Biofertilizers

Course Code: DSEB -3.1b

COURSE LEARNING OUTCOMES (CLOs)

After completing this course, students will be able to:

CLO 1: Explain mushroom types, cultivation principles, and infrastructure requirements.

CLO 2: Describe spawn production, bed preparation, pest management, and postharvest handling of mushrooms.

CLO 3: Explain the role and production of biofertilizer microbes.

CLO 4: Apply mycorrhizal and organic farming practices to enhance crop growth and yield.

COURSE CONTENT:

Unit I: Mushroom Culture Technology: Introduction and scope of mushroom cultivation.

Edible and poisonous mushrooms: Common edible mushrooms- Button mushroom (*Agaricus bisporus*), Milky mushroom (*Calocybe indica*), Oyster mushroom (*Pleurotus sajor-caju*), and paddy straw mushroom (*Volvariella volvacea*). **Mushroom cultivation:** Structure and construction of the mushroom house. Sterilization of substrates.

Teaching hours: 12

Unit II: Spawn production- culture media preparation- production of pure culture, mother spawn, and multiplication of spawn. Composting technology, mushroom bed preparation. Spawning, spawn running, harvesting. **Cultivation of oyster and paddy straw mushroom.** Problems in cultivation, diseases, pests and nematodes, weed moulds, and their management strategies. **Preservation of mushrooms: freezing,** dry-freezing, drying, canning, quality assurance, and entrepreneurship. **Nutritional and medicinal** values of mushrooms. **Postharvest technology:** Value-added products of mushrooms.

Teaching hours: 12

Unit III: Biofertilizer: Introduction, General account about the microbes used as biofertilizer. **Bacteria:** *Rhizobium*-isolation, identification, mass multiplication, carrier-based inoculants, **Actinorhizal symbiosis:** *Azotobacter*- classification, characteristics, crop response to *Azotobacter* inoculum, maintenance, and mass multiplication. **Cyanobacteria-** *Anabaena azollae* and *Azolla* association, nitrogen fixation, factors affecting growth, blue-green algae, and *Azolla* in rice cultivation.

Teaching hours: 12

Unit IV: Mycorrhiza: Occurrence and distribution, types of Mycorrhizal association, phosphorus nutrition, growth and yield- colonization of VAM- isolation and inoculum production of VAM, and its influence on growth and yield of crop plants. **Organic farming:** Green manuring and organic fertilizers, recycling of biodegradable municipal, agricultural, and industrial wastes. Biocomposting and Vermi composting (methods and field Application).

Teaching hours: 12

LEARNING RESOURCES

- 1) Bhal, N. (2000). *Handbook on Mushrooms* (Vol. I & II). Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
- 2) Dubey, R. C. (2005). *A Text Book of Biotechnology*. S. Chand & Co., New Delhi.
- 3) Krishnamoorthy, A. S., Sivaprakasam, K., & Jayarajan, R. (1991). *Oyster Mushrooms*. Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore.
- 4) Kumaresan, V. (2005). *Biotechnology*. Saras Publications, New Delhi.
- 5) Marimuthu, T. (1991). *Oyster Mushroom*. Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore.
- 6) Pandey, R. K., & Ghosh, S. K. (1996). *A Handbook on Mushroom Cultivation*. Emkey Publications.
- 7) Pathak, V. N., Yadav, N., & Gaur, M. (2000). *Mushroom Production and Processing Technology*. Vedams Ebooks Pvt. Ltd., New Delhi.
- 8) Prakash, J. J. E. (2004). *Outlines of Plant Biotechnology*. Emkay Publication, New Delhi.
- 9) Rao, S. N. S. (2000). *Soil Microbiology*. Oxford & IBH Publishers, New Delhi.
- 10) Sathe, T. V. (2004). *Vermiculture and Organic Farming*. Daya Publishers.
- 11) Swaminathan, M. (1990). *Food and Nutrition*. The Bangalore Printing and Publishing Co. Ltd., Bangalore.
- 12) Tewari, P., & Kapoor, S. C. (1988). *Mushroom Cultivation*. Mittal Publications, Delhi.
- 13) Tripathi, D. P. (2005). *Mushroom Cultivation*. Oxford & IBH Publishing Co., New Delhi.
- 14) Vayas, S. C., Vayas, S., & Modi, H. A. (1998). *Bio-fertilizers and Organic Farming*. Akta Prakashan, Nadiad.

Theory Question Paper Scheme (2025-26 onwards)
III Semester-Elective Paper II (DSEB -3.1b)
MUSHROOM CULTURE TECHNOLOGY & BIOFERTILIZER
Code:

Time: 3Hr

Max. Marks: 40

Instruction: Draw neat, labelled diagrams wherever necessary

II. Define/ Explain any EIGHT of the following. 8X1 = 08

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

III. Write short notes on any FIVE of the following. 4X3 = 12

- 11.
- 12.
- 13.
- 14.
- 15.
- 16.

IV. Answer any FIVE of the following. 4X5 = 20

- 17.
- 18.
- 19.
- 20.
- 21.
- 22.

Theory Question Paper Scheme for Elective (2025-26 onwards)
III Semester- Paper II (DSEB -3.1b)
MUSHROOM CULTURE TECHNOLOGY & BIOFERTILIZER
Code:

Time: 3 Hrs

Max. Marks: 40

Instruction: Draw neat, labelled diagrams wherever necessary

- I. Define/ Explain any EIGHT of the following** **8X1 = 08**
2 from Unit I
3 from Unit II
3 from Unit III
2 from Unit IV
- II. Write short notes on any FOUR of the following** **4X3 = 12**
1 from Unit I
2 from Unit II
2 from Unit III
1 from Unit IV
- III. Answer any Four of the following** **4X5 = 20**
2 from Unit I
1 from Unit II
1 from Unit III
2 from Unit IV

Unit	2 Mark	3 Mark	5 Marks	Total
I	2 X1 =02	1 X3 =03	2 X5 =10	15
II	3 X1=03	2 X3 =06	1 X5 =05	14
III	3 X1 =03	2 X3 =06	1 X5 =05	14
IV	2 X1=02	1 X3 =03	2 X5 =10	15

Assessment method

Assessment		Marks
C1	Assignment	05
C2	Test	05
C3	Semester end exam	40

COURSE DETAILS

Semester No.: 4

Course No.: 1

No. of Credits: 3

Course Title: Plant Physiology & Metabolism, Cell Biology & Molecular Biology

Course Code: DSCB*- 4.1

COURSE LEARNING OUTCOMES (CLOs)

After completing this course, students will be able to:

CLO 1: Explain plant water relations, nutrition, hormones, and photoperiodic responses.

CLO 2: Describe photosynthesis, respiration, nitrogen metabolism, and biomolecules.

CLO 3: Analyze cell structure, organelles, chromosomes, and polyploidy.

CLO 4: Explain nucleic acids, DNA replication, protein synthesis, and cell division.

COURSE CONTENT:

Unit I: Plant Physiology: Plant and water relations- Imbibition, diffusion, osmosis and their significance; Cell as an osmotic system; Short distance transport-Active and passive absorption of water; Long distance transport- Ascent of sap; TCT theory. Absorption of mineral salts – carrier concept. **Transpiration** Definition, types, structure of stomata, mechanism of stomatal movement (K⁺), antitranspirants, significance of transpiration and Guttation; Phloem transport- Munch's hypothesis. **Mineral nutrition:** Essential elements, macro (NPK) and micro (Zn, Mo, B) nutrients, role of essential elements. **Phytohormones:** Application of auxins, gibberellins, cytokinins, ABA, ethylene. **Tropic movements:** Phototropism, thigmotropism, geotropism, and hydrotropism. **Photoperiodism:** Photoperiodism (SDP, LDP, Day neutral plants); Phytochrome (discovery and structure), red and farred light responses on photomorphogenesis; **Vernalization.**

Teaching hours: 12

Unit II Plant Metabolism: Enzymes- Structure and properties, Mode of action. **Photosynthesis:** Photosynthetic apparatus and pigments, Mechanism of light and dark reactions- C₃, C₄ and CAM pathways and C₂ cycle (Photorespiration), factors affecting photosynthesis. **Respiration** Aerobic respiration- Glycolysis, Krebs' cycle, Terminal oxidation; Anaerobic respiration. Alcoholic and lactic acid fermentation. **Nitrogen metabolism:** Biological nitrogen fixation; Nitrate reduction, synthesis of amino acids. **Proteins:** Classification, primary, secondary, tertiary, and quaternary. **Vitamins:** Types and their functions.

Teaching hours: 12

Unit III: Cell Biology: Cell structure and function- Prokaryotic and Eukaryotic cell;. **Cell organelles:** Cell wall, Cell membrane, Nucleus, Mitochondria, Chloroplast, Endoplasmic reticulum, Golgi Apparatus, Lysosomes, Microbodies, and Ribosomes. **Chromosome structure:** Nucleosome concept. Karyotype and ideogram and their significance; Special types- Salivary gland and Lamp

brush chromosomes. **Chromosomal aberrations: Structural-** Deletions, Duplications, Inversion and Translocation; **Numerical-** Euploidy and Aneuploidy; Polyploidy, induction of polyploidy in plants, and role of polyploidy in evolution.

