JSS MAHAVIDYAPEETHA

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE

(Autonomous, 'A+' Grade and 'College with Potential for Excellence')

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DEPARTMENT OF BOTANY (UG)

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, Bangalore, dated 05-05-2024)

B.Sc. BOTANY

Syllabus and Scheme of Examination

2025 – 2026

I to IV semesters

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE (AUTONOMOUS)
OOTY ROAD, MYSURU-25

DEPARTMENT OF BOTANY
BOS MEETING (2025-2026)

Proceedings of the Meeting of Board of Studies for the programmes I, II, III, IV, Semester Papers (SEP) for B.Sc. in CBZ, BBM and Open Elective papers (SEP) for III & IV sem. held on _____ at 11.00 am in the chamber of the Chairperson, Department of Botany, JSS College, Ooty road, Mysuru-25

Sl. No.	MEMBERS PRESENT	SIGNATURE
1	**Mrs. Gayathri Devi. N** Assistant professor and HOD Dept. of Botany JSS CACS, Ooty road, Mysuru Contact no: 8050684736 **gayathridevigatu@gmail.com** ***Chairpeson***	
2	**Dr. G. R Janardhana** Senior Professor of Botany DOS in Botany, Manasagangotri, UOM Contact no: 9845636998 grjplantclinic@botany.uni-mysore.ac.in ***Member (VC Nominee)***	
3	**Dr. Purshothm S. P** Professor of Botany GFGC, Channapatna-571401 Contact no: 9448115524 pgbotmscwsp@gmail.com ***Member (AC Nominee)***	
4	**Dr. V. N. Muralidhar** Associate professor of Botany Govt. first grade College Pavagada,Tumkur District -561202 Contact no: 9483682266 drvnmurulidhar@gmail.com ***Member (AC Nominee)***	
5	**Nikhil. M,** Proprietor, IFIMED Growezy Agri-Tech solutions #1, Near Vasu Layout, K Block, Ramakrishna nagara Mysuru-570022 Contact no: 8951677672 growesyagts@gmail.com ***Expert from industry***	
6	**Smt. Bhanushree R,** Research Scholar DOS in Botany, University of Mysore, Mysuru Contact no: 8095807688 ***Alumnus***	
7	**Dr. Kiran, B. L** Assistant Professor, UG department of Botany, JSSCACS, Ooty road, Mysuru-25 Contact no: 9632819347 **kiranbl4u@gmail.com** ***Senior Faculty***	

At the outset, the Chairperson, BOS in Botany, welcomed the members to the meeting of BOS and briefed about the agenda to be discussed. The following agenda were placed by the Chairperson which were discussed and resolved as follows:

Agenda 1: Introduction of B.Sc. Botany syllabus for CBZ & BBM I, II, III and IV semesters (SEP) and Elective courses for II B.Sc. (III & IV semester) for the academic year 2025-26 as per the programme structure given by University of Mysore and also review of syllabus under NEP-2020 for the programmes III B.Sc. CB & BZ (V &VI semesters) from the academic year 2025-2026 onwards.

Resolution: The Chairperson appraised the members about the introduction of new syllabus for II year B.Sc. (CBZ & BBM - III & IV semesters), review of I B. Sc. (CBZ & BBM - I & II semesters) and NEP-2020 for the programmes III B.Sc. CB & BZ (V &VI semesters) as per the programme structure given by University of Mysore for the academic year 2025-26.

Accordingly, a new/revised syllabus/ Scheme of examination was discussed and approved by the board for the academic year 2025-26.

Agenda 2: To prepare the Panel of Examiners for the examinations for the year 2025-2026.

Resolution: The Panel of Examination was prepared and approved.

Agenda 3: Approval of Reference books

Resolution: The lists of Reference books were approved.

Agenda 4: Any other matter with the permission of the Chairman

Nil

Finally the meeting was concluded with vote of thanks by the Chairperson.

Chairperson

ALLOCATION OF CREDITS

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE, OOTY ROAD, MYSURU-25

DEPARTMENT OF BOTANY
PROFORMA OF INSTRUCTIONS AND EXAMINATION FOR B.Sc. PROGRAMME IN BOTANY MODIFIED NEP

Sem	Course code	Q P Code	Practical/ Theory	TITLE OF THE COURSE DISCIPLINE CORE COURSE (COMPULSORY)	Hrs/ Week L:T:P	Credits	Max marks
I	GB0101	245101	Theory	**Diversity of Microbes, Algae, Fungi & Phytopathology**	3 Hrs.	3	80+20
	GB0102	--	Practical		4 Hrs.	2	40+10
II	GB0201	245201	Theory	**Bryophytes, Pteridophytes, Gymnosperms, Palaeobotany & Morphology of Angiosperms**	3 Hrs.	3	80+20
	GB0202	--	Practical		4 Hrs.	2	40+10
III	GB0301		Theory	**Plant Anatomy, Reproductive Biology, Ecology & Conservation Biology**	3 Hrs.	3	80+20
	GB0302		Practical		4 Hrs.	2	40+10
	GB0303		Elective	**Horticulture and Floriculture**	3 Hrs.	3	80+20
	GB0304		Elective	**Mushroom culture & Bioferilizers**	3 Hrs.	3	80+20
IV	GB0401		Theory	**Plant Physiology, Cell Biology & Molecular Biology**	3 Hrs.	3	80+20
	GB0402		Practical		4 Hrs.	2	40+10
	GB0403		Elective	**Medicinal plants & Herbal technology**	3 Hrs.	3	80+20
	GB0404		Compulsory Practical	**Nursery, Gardening & Landscaping**	4 Hrs.	2	40+10