Teaching hours: 12

Unit IV: Molecular Biology: Nucleic acids: Chemistry, structure, types and functions of DNA and RNA. **DNA replication:** Mechanism of DNA replication (Semi-conservative method); **Central Dogma:** Central Dogma of molecular biology; **Gene concept,** Genetic code, Fine structure of Gene, Wobble hypothesis; **Protein synthesis:** Protein synthesis–in prokaryotes & eukaryotes; **Cell Division:** Cell cycle, Mitosis, Meiosis and their significance.

Teaching hours: 12

LEARNING RESOURCES

1. Bajracharya, D. (1999). *Experiments in Plant Physiology: A Laboratory Manual*. Narosa Publishing House, New Delhi.
2. Becker, W. M., Kleinsmith, L. J., Hardin, J., & Bertoni, G. P. (2009). *The World of the Cell* (7th ed.). Pearson Benjamin Cummings Publishing, San Francisco.
3. Brown, T. A. (1990). *Gene Cloning*. Chapman & Hall.
4. Brown, T. A. (2010). *Gene Cloning and DNA Analysis* (6th ed.). Wiley-Blackwell Publishers.
5. Cooper, G. M., & Hausman, R. E. (2009). *The Cell: A Molecular Approach* (5th ed.). ASM Press, Washington, D.C.; Sinauer Associates, MA.
6. Day, P. M., & Harborne, J. B. (2000). *Plant Biochemistry*. Harcourt Asia (P) Ltd., India; Academic Press, Singapore.
7. De Robertis, E. D. P., & De Robertis, E. M. F. (2006). *Cell and Molecular Biology* (8th ed.). Lippincott Williams & Wilkins, Philadelphia.
8. De Robertis, E. D. P., & De Robertis, E. M. F. (2006). *Cell and Molecular Biology* (8th ed.). Lippincott Williams & Wilkins, Philadelphia.
9. Hopkins, W. G., & Huner, N. P. (2009). *Introduction to Plant Physiology*. John Wiley & Sons, U.S.A.
10. Lawlor, D. W. (1989). *Photosynthesis: Metabolism, Control and Physiology*. ELBS/Longman, London.
11. Mayer, B. S., Anderson, D. B., Bohning, R. H., & Fratianne, D. G. (1973). *Introduction to Plant Physiology* (2nd ed.). Van Nostrand Co.
12. Mukherjee, S., & Ghosh, A. K. (1998). *Plant Physiology*. Tata McGraw Hill Publishers Ltd., New Delhi.
13. Noggle, G. R., & Fritz, G. J. (1989). *Introductory Plant Physiology*. Prentice Hall of India.
14. Plummer, D. (1989). *Biochemistry: The Chemistry of Life*. McGraw Hill Book Co.
15. Rashid, A. (2009). *Molecular Physiology and Biotechnology of Flowering Plants*. Narosa Publishing House Pvt. Ltd., New Delhi.
16. Salisbury, F. B., & Ross, C. W. (1999). *Plant Physiology*. CBS Publishers & Printers, New Delhi.
17. Singh, S. K. (2007). *Cytology, Genetics and Molecular Biology*. Commonwealth Publishers.

18. Sinha, U., & Sinha, S. (1998). *Cytogenetics, Plant Breeding and Evolution*. Vikas Publications.
19. Steward, F. C. (1964). *Plants at Work (A Summary of Plant Physiology)*. Addison-Wesley Publishing Co., London.
20. Taiz, L., & Zeiger, E. (2010). *Plant Physiology*. Sinauer Associates Inc., U.S.A.
21. Verma, P. S., & Agarwal, P. K. (1998). *Cell Biology, Genetics, Molecular Biology, Evolution and Ecology*. S. Chand & Company Ltd

Theory Question Paper Scheme (2025-26 onwards)

IV Semester- Paper I (DSCB 4.1)

PLANT PHYSIOLOGY & METABOLISM, CELL BIOLOGY & MOLECULAR BIOLOGY

Code:

Time: 3Hrs

Max. Marks: 80

Instruction: Draw neat, labelled diagrams wherever necessary

I. Define/ Explain any EIGHT of the following

8X1 = 08

- 3 from Unit I
- 2 from Unit II
- 2 from Unit III
- 3 from Unit IV

II. Write short notes on any FIVE of the following

5X3 = 15

- 2 from Unit I
- 2 from Unit II
- 2 from Unit III
- 1 from Unit IV

III. Answer any FIVE of the following

5X5 = 25

- 2 from Unit I
- 2 from Unit II
- 2 from Unit III
- 2 from Unit IV

IV. Describe any FOUR of the following in detail

4X8 = 32

- 1 from Unit I
- 2 from Unit II
- 2 from Unit III
- 2 from Unit IV

Unit	1 Mark	3 Marks	5 Marks	8 Marks	Total
I	1 X3 =3	3 X2 =6	5 X2 =10	8 X2 =16	35
II	1 X2 =2	3 X2 =6	5 X2 =10	8 X2 =16	34
III	1 X2 =2	3 X2 =6	5 X2 =10	8 X2 =16	34
IV	1 X3 =3	3 X1 =3	5 X2 =10	8 X2 =16	32

Assessment method

Assessment		Marks
C1	Assignment	10
C2	Test	10
C3	Semester-end exam	80

Theory Question Paper Scheme (2025-26 onwards)
IV Semester -Paper I (DSCB 4.1)
PLANT PHYSIOLOGY & METABOLISM, CELLBIOLOGY & MOLECULAR BIOLOGY
Code:

Time: 3 Hrs

Max. Marks: 80

Instruction: Draw neat, labelled diagrams wherever necessary.

I. Define/ Explain any EIGHT of the following.

8X1 = 08

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

II. Write short notes on any FIVE of the following.

5X3 = 15

- 11.
- 12.
- 13.
- 14.
- 15.
- 16.
- 17.

III. Answer any FIVE of the following.

5X5 = 20

- 18.
- 19.
- 20.
- 21.
- 22.
- 23.
- 24.
- 25.

IV. Describe any FOUR of the following in detail.

4X8 = 32

- 26.
- 27.
- 28.
- 29.
- 30.
- 31.
- 32.

BOTANY-IV SEMESTER (2025-26 onwards)

PRACTICAL (DSCB 4.1)

Practical Syllabus

PLANT PHYSIOLOGY & METABOLISM, CELL BIOLOGY & MOLECULAR BIOLOGY

Code:

Time: 64 Hrs. (1practical of 4Hrs /week)

Credits: 02

Major experiments

1. Determination of osmotic potential of plant cell sap by the plasmolytic method.
2. Experiment to demonstrate the effect of temperature and solvent on cell membrane permeability using beet cylinders.
3. Calculation of stomatal index and stomatal frequency of a mesophyte and a xerophyte.
4. Hill reaction; Effect of temperature, pH, and concentration of enzyme on the activity of catalase.
5. Experiment on the relation between transpiration and absorption.
6. To study the effect of light intensity on O₂ evolution in photosynthesis.
7. Comparison of the rate of respiration in any two plant parts.
8. Separation of chlorophyll pigments by paper chromatography.

Minor experiments

1. Suction due to transpiration, Respiration in roots, Cobalt chloride test.
2. **Demonstration:** Bolting, Effect of auxins on rooting, Mohl's half leaf apparatus, Ganong's light screen, Arc Auxanometer, Kuhne's fermentation vessel, Heliotropic chamber, Clinostat.
3. **Instruments:** Spectrophotometer, Centrifuge, Colorimeter.
4. **Photographs:** Mineral nutrition deficiency symptoms, Photoperiodism, Light spectrum, Growth hormones.
5. Study of Photographs and charts from molecular biology and cell biology: DNA replication, the Lac Operon, genetic disorder: sickle cell anemia.
6. Study of fixatives and stains & Study of mitosis e.g. Onion root tip.
7. Study of meiosis: Onion/ *Chlorophytum* flower buds.
8. Study of micrometry, karyotype, and ideogram study.
9. Photographs/ charts-Cell organelles (Nucleus, Mitochondria, Chloroplast), Salivary gland chromosome, lamp brush chromosome, DNA replication, Lac operon, Thalassemia, and sickle cell anaemia.

Assessment method

Assessment		Marks
C1	Continuous assessment (CA)	05
C2	Submission/ Assignment	05
C3	Semester-end exam	40

Practical Question Paper (2025-26 onwards)
IV Semester- Practical (DSCB 4.1)
PLANT PHYSIOLOGY & METABOLISM, CELL BIOLOGY & MOLECULAR
BIOLOGY

Time: 3Hrs.	Code: 40	Max. Marks:
--------------------	---------------------------	--------------------

- | | |
|--|----------|
| I. Perform the experiment A | 07 Marks |
| II. Perform the experiment B and C | 08 Marks |
| III. Comment on C, D and E | 12 Marks |
| IV. Prepare a temporary squash of the material F | 08 Marks |
| V. Record | 05 Marks |

Note: Each student should bring the valued practical record to the practical examination, without which he or she shall not be allowed to appear for the examination.

Scheme of Practical Question Paper (2025-26 onwards)
IV Semester-Practical IV (DSCB 4.1)
PLANT PHYSIOLOGY & METABOLISM, CELL BIOLOGY & MOLECULAR
BIOLOGY
Code:

Time: 3Hrs.

Max. Marks: 40

- | | | |
|------|---|----|
| I. | Perform the experiment A
(Physiology major experiment) | 07 |
| II. | Perform the experiment B and C
(Physiology minor experiment and Karyotype and Ideogram) | 08 |
| III. | Comment on C, D and E
(1 each from Demo experiment, Instrument/ growth hormone/Mineral nutrition and Permanent slide or chart from Cell biology & Molecular biology) | 12 |
| IV. | Prepare a temporary squash of the material F (Mitosis/ Meiosis) | 08 |
| V. | Record | 05 |

Note: Each student should bring the valued practical record to the practical examination, without which he or she shall not be allowed to appear for the examination.

COURSE DETAILS

Semester No.: 4

Course No.: 2

No. of Credits: 2

Course Title: Medicinal Plants & Herbal Technology

Course Code: DSEB - 4.1

COURSE LEARNING OUTCOMES (CLOs)

After completing this course, students will be able to:

CLO 1: Explain the history, scope, and use of medicinal plants.

CLO 2: Describe pharmacognosy and applications of key herbs.

CLO 3: Analyze active principles and their therapeutic uses.

CLO 4: Apply analytical methods to evaluate and screen herbal drugs.

COURSE CONTENT:

Unit I: Herbal Medicines: History and Scope, Definition of medical terms, Role of medicinal plants in Siddha systems of medicine, Cultivation, harvesting, processing, storage, marketing and utilization of medicinal plants.

Teaching hours: 12

Unit II: Pharmacognosy: Systematic position of medicinal uses of the following herbs in curing various ailments: Tulsi, Ginger, Fenugreek, Indian Goose Berry, and Ashoka. Medicinal plant banks, micropropagation of important species (*Withania somnifera*, neem, and tulsi), Herbal foods, future of pharmacognosy.

Teaching hours: 12

Unit III: Medicinal Herbs: Active principles and methods of their testing, identification, and utilization of the medicinal herbs; *Catharanthus roseus* (cardiotonic), *Withania somnifera* (drugs acting on the nervous system), *Clerodendron phlomoides* (anti-rheumatic), and *Centella asiatica* (memory booster).

Teaching hours: 12

Unit IV: Analytical Pharmacognosy: Drug adulteration-types, methods of drug evaluation, Biological testing of herbal drugs, Phytochemical screening for secondary metabolites (alkaloids, flavonoids, steroids, triterpenoids, phenolic compounds).

Teaching hours: 12

LEARNING RESOURCES

1. Chopra, R. N., Nayar, S. L., & Chopra, I. C. (1956). *Glossary of Indian Medicinal Plants*. C.S.I.R., New Delhi.
2. Kanny, Lall, Dey, & Bahadur, R. (1984). *The Indigenous Drugs of India*. International Book Distributors.
3. Arber, A. (1999). *Herbal Plants and Drugs*. Mangal Deep Publications.

4. Sivarajan, V. V., & Indra, B. (1994). *Ayurvedic Drugs and Their Plant Source*. Oxford & IBH Publishing Co.
5. Miller, L., & Miller, B. (1998). *Ayurveda and Aromatherapy*. Motilal Banarsidass Publications, Delhi.
6. Green, G. (2000). *Principles of Ayurveda*. Thomsons, London.
7. Kokate, C. K., Purohit, A. P., & Gokhale, S. B. (1999). *Pharmacognosy*. Nirali Prakashan.

Theory Question Paper Scheme (2025-26 onwards)
IV Semester-Elective Paper-1 (DSEB 4.1)
MEDICINAL PLANTS AND HERBAL TECHNOLOGY

Code:

Time: 3 Hrs.

Max. Marks: 40

Instruction: Draw neat, labelled diagrams wherever necessary

I. Define/Explain any EIGHT of the following. 8X1 = 08

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

II. Write short notes on any FIVE of the following 4X3 = 12

- 11.
- 12.
- 13.
- 14.
- 15.
- 16.

III. Answer any FIVE of the following 4X5 = 20

- 17.
- 18.
- 19.
- 20.
- 21.
- 22.

Unit	2 Mark	3 Mark	5 Marks	Total
I	2 X1 =02	1 X3 =03	2 X5 =10	15
II	3 X1 =03	2 X3 =06	1 X5 =05	14
III	3 X1 =03	2 X3 =06	1 X5 =05	14
IV	2 X1 =02	1 X3 =03	2 X5 =10	15

Assessment method

Assessment		Marks
C1	Assignment	05
C2	Test	05
C3	Semester-end exam	40

COURSE DETAILS

Semester No.: 4

Course No.: 2

No. of Credits: 2

Course Title: Nursery, Gardening & Landscaping

Course Code: DCB - 4.1

COURSE LEARNING OUTCOMES (CLOs)

After completing this course, students will be able to:

CLO 1: Apply nursery management practices and propagation media techniques.

CLO 2: Demonstrate plant propagation methods and bonsai training skills.

CLO 3: Identify horticultural plants and select suitable species for different garden types.

CLO 4: Develop landscape designs using garden principles, CAD tools, and eco-friendly practices.

COURSE CONTENT: Practical

- | | |
|--|----------|
| 1. Methods of preparation of nursery beds and sowing of seeds. Media for propagation of plants in Nursery Beds, Pots and Mist chamber. | 02 Weeks |
| 2. Study and practice of different propagation methods viz., cutting, layering, division, grafting and budding. | 01 Week |
| 3. Introduction and practicing Bonsai training, pruning and wiring. | 01 Week |
| 4. Study of different types of gardens (indoor and outdoor) and key features of gardens (Paths & Avenues, Hedges & Edges, Lawn, Flower beds, Arches & Pergolas, Fencing, Water bodies, Rock garden). | 02 Weeks |
| 5. Study of Vertical Gardening and Roof top gardening | 01 Week |
| 6. Methods for selection and enlisting of suitable plants for different locations and in different types of gardens. | 01 Week |
| 7. Identification of key horticultural plants, Herbs including different types of grasses- foliage and flowering, Shrubs including hedge plants. | 02 Weeks |
| 8. Foliage and flowering, Avenue trees - foliage and flowering, Climbers, Lianas, Epiphytes, Creepers, Trailers, Aquatic plants, Succulents, Weeds. | 02 Weeks |
| 9. Study of important gardens of India (any five). | 01 Week |
| 10. Methods of Landscape designing of Residential areas and Public Gardens, Aquatic Garden, Rock Garden, Industrial gardens. | 01 Week |
| 11. Concept and Application of Computer aided Designing (CAD) for landscape designing/ Preparation of landscape designs for school and college using CAD technology. | 01 Week |
| 12. Study of Interior designing with plants-Terrarium, miniature landscape | 01 Week |
| 13. Preparation and application of herbal pesticides | 01 Week |
| 14. Demonstration of different composting methods for Biofertilizers. | 01 Week |
| 15. Visit to a nursery, Tissue culture Laboratory and horticulture garden | 01 Week |

LEARNING RESOURCES

1. *A Handbook of Landscape*. CPWD.
2. Gopalaswamyengar, K. S., Parthasarathy, G., & Mukundan, P. (1991). *Complete Gardening in India*. Srinivasa, India.
3. Hartmann, H. T., & Kester, D. E. (1975). *Plant Propagation: Principles and Practices*. Prentice-Hall, India.
4. Hodge, G. (2014). *Practical Botany for Gardeners: Over 3,000 Botanical Terms Explained and Explored*. University of Chicago Press, United Kingdom.
5. Littlepage, R. (2017). *Fundamentals of Garden Design: An Introduction to Landscape Design*. CreateSpace Independent Publishing Platform.
6. Roy, R. K. (2013). *Fundamentals of Garden Designing: A Colour Encyclopedia*. New India Publishing Agency, India.
7. *The Royal Horticultural Society Gardening Manual*. (2000). Dorling Kindersley, United Kingdom.

Practical Question Paper (2025-26 onwards)
IV Semester - Compulsory Elective Practical (DCB 4.1)
NURSERY GARDENING AND LANDSCAPING
Code:

Time: 3Hrs.

Max. Marks: 40

- | | | |
|------|--|----------|
| I. | Perform the experiment A | 07 Marks |
| II. | Perform the experiment B and C | 08 Marks |
| III. | Comment on C, D and E | 12 Marks |
| IV. | Prepare a temporary Terrarium/ miniature landscape F | 08 Marks |
| V | Record | 05 Marks |

Note: Each student should bring the valued practical record to the practical examination, without which he or she shall not be allowed to appear for the examination.

Scheme of Practical Question Paper (2025-26 onwards)
IV Semester - Compulsory Elective Practical I (DCB 4.1)
NURSERY GARDENING AND LANDSCAPING
Code:

Time: 3Hrs.

Max. Marks: 40

- | | | |
|------|---|----|
| I. | Perform the experiment A
(Media for propagation of plants major experiment) | 07 |
| II. | Perform the experiment B and C
(Propagation methods viz., cutting, layering, division, grafting and budding) | 08 |
| III. | Comment on C, D and E
(Identification of key horticultural plants and implements) | 12 |
| IV. | Prepare a temporary Terrarium/miniature landscape F | 08 |
| V. | Record | 05 |

Note: Each student should bring the valued practical record to the practical examination, without which he or she shall not be allowed to appear for the examination.

Assessment method

Assessment		Marks
C ₁	Assignment	05
C ₂	Test	05
C ₃	Semester end practical exam	40

COURSE DETAILS

Semester No.: 5

Course No.: 1

No. of Credits: 3

Course Title: Morphology of Angiosperms, Taxonomy, Economic Botany & Ethnobotany

Course Code: DSCB - 5.1

COURSE LEARNING OUTCOMES (CLOs)

After completing this course, students will be able to:

CLO 1: Explain plant morphology and key principles of taxonomy.

CLO 2: Describe major dicot and monocot plant families.

CLO 3: Analyze economically and medicinally important plants and their uses.

CLO 4: Explain plant diseases, their development, and management strategies.

COURSE CONTENT:

Unit I: Root system: Tap and Fibrous root system, Root, Stem and Leaf modification, Inflorescence; racemose, cymose and special types, Fruits- simple, aggregate and composite; Structure of dicot seed and monocot seed. Contribution of Carolus Linnaeus, Plant Nomenclature-Binomial system, ICBN /ICN – principles, rules, typification, ranks, categories, and taxonomic hierarchy; author citation, valid publication, rejection of names, principle of priority, and its limitations. A brief account of classical and modern Taxonomy; Systems of classification; Broad outline of Bentham and Hooker's, Engler and Prantl's System of classifications with merits and demerits. A brief account of the APG IV system of classification. Important Botanical Gardens of India and World; Botanical Survey of India, Field and Herbarium Techniques- important herbaria; Hortus Malabaricus.

Teaching hours: 12

Unit II: Study of following plant families: Dicots: Magnoliaceae, Brassicaceae, Malvaceae, Rutaceae, Fabaceae (with sub families), Myrtaceae, Apiaceae, Asteraceae, Rubiaceae, Apocynaceae, Solanaceae and Euphorbiaceae. Monocots: Liliaceae, Arecaceae, Poaceae, Musaceae, and Orchidaceae.

Teaching hours: 12

Unit III: Economic Botany: Food plants: Rice, Wheat, Maize, Ragi, **Fodder plants:** Sorghum, Cow pea, Subabul, **Fibre plants:** Cotton, Jute, Coir, **Spices:** Cardamom, Clove, Cinnamon, Pepper, **Beverages:** Coffee and Tea, **Perfumes:** Jasmine, Patchouli, Sandal, **Dyes:** Indigo, Bixa, Lawsonia, **Narcotic Plants:** Opium, Cannabis, Tobacco **Insecticides:** Neem, Pyrethrin, Nicotine, **Oil yielding plants:** Ground nut, Coconut, Safflower, Sunflower, **Timber:** Rose wood, Teak, Honne. A Brief account of Medicinal plants and their uses. **Ethnobotany:** Introduction and significance of Ethnobotany; Contribution of Ethnobotanists; Janaki Ammal and S K Jain; a brief account of ethnomedicinal plants: *Phyllanthus emblica*, *Hemidesmus indicus*, *Strychnos nux-vomica*, *Withania Somnifera*, *Terminalia chebula*, *T. bellirica*, *T. arjuna*, *Rauwolfia serpentina*, *Acontitum heterophyllum*, *Cinchona officinalis*, *Atropa belladonna*, *Tylophoro asthamatica* and *Vetiveria zizanioides*.

Teaching hours: 12

LEARNING RESOURCES

1. Any local/ state/ regional flora published by BSI or any other agency.
2. Coiton, C.M. 1996. Ethnobotany- Principles and Applications. Wiley and Sons.
3. Datta SC, Systemic Botany, 4th Ed, WileyEstern Ltd., New Delhi, 1988.
4. Eames A.J. Morphology of Angiosperms, McGraw Hill, NewYork.
5. Hall, B.G. (2011). Phylogenetic Trees Made Easy: A How-to Manual. Sinauer Associates, Inc. USA
6. Heywood, P. Plant Taxonomy, Edward Arnold, London.
7. Jeffrey C.J. and A. Churchil. An introduction to taxonomy. London.
8. Jeffrey, C. (1982). An Introduction to Plant Taxonomy., Cambridge University Press, Cambridge.
9. Judd, W.S., Campbell, C.S., Kellogg, E.A., Stevens, P.F. Donogue, M.J., 2002. Plant Systematics: A phylogenetic Approach, 2nd edition. Sinauer Associates, Inc., USA.
10. Lawrence- Taxonomy of Vascular Plants, Oxford & IBH. NewDelhi.
11. Manilal, K.S. and M.K. Muktesh Kumar. 1998. A Handbook of Taxonomy Training. DST, New Delhi.
12. Manilal. K.S. and A.K. Pandey. 1996. Taxanomy and Plant Conservation. C.B.S. Publishers & Distributors. New Delhi.
13. Singh V. & Jain- Taxonomy of Angiosperm. Rastogi Publications, Meerut.
14. Sivarajan V.V Introduction of Principles of Taxonomy., Oxford & IBH NewDelhi.

BOTANY - V SEMESTER (2026-27 onwards)

PRACTICAL - V DSCB 5.1

Practical Syllabus

Morphology of Angiosperms, Taxonomy, Economic Botany and Ethnobotany

Code:

Practicals

- I. Root, stem, and leaf modifications.
- II. Inflorescence: Racemose, Cymose, and Special types.
- III. Fruits: Simple aggregate and composite types.
- IV. Construction of floral diagrams with floral formulae.
- V. Study of the plants belonging to the families:
 - i. Brassicaceae and Malvaceae
 - ii. Rutaceae and Fabaceae (with subfamilies)
 - iii. Myrtaceae and Apiaceae
 - iv. Asteraceae and Rubiaceae
 - v. Apocynaceae, Solanaceae, and Euphorbiaceae
 - vi. Monocot families: Lilliaceae and Arecaceae
 - vii. Poaceae, Musaceae, and Orchidaceae
- VI. Economic Botany as per the syllabus
- VII. Ethnobotany as per the syllabus
- VIII. As a part of the curriculum, a compulsory field trip to study the local flora of the area.

Note: A compulsory Botanical Tour of about 2 to 3 days will be conducted to study the different types of vegetation and collect herbarium specimens. The Botanical Tour report and 5 herbarium sheets have to be submitted during the practical examination.

SCHEME OF PRACTICAL EXAMINATION. PRACTICAL -V
(MODEL QUESTION PAPER)
Morphology of Angiosperms, Taxonomy, Economic Botany and Ethnobotany
Practical Exams

Time: 3 Hrs.

Max. Marks 40

- | | |
|--|----------|
| I. Assign the plants A, B and C to their respective families giving reasons
(One from Polypetalae, one from Gamopetalae and one from
Monochlamydeae / Monocot) | 12 Marks |
| II. Describe the plant D in technical terms. | 05 marks |
| III. Draw a floral diagram with flora formula of E | 05 marks |
| IV. Plant Modification F and G | 06 marks |
| V. Comment on H and I (Economic Botany) | 06 marks |
| VI. Comment on J and K (Ethno botany) | 06 marks |

Theory Question Paper Scheme (2026-27 onwards)
V Semester – Paper (DSCB 5.1)
Morphology of Angiosperms, Taxonomy, Economic Botany and Ethnobotany
Code:

Time: 3 Hrs.

Max Marks: 80

Instruction: Draw neat, labeled diagrams wherever necessary

I. Define/Explain any EIGHT of the following

8 X 1 = 08

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

II. Write short note on any FIVE of the following

5 X 3 = 15

- 11.
- 12.
- 13.
- 14.
- 15.
- 16.
- 17.

III. Answer any FIVE of the following

5 X 5 = 25

- 18.
- 19.
- 20.
- 21.
- 22.
- 23.
- 24.

IV. Describe any FOUR of the following in detail

4 X 8 = 32

- 25.
- 26.
- 27.
- 28.
- 29.
- 30.

Theory Question Paper Scheme (2026-27 onwards)
V Semester – Paper (DSCB 5.1)
Morphology of Angiosperms, Taxonomy, Economic Botany and Ethnobotany
Code:

Time: 3 Hrs.

Max Marks: 80

Instruction: Draw neat labeled diagrams wherever necessary

I. Define/Explain any EIGHT of the following **8 X 1 = 08**

- 5 from Unit I
- 3 from Unit II
- 2 from Unit III

II. Write short note on any FIVE of the following **5 X 3 = 15**

- 2 from Unit I
- 3 from Unit II
- 2 from Unit III

III. Answer any FIVE of the following **5 X 5 = 25**

- 2 from Unit I
- 2 from Unit II
- 3 from Unit III

IV. Describe any FOUR of the following in detail **4 X 8 = 32**

- 2 from Unit I
- 2 from Unit II
- 2 from Unit III

Unit	1 Mark	3 Marks	5 Marks	8 Marks	Total
I	1 X 5 = 5	3 X 2 = 6	5 X 2 = 10	8 X 2 = 16	37
II	1 X 3 = 3	3 X 3 = 9	5 X 2 = 10	8 X 2 = 16	38
III	1 X 2 = 2	3 X 2 = 6	5 X 3 = 15	8 X 2 = 16	39

Assessment method

Assessment		Marks
C ₁	Assignment	10
C ₂	Test	10
C ₃	Semester and Exam	80

COURSE DETAILS

Semester No.: 5

Course No.: 2

No. of Credits: 3

Course Title: Plant Breeding and Phytogeography

Course Code: DSCB - 5.2

COURSE LEARNING OUTCOMES (CLOs)

After completing this course, students will be able to:

CLO 1: Explain plant breeding objectives, methods, and acclimatization.

CLO 2: Describe hybridization, heterosis, mutations, polyploidy, and biotechnology in crop improvement.

CLO 3: Analyze crop improvement achievements and plant breeding institutes in India.

CLO 4: Explain phytogeography, plant distribution, and vegetation types of India and Karnataka.

COURSE CONTENT:

Unit I: Plant Breeding: A brief history, aims, and objectives of Plant breeding. Types of plant breeding, incompatibility, and male sterility. Important achievements and undesirable consequences of plant breeding. Centers of origin and domestication of crop plants- Rice, Wheat, Sugarcane; Plant genetic resources; Acclimatization, Selection methods- for self-pollination, cross-pollination and vegetatively propagated plants.

Teaching hours: 16

Unit II: Hybridization: Self, cross and vegetative propagation in plants – Procedure, advantages and limitations. Inbreeding depression and Heterosis, genetic basis of inbreeding depression and heterosis; hybrid seed production. Crop improvement and breeding, role of mutations and polyploidy in plant breeding. Role of biotechnology in crop improvement. Plant breeding work done in India - paddy and cotton. Plant breeding institutes in India.

Teaching hours: 16

Unit III: Phytogeography: biogeography of India with special reference to Karnataka. Polar oscillations and glaciations. Centre of origin of plant - Vavilov's concept, types. Phytogeographical regions concept, phytogeographical regions of India and Karnataka, Climatic zones, tectonics, continental movements. Types of plant distribution - discontinuous distribution . Vegetation types of Karnataka, Western Ghats Composition and distribution of evergreen, semi-evergreen, deciduous, scrub, mangroves, shola forests and grasslands.

Teaching hours: 16

LEARNING RESOURCES

1. Acquaah, G. (2007). Principles of Plant Genetics & Breeding. New Jersey, U.S. Blackwell Publishing
2. Alberts, B., Bray, D., Hopkin, K., Johnson, A.D., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2013). Essential cell biology (4th ed.). Garland Publishing.
3. Becker W.M., Kleinsmith L.J. and Bertoni G.P. 2009. The World of the Cell. 7th edition. Pearson, Benjamin Cummings Publishing, San Francisco.
4. Chaudhari, H.K. (1984). Elementary Principles of Plant Breeding, 2nd edition. New Delhi, Delhi: Oxford - IBH.
5. DeRobertis, E.D.P. and DeRobertis, R.E. 2009. Cell and Molecular Biology, 8th edition. Lippincott, Williams and Wilkins, Philadelphia.
6. Gardner, E.J., Simmons, M.J., Snustad, D.P. (1991). Principles of Genetics, 8th edition. New Delhi, Delhi: John Wiley & Sons
7. Griffiths, A.J.F., Wessler, S.R., Carroll, S.B., Doebley, J. (2010). Introduction to Genetic Analysis, 10th edition. New York, NY: W.H. Freeman and Co.
8. Karp, G. (2010). Cell Biology, 6th edition. New Jersey, U.S.A.: John Wiley & Sons.
9. Klug, W.S., Cummings, M.R., Spencer, C.A. (2012). Concepts of Genetics, 10th edition. San Francisco, California: Benjamin Cummings.
10. Poehlman, J.M. (1957). Breeding Field Crops, 3rd Ed. AVI Publishing Co. Inc., Westport, Connecticut
11. Raven, F.H., Evert, R.F., Eichhorn, S.E. (1992). Biology of Plants. New York, NY: W.H. Freeman and Co.
12. Raven, F.H., Evert, R.F., Eichhorn, S.E. (1992). Biology of Plants. New York, NY: W.H. Freeman and Company
13. Singh, B.D. (2005). Plant Breeding: Principles and Methods, 7th edition. New Delhi, Delhi: Kalyani Publishers.
14. Stewart C N Jr. (2008) Plant Biotechnology and Genetics Principles techniques and applications John Wiley and Sons inc. U.S.A.
15. Verma, P.S. (2004). Cell Biology, Genetics, Molecular Biology: Evolution and Ecology. India: S. Chand Limited.
16. Welsh, J.R. (1981). Fundamentals of Plant Genetics and Breeding. John Wiley and Sons, New York.

Theory Question Paper Scheme (2026-27 onwards)
V Semester – Paper (DSCB 5.2)
Plant Breeding and Phytogeography
Code:

Time: 3 Hrs.

Max. Marks: 80

Instruction: Draw neat, labeled diagrams wherever necessary

I. Define/Explain any EIGHT of the following

8 X 1 = 08

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

II. Write short note on any FIVE of the following

5 X 3 = 15

- 11.
- 12.
- 13.
- 14.
- 15.
- 16.
- 17.

III. Answer any FIVE of the following

5 X 5 = 25

- 18.
- 19.
- 20.
- 21.
- 22.
- 23.
- 24.

IV. Describe any FOUR of the following in detail

4 X 8 = 32

- 25.
- 26.
- 27.
- 28.
- 29.
- 30.

Theory Question Paper Scheme (2026-27 onwards)
V Semester – Paper (DSCB 5.2)
Plant Breeding and Phytogeography
Code:

Time: 3 Hrs

Max Marks: 80

Instruction: Draw neat, labeled diagrams wherever necessary

- I. Define/Explain any EIGHT of the following** **8 X 1 = 08**
 5 from Unit I
 3 from Unit II
 2 from Unit III
- II. Write a short note on any FIVE of the following** **5 X 3 = 15**
 2 from Unit I
 3 from Unit II
 2 from Unit III
- III. Answer any FIVE of the following** **5 X 5 = 25**
 2 from Unit I
 2 from Unit II
 3 from Unit III
- IV. Describe any FOUR of the following in detail** **4 X 8 = 32**
 2 from Unit I
 2 from Unit II
 2 from Unit III

Unit	1 Mark	3 Marks	5 Marks	8 Marks	Total
I	1 X 5 = 5	3 X 2 = 6	5 X 2 = 10	8 X 2 = 16	37
II	1 X 3 = 3	3 X 3 = 9	5 X 2 = 10	8 X 2 = 16	38
III	1 X 2 = 2	3 X 2 = 6	5 X 3 = 15	8 X 2 = 16	39

Assessment method

Assessment		Marks
C ₁	Assignment	10
C ₂	Test	10
C ₃	Semester and Exam	80

COURSE DETAILS

Semester No.: 5

Course No.: 3

No. of Credits: 2

Course Title: Floriculture

Course Code: DSEB - 5.1

COURSE LEARNING OUTCOMES (CLOs)

After completing this course, students will be able to:

CLO 1: Explain the scope and importance of floriculture and landscaping.

CLO 2: Describe nursery management and plant propagation techniques.

CLO 3: Apply garden design principles, bonsai, and landscaping practices.

CLO 4: Analyze commercial floriculture, flower cultivation, and postharvest management.

COURSE CONTENT:

Unit I: Introduction: History of gardening; Importance and scope of floriculture and landscape gardening; Nursery Management and Routine Garden Operations: Sexual and vegetative methods of propagation; Soil sterilization; Seed sowing; Pricking; Planting and transplanting; Shading; Stopping or pinching; Defoliation; Wintering; Mulching; Topiary; Role of plant growth regulators; Ornamental Plants: Flowering annuals; Herbaceous perennials; Divine vines; Shade and ornamental trees; Ornamental bulbous and foliage plants; Cacti and succulents; Palms and Cycads; Ferns and Selaginellas.

Teaching hours: 16

Unit II: Cultivation of Flowering Plants: Cultivation of plants in pots; Indoor gardening; Bonsai; Principles of Garden Designs in brief. Features of a garden (Garden wall, Fencing, Steps, Hedge, Lawn, Flower beds, Shrubbery, Borders, Water garden. Some Famous gardens of India; Landscaping places of public importance: Landscaping highways and Educational institutions; Commercial Floriculture: Factors affecting flower production; Production and packaging of cut flowers; Flower arrangements; Methods to prolong vase life; Cultivation of important cut flowers (Carnation, Aster, Chrysanthemum, Dahlia, Gerbera, Gladiolus, Marigold, Rose, Lilium, Orchids); Diseases and Pests of ornamental plants.

Teaching hours: 16

LEARNING RESOURCES

1. Randhawa, G.S. and Mukhopadhyay, A. (1986). Floriculture in India. Allied Publishers.
2. Adams, C., M. Early and J. Brrok (2011). Principles of Horticulture. Routledge, U.K.

Theory Question Paper Scheme (2026-27 onwards)

V Semester – Paper (DSEB 5.1)

Floriculture

Code:

Time: 2 Hrs.

Max. Marks: 40

Instruction: Draw neat, labeled diagrams wherever necessary

I. Define/Explain any FOUR of the following

4 X 1 = 04

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

II. Write a short note on any FOUR of the following

4 X 3 = 12

- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

III. Answer any THREE of the following

8 X 3 = 24

- 13.
- 14.
- 15.
- 16.

Theory Question Paper Scheme (2026-27 onwards)
V Semester – Paper (DSEB 5.1)
Floriculture
Code:

Time: 2 Hrs

Max Marks: 40

Instruction: Draw neat, labeled diagrams wherever necessary

- I. Define/Explain any EIGHT of the following** **4 X 1 = 04**
3 from Unit I
3 from Unit II
- II. Write a short note on any FIVE of the following** **4 X 3 = 12**
3 from Unit I
3 from Unit II
- III. Answer any THREE of the following** **8 X 3 = 24**
2 from Unit I
2 from Unit II

Unit	1 Mark	3 Marks	8 Marks	Total
I	1 X 3 = 3	4 X 3 = 12	8 X 2 = 16	31
II	1 X 3 = 3	4 X 3 = 12	8 X 2 = 16	31

Assessment method

Assessment		Marks
C ₁	Assignment	5
C ₂	Test	5
C ₃	Semester and Exam	40

COURSE DETAILS

Semester No.: 6

Course No.: 1

No. of Credits: 3

Course Title: Genetics, Genetic Engineering, Plant Biotechnology & Evolution

Course Code: DSCB - 6.1

COURSE LEARNING OUTCOMES (CLOs)

After completing this course, students will be able to:

CLO 1: Explain Mendelian genetics and inheritance patterns.

CLO 2: Describe principles and applications of genetic engineering.

CLO 3: Apply plant biotechnology techniques for crop improvement.

CLO 4: Explain evolutionary concepts, evidence, and speciation.

COURSE CONTENT:

Unit I: Mendelian genetics; Principles, monohybrid cross, Dihybrid cross, test and back cross, incomplete dominance in *Mirabilis jalapa*. **Co-dominance** in *Rhododendron* sp., Multiple alleles in **ABO Blood**, Epistasis in fruit colour in summer squashes. **Interaction of genes-** Complementary gene action -flower colour in sweet pea; Supplementary interaction - Anthocyanin pigmentation in Snapdragon. **Epistasis-** fruit colour in summer squash; Multiple factor inheritance - ear size in Maize; Cytoplasmic inheritance in Maize. **Linkage and crossing over** - linkage in maize, and crossing over- Cytological evidence for Crossing over. Sex linked inheritance (*Drosophila melanogaster*). Genetic model plant- *Arabidopsis thaliana*.

Teaching hours: 16

Unit II: Genetic Engineering: Introduction, scope and importance in agricultural, medical, industrial and environmental sectors. Enzymes in genetic engineering (DNA polymerases, restriction enzymes, ligases, kinases, endonucleases, phosphatase, reverse transcriptase). Vectors - Plasmids (pBR322), Cosmids, Shuttle Vector, YAC & BAC. Direct DNA delivery methods (microinjection, biolistic method, electroporation, CaCl_2 mediated gene transfer). **Plant Biotechnology:** History and introduction to plant tissue culture, techniques and its applications. Plant tissue culture media (MS media composition and preparation), organogenesis, micropropagation; Isolation and fusion of protoplast and somatic hybridization, cybrids, synthetic seeds. Production of haploids and virus free plants. Secondary metabolites production.

Teaching hours: 16

Unit III: Evolution: A brief account of the origin of life, Miller-Urey experiment. Theories- Lamarckism, Darwinism, & Neo Darwinism. Evidence for evolution (palaeontology, comparative anatomy, divergent and convergent evolution, and industrial evolution);

Hardy-Weinberg principle and affecting factors (gene migration, genetic drift, mutation, recombination, and natural selection); Species concepts and modes of speciation (allopatric, sympatric, parapatric).

Teaching hours: 16

LEARNING RESOURCES

1. Acquaah, G. (2007). Principles of Plant Genetics & Breeding. New Jersey, U.S. Blackwell Publishing
2. Singh, B.D. (2005). Plant Breeding: Principles and Methods, 7th edition. New Delhi, Delhi: Kalyani Publishers.
3. Chaudhari, H.K. (1984). Elementary Principles of Plant Breeding, 2nd edition. New Delhi, Delhi: Oxford – IBH.
4. Gardner, E.J., Simmons, M.J., Snusid, D.P. (1991). Principles of Genetics, 8th edition. New Delhi, Delhi: John Wiley & Sons
5. Griffiths, A.J.F., Wessler, S.R., Carroll, S.B., Doebley, J. (2010). Introduction to Genetic Analysis, 10th edition. New York, NY: W.H. Freeman and Co.
6. Klug, W.S., Cummings, M.R., Spencer, C.A. (2012). Concepts of Genetics, 10th edition. San Francisco, California: Benjamin Cummings.
7. Raven, F.H., Evert, R.F., Eichhorn, S.E. (1992). Biology of Plants. New York, NY: W.H. Freeman and Co.
8. Welsh, J.R. (1981). Fundamentals of Plant Genetics and Breeding. John Wiley and Sons, New York.
9. Poehlman, J.M. (1957). Breeding Field Crops, 3rd Ed. AVI Publishing Co. Inc., Westport, Connecticut
10. Karp, G. (2010). Cell Biology, 6th edition. New Jersey, U.S.A.: John Wiley & Sons.
11. DeRobertis, E.D.P. and DeRobertis, R.E. 2009. Cell and Molecular Biology, 8th edition. Lippincott, Williams and Wilkins, Philadelphia.
12. Becker W.M., Kleinsmith L.J. and Bertni G.P. 2009. The World of the Cell. 7th edition. Pearson, Benjamin Cummings Publishing, San Francisco.
13. Raven, F.H., Evert, R.F., Eichhorn, S.E. (1992). Biology of Plants. New York, NY: W.H. Freeman and Company
14. Alberts, B., Bray, D., Hopkin, K., Johnson, A.D., Lewis, J., Raff, M., Roberts, K., & Walter, P. (2013). Essential cell biology (4th ed.). Garland Publishing.
15. Verma, P.S. (2004). Cell Biology, Genetics, Molecular Biology: Evolution and Ecology. India: S. Chand Limited.
16. Stewart C N Jr. (2008) Plant Biotechnology and Genetics Principles techniques and applications John Wiley and Sons inc. U.S.A.

BOTANY – VI SEMESTER (2026-27 onwards)
PRACTICAL – VI DSCB – 6.1
Practical Syllabus
Genetics, Genetic Engineering, Plant Biotechnology & Evolution

I. Solving the Genetic Problems: Monohybrid Cross

- 1) In tomatoes, red fruit color (R) is dominant over yellow (r). A red-fruited plant is crossed to a yellow-fruited one. What will be the appearance of F₁? F₁ are interbred and produce 330 offspring in the F₂. How many of them will be red and how many yellow? What will be the genotypes of F₂ and in what numbers?
- 2) In the pea plant, Tallness (T) is dominant over dwarfness (t). A tall pea crossed with a dwarf produces offspring of which 50% are tall, and 50% are dwarf. What are the genotypes of the parents?

II. Problems on Dihybrid Cross

- 1) In garden pea, yellow seed color (Y) is dominant over green (y), and round seed shape (R) is dominant over wrinkled (r). The character pair segregates separately. A pure yellow wrinkled variety is crossed with a pure green round. Give the phenotypes and genotypes of F₁ and the phenotypic ratio of F₂ generation.
- 2) A tall red when crossed with a dwarf red produces a dwarf white. Give the genotypes of the parents.

III. Problems on the interaction of factors

- 1) Two white-flowered strains of sweet pea (*Lathyrus odoratus*) were crossed, producing F₁ with only purple flowers. Random crossing among the F₁ produced 96 progeny plants, 53 exhibiting purple flowers and 43 with white flowers.
 - a) What phenotypic ratio is approximated by the F₂?
 - b) What type of interaction is involved?
 - c) What was the probable genotype of the parental strains?

IV. Construction of linkage maps - two-point and three-point test cross

- 1) In tomato, red fruit (R) is dominant over yellow fruit (r), and yellow flowers (W) are dominant over white flowers (w). A cross is made between true-breeding plants with red fruit and yellow flowers and plants with yellow fruit and white flowers. The F₁ generation plants are then test-crossed to plants with yellow fruits and white flowers. The following results are obtained: 333 red fruits/yellow flowers, 58 yellow fruits/yellow flowers, 64 red fruits/white flowers, 350 yellow fruits/white flowers. Calculate the map distance between the two genes.
- 2) Two different traits affecting pod characteristics in garden pea plants are encoded by genes found on chromosome 5. The narrow pod is recessive to the normal pod, and the yellow pod is recessive to the green pod. A true-breeding plant with narrow, green pods was crossed to a true-breeding plant with normal yellow pods. The F₁ were then test-crossed to plants with narrow, yellow pods. The following results were obtained. 144 normal green pods, 11 normal yellow pods, 150 narrow yellow pods, 9 narrow green pods.
How far apart are these two genes?

V. Synthetic seed preparation

- VI. Isolation of DNA
- VII. Preparation of MS Media
- VIII. Preparation and inoculation of explant
- IX. Protoplast isolation
- X. Construction of Phylogenetic tree
- XI. Study of Photographs in Genetic Engineering
- XII. Study of Photographs of plant tissue culture – callus, multiple shoots, tissue culture equipments
- XIII. Photographs of Evolution and origin of life
- XIV. Industrial visit.

SCHEME OF PRACTICAL EXAMINATION. PRACTICAL -VI
(MODEL QUESTION PAPER)
Genetics, Genetic Engineering, Plant Biotechnology & Evolution
Practical Exams

Time: 3 hrs

Max. Marks= 40

- | | |
|---|----------|
| I. A- Preparation of synthetic seed | 04 marks |
| II. Solve the genetic problems B and C | 10 marks |
| III. D-Preparation and inoculation of explant | 08 marks |
| IV. E- Isolation of DNA | 06 marks |
| V. Comment on F, G, H and I | 12 marks |
| (Genetic Engineering, Plant Tissue Culture and Evolution) | |

Theory Question Paper Scheme (2026-27 onwards)
VI Semester - (DSCB 6.1)
Genetics, Genetic Engineering, Plant Biotechnology & Evolution
Code:

Time: 3 Hrs

Max Marks: 80

Instruction: Draw neat, labelled diagrams wherever necessary

I. Define/Explain any EIGHT of the following

8 X 1 = 08

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

II. Write short note on any FIVE of the following

5 X 3 = 15

- 11.
- 12.
- 13.
- 14.
- 15.
- 16.
- 17.

III. Answer any FIVE of the following

5 X 5 = 25

- 18.
- 19.
- 20.
- 21.
- 22.
- 23.
- 24.

IV. Describe any FOUR of the following in detail

4 X 8 = 32

- 25.
- 26.
- 27.
- 28.
- 29.
- 30.

Theory Question Paper Scheme (2026-27 onwards)
VI Semester – Paper (DSCB 6.1)
Genetics, Genetic Engineering, Plant Biotechnology & Evolution
Code:

Time: 3 Hrs

Max. Marks: 80

Instruction: Draw neat, labelled diagrams wherever necessary

I. Define/Explain any EIGHT of the following **8 X 1 = 08**

- 5 from Unit I
- 3 from Unit II
- 2 from Unit III

II. Write a short note on any FIVE of the following **5 X 3 = 15**

- 2 from Unit I
- 3 from Unit II
- 2 from Unit III

III. Answer any FIVE of the following **5 X 5 = 25**

- 2 from Unit I
- 2 from Unit II
- 3 from Unit III

IV. Describe any FOUR of the following in detail **4 X 8 = 32**

- 2 from Unit I
- 2 from Unit II
- 2 from Unit III

Unit	1 Mark	3 Marks	5 Marks	8 Marks	Total
I	1 X 5 = 5	3 X 2 = 6	5 X 2 = 10	8 X 2 = 16	37
II	1 X 3 = 3	3 X 3 = 9	5 X 2 = 10	8 X 2 = 16	38
III	1 X 2 = 2	3 X 2 = 6	5 X 3 = 15	8 X 2 = 16	39

Assessment method

Assessment		Marks
C ₁	Assignment	10
C ₂	Test	10
C ₃	Semester and Exam	80

COURSE DETAILS

Semester No.: 6

Course No.: 2

No. of Credits: 3

Course Title: Phytochemistry and Bioanalytical Techniques

Course Code: DSCB - 6.2

COURSE LEARNING OUTCOMES (CLOs)

After completing this course, students will be able to:

CLO 1: Explain phytochemistry and standardization of medicinal plants.

CLO 2: Describe the extraction and isolation of phytochemicals.

CLO 3: Apply chromatographic and spectroscopic techniques for phytochemical analysis.

CLO 4: Analyze phytochemicals for qualitative and quantitative evaluation.

COURSE CONTENT:

Unit I: Phytochemistry: Scope of phytochemistry, plants as a source of chemical compounds, primary and secondary metabolites, and their applications; Definition, source of herbal raw materials, identification, authentication, standardization of medicinal plants as per WHO guidelines and different herbal pharmacopoeias, natural pigments, natural products as markers for new drug discovery.

Teaching hours: 16

Unit II: Extraction, isolation and purification of phytochemicals: Selection of plant samples, processing and storage of samples for extraction; Factors influencing the choice of extraction, principles of extraction methods, infusion, decoction, digestion, maceration, percolation, solvent extraction, ultrasound, microwave assisted extraction, advantage and disadvantage involved in each method; Isolation of selected primary and secondary metabolites – carbohydrate and proteins; Phenolics, flavonoids, alkaloids, lipids, oils, terpenes and saponins.

Teaching hours: 16

Unit III: Characterisation of Phytochemicals: Preliminary, qualitative and quantitative techniques – paper chromatography, thin layer chromatography, column chromatography- HPLC, GC (qualitative and quantitative), colour reactions for amino acids, sugars, phenolics, flavonoids, alkaloids, terpenes, saponins, oils, lipids; Spectroscopic estimations/ gravimetric determination of total sugars, proteins, lipids, oils, phenolics, flavonoids, terpenes, saponins, alkaloids and amino acids.

Teaching hours: 16

LEARNING RESOURCES

1. Bourne, U.K. Kokate, Purohit, C.K. and Gokhale S.B. 1983. Pharmacognosy. Nivali Prakashan Publication.
2. Braithwaite, A. and Smith, F. J. 1996. Chromatographic Methods. 5th edn. Blackie Academic & Professional, London.
3. Braithwaite, A. and Smith, F.J. 1996. Chromatographic Methods. 5th edn., Blackie Academic & Professional, London.
4. Harborne J.B., 1973. Phytochemical methods a guide to modern techniques of plants analysis. Chapman and Hall Ltd. London.
5. Harborne, J.B. 1984. Phytochemical Methods, 2nd edn. Chapman and Hall, London.
6. Sadasivam. S. and A. Manickam, 0000. Bio Chemical methods 2ndedn. New Age International Pvt Ltd. New Delhi.

Theory Question Paper Scheme (2026-27 onwards)
VI Semester – Paper (DSCB 6.1)
Phytochemistry and Bioanalytical Techniques
Code:

Time: 3 Hrs.

Max Marks: 80

Instruction: Draw neat, labelled diagrams wherever necessary

I. Define/Explain any EIGHT of the following

8 X 1 = 08

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

II. Write short note on any FIVE of the following

5 X 3 = 15

- 11.
- 12.
- 13.
- 14.
- 15.
- 16.
- 17.

III. Answer any FIVE of the following

5 X 5 = 25

- 18.
- 19.
- 20.
- 21.
- 22.
- 23.
- 24.

IV. Describe any FOUR of the following in detail

4 X 8 = 32

- 25.
- 26.
- 27.
- 28.
- 29.
- 30.

Theory Question Paper Scheme (2026-27 onwards)
VI Semester – Paper (DSCB 6.1)
Phytochemistry and Bioanalytical Techniques
Code:

Time: 3 Hrs.

Max Marks: 80

Instruction: Draw neat, labelled diagrams wherever necessary

I. Define/Explain any EIGHT of the following **8 X 1 = 08**

- 5 from Unit I
- 3 from Unit II
- 2 from Unit III

II. Write a short note on any FIVE of the following **5 X 3 = 15**

- 2 from Unit I
- 3 from Unit II
- 2 from Unit III

III. Answer any FIVE of the following **5 X 5 = 25**

- 2 from Unit I
- 2 from Unit II
- 3 from Unit III

IV. Describe any FOUR of the following in detail **4 X 8 = 32**

- 2 from Unit I
- 2 from Unit II
- 2 from Unit III

Unit	1 Mark	3 Marks	5 Marks	8 Marks	Total
I	1 X 5 = 5	3 X 2 = 6	5 X 2 = 10	8 X 2 = 16	37
II	1 X 3 = 3	3 X 3 = 9	5 X 2 = 10	8 X 2 = 16	38
III	1 X 2 = 2	3 X 2 = 6	5 X 3 = 15	8 X 2 = 16	39

Assessment method

Assessment		Marks
C ₁	Assignment	10
C ₂	Test	10
C ₃	Semester and Exam	80

COURSE DETAILS

Semester No.: 6

Course No.: 3

No. of Credits: 3

Course Title: Botanical products

Course Code: DSEB - 6.1

COURSE LEARNING OUTCOMES (CLOs)

After completing this course, students will be able to:

CLO 1: Explain types and uses of botanical products.

CLO 2: Describe key bioactive constituents of plants.

CLO 3: Apply botanicals in foods, beverages, and cosmetics.

CLO 4: Analyze botanicals' role in nutrition and functional foods.

COURSE CONTENT:

Unit I: Botanical products: Definition, Types and Components, Botanical Dietary Supplements: Products intended to enhance the diet, often containing herbal extracts. Botanical Drugs: Complex mixtures derived from plant materials, meant for diagnosing, curing, or treating diseases. Cosmeceuticals: Plant extracts (leaves, roots, fruits, flowers) used in skincare, hair care, and cosmetics to provide antioxidant and protective effects. Main Constituents: - polyphenols, alkaloids, polysaccharides, essential oils, and fatty acids.

Teaching hours: 16

Unit II: Botanical Applications: Bakery Products, Baking & Cereals Sweet Biscuits, Cookies & Snacks: Confectionery- Confectionery Resources, Plant-Based, Dairy Products -Dairy & Plant-Based Pantry Solutions, Beverages -Alcoholic Beverages and Non-Alcoholic Beverages; Specialized Nutrition-Probiotics, Plants Supporting Enhanced Amino Acid Absorption with Probiotics and Plant-Based Proteins.

Teaching hours: 16

LEARNING RESOURCES

1. Albert Frederick Hill. 1952. Economic Botany: A Textbook of Useful Plants and Plant Products, McGraw-Hill
2. Kapoor, L.D., 2017. Handbook of Ayurvedic medicinal plants: Herbal reference library. Routledge.
3. Kochhar, S. L. 2016. Economic botany: A comprehensive study. Cambridge University Press, New Delhi.
4. Wickens, G.E., 2012. Economic botany: principles and practices. Springer Science & Business Media.

Theory Question Paper Scheme (2026-27 onwards)
VI Semester – Paper (DSEB 6.1)
Botanical Products
Code:

Time: 2 Hrs.

Max. Marks: 40

Instruction: Draw neat, labelled diagrams wherever necessary

I. Define/Explain any FOUR of the following

4 X 1 = 04

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

II. Write short note on any FOUR of the following

4 X 3 = 12

- 7.
- 8.
- 9.
- 10.
- 11.
- 12.

III. Answer any THREE of the following

8 X 3 = 24

- 13.
- 14.
- 15.
- 16.

Theory Question Paper Scheme (2026-27 onwards)
VI Semester – Paper (DSEB 6.1)
Botanical Products
Code:

Time: 2 Hours

Max. Marks: 40

Instruction: Draw neat, labeled diagrams wherever necessary

- I. Define/ Explain any FOUR of the following** **4 X 1 = 04**
3 from Unit I
3 from Unit II
- II. Write a short note on any FIVE of the following** **4 X 3 = 12**
3 from Unit I
3 from Unit II
- III. Answer any THREE of the following** **8 X 3 = 24**
2 from Unit I
2 from Unit II

Unit	1 Mark	3 Marks	8 Marks	Total
I	1 X 3 = 3	4 X 3 = 12	8 X 2 = 16	31
II	1 X 3 = 3	4 X 3 = 12	8 X 2 = 16	31

Assessment method

Assessment		Marks
C ₁	Assignment	5
C ₂	Test	5
C ₃	Semester and Exam	40

PROGRAM LEARNING OUTCOMES (PLOs)- COURSE COMPLIANCE MATRIX

Legend: ✓ = primary alignment; – = not a primary focus

Sl.No.	Course Title	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8
1.	DSCB*-1.1: Diversity of Microbes, Algae, Fungi & Phytopathology	✓	✓	✓	✓	✓	✓	–	✓
2.	DSCB*- 2.1: Bryophytes, Pteridophytes, Gymnosperms, Palaeobotany & Anatomy of Angiosperms	✓	✓	–	–	–	✓	–	✓
3.	DSCB*-3.1: Reproductive Biology, Plant Ecology, Biodiversity & Conservation	✓	✓	✓	✓	✓	✓	–	✓
4.	DSEB-3.1a: Horticulture and Flower Gardening	✓	✓	✓	–	–	✓	✓	✓
5.	DSEB -3.1b: Mushroom Culture Technology & Biofertilizers	✓	✓	✓	–	–	✓	✓	✓
6.	DSCB*- 4.1: Plant Physiology & Metabolism, Cell Biology & Molecular Biology	✓	✓	✓	–	–	✓	✓	✓
7.	DCB**- 4.1: Nursery, Gardening & Landscaping	✓	✓	–	✓	–	✓	✓	✓
8.	DSEB - 4.1: Medicinal Plants & Herbal Technology	✓	✓	✓	–	–	✓	✓	✓
9.	DSCB - 5.1: Morphology of Angiosperms, Taxonomy, Economic Botany & Ethnobotany	✓	✓	✓	–	✓	✓	–	✓
10.	DSCB- 5.2: Plant Breeding and Phytogeography	✓	✓	–	–	–	✓	✓	✓
11.	DSEB- 5.1: Floriculture	✓	✓	–	–	–	✓	✓	✓
12.	DSCB - 6.1: Genetics, Genetic Engineering, Plant Biotechnology & Evolution	✓	✓	✓	–	–	✓	✓	✓
13.	DSCB - 6.2: Phytochemistry and Bioanalytical Techniques	✓	✓	✓	–	–	✓	✓	✓
14.	DSEB - 6.1: Botanical products	✓	✓	–	–	–	✓	✓	✓

SUSTAINABLE DEVELOPMENT GOALS (SDGS)- COURSE MAPPING

Legend: ✓ = Direct thematic contribution; - = not a primary focus

Sl. No.	Course Title	SDG2 Zero hunger	SDG3 Good health and well-being	SDG4 Quality Education	SDG7 Affordable and Clean Energy	SDG9 Industry, Innovation and Infrastructure	SDG13 Climate action	SDG14 Life below water	SDG15 Life on land
1.	DSCB*-1.1: Diversity of Microbes, Algae, Fungi & Phytopathology	✓	✓	✓	-	-	-	✓	✓
2.	DSCB*- 2.1: Bryophytes, Pteridophytes, Gymnosperms, Palaeobotany & Anatomy of Angiosperms	-	-	✓	-	-	-	✓	✓
3.	DSCB*-3.1: Reproductive Biology, Plant Ecology, Biodiversity & Conservation	✓	✓	✓	-	-	✓	✓	✓
4.	DSEB-3.1a: Horticulture and Flower Gardening	✓	✓	✓	-	-	-	-	✓
5.	DSEB -3.1b: Mushroom culture technology & Biofertilizers	✓	✓	✓	-	✓	-	-	✓
6.	DSCB*- 4.1: Plant Physiology & Metabolism, Cell Biology & Molecular Biology	-	-	✓	-	-	-	-	-
7.	DCB**- 4.1: Nursery, Gardening & Landscaping	✓	✓	✓	-	-	-	-	✓
8.	DSEB - 4.1: Medicinal Plants & Herbal Technology	✓	✓	✓	-	✓	-	-	-

9.	DSCB - 5.1: Morphology of Angiosperms, Taxonomy, Economic Botany & Ethnobotany	-	-	✓	-	-	-	-	✓
10.	DSCB- 5.2: Plant Breeding and Phytogeography	✓	✓	✓	-	-	-	-	✓
11.	DSEB- 5.1: Floriculture	-	-	✓	-	-	-	-	✓
12.	DSCB - 6.1: Genetics, Genetic Engineering, Plant Biotechnology & Evolution	-	✓	✓	✓	-	-	-	-
13.	DSCB - 6.2: Phytochemistry and Bioanalytical techniques	-	✓	✓	-	✓	-	-	-
14.	DSEB - 6.1: Botanical products	✓	✓	✓	-	-	-	-	-

Dr. K.N. Amruthesh
CHAIRMAN
Board of Studies in Botany (UG)