Examiners list

Sl. No	Name	Designation and DOB	Joining Date	Phone number
	Internal Examiners			
1.	Gayathri Devi N JSS College, Ooty Road, Mysore	Asst. Prof.	01-01-2005	8050684736
2.	Dr. Kiran B L JSS College, Ooty Road, Mysore	Asst. Prof.	23-09-2015	9638219347
3	Mrs. Pooja N JSS College, Ooty Road, Mysore	Asst. Prof.	30-08-2017	9844210414
	External Examiners			
1.	Dr. Hemavathi C Govt. First grade college, Vijayanagar, Mysuru	Asso. Prof. 05/04/1966	17/08/1992	9980748813
2.	Dr. Shivalingaiah GFGC, K R Nagar	Asst. Prof. 01/06/1968	08/01/1996	9036766869
3.	Dr. Purushotham S P GFGC, Channapatna-571401	Prof. 15/05/1967	02/08/1996	9448115524
4.	Dr. Basavaraju G L Maharani`s Science College for Women, Mysore	Asst. Prof. 21/07/1976	30/01/2004	
5.	Dr. Devika M Saradavilas College, Mysore	Asst. Prof. 14/03/1970	14/12/2005	9880024483
6.	Dr. Pruthviraj Maharani`s Science College for Women, Mysore	Asso. Prof.		9448925262
7.	Dr. Nataraju Maharani`s Science College for Women, Mysore	Asso. Prof.		9448033901
8.	Dr. Suresh N S Government Science college, Hassan	Asst. Prof. 25/02/1975	02/05/2006	9242243601
9.	Dr. Jayalakshmi B Govt College for Women, Mandya	Asst. Prof. 18/11/1974	14/07/2006	9482640645
10.	Sowmya H K Maharani`s Science College for Women, Mysore	Asst. Prof. 18/06/1970	22/12/2007	7338466887
11.	Dr. Thoyajaksha Maharani`s Science College for Women, Mysore	Asst. Prof. 20/07/1970	24/12/2007	9743779983
12.	Sandhya Rani D Govt Science College, Hassan	Asst. Prof. 24/08/1972	24/12/2007	9448602597
13.	Dr. Pushpalatha H G Govt College for Women, Mandya	Asst. Prof. 23/12/1979	26/12/2007	9480442844
14.	Dr. Ashok N Pyati Sri Mahadeshwara Govt. First grade college, Kollegala	Asst. Prof. 22/04/1970	28/12/2007	7204661365
15.	Dr. Deepa Hebbar Maharani`s Science College for Women, Mysore	Asso. Prof.		9632869690

16.	Dr. Lalitha V Maharani`s Science College for Women, Mysore	Asso. Prof.		8105004148
17.	Revanamaba B JSS College for Women, Chamarajanagara	Asst. Prof.		9448528471
18.	Dr. Krishna Yuvarajas college, Mysore.	Asst. Prof.		
19.	Nayana, K. N. Maharani`s Science College for Women, Mysore , Mysuru	Asst. Prof.		9964041544
20.	Dr. Anil Kumar Yuvaraja College, Mysuru	Asst. Prof.		8970945497
21.	Dr. Netra Yuvarajas college, Mysore	Asst. Prof.		9620782198
22.	Dr. Poornima Yuvaraja College, Mysuru	Asst. Prof.		8217642534
23.	Dorothy P St. Philos, Mysuru	Asst. Prof.		8867440178
24.	Chandana C JSSCW, Mysuru	Asst. Prof.		7019663825
25.	Anusha JSSCW, Mysuru	Asst. Prof.		8095170082
26.	Amulya JSS College for Women, Chamarajanagara	Asst. Prof.		8147230361
27.	Yashwanth Sharada Vilas college, Mysuru	Asst. Prof.		8904300482
28.	Jeevitha Saldhana St. Philos, Mysuru	Asst. Prof.		9740674763

Botany – I semester

Diversity of Microbes, Algae, Fungi and Phytopathology

Code: GB0101 **48 Hrs (3 Hrs of instruction/ week: 3 Credits)**

Course outcome

1. Students will be in position to understand the general characters, classification and economic importance of Mollicutes, Viruses, Bacteria, Cyanobacteria, Algae, Fungi and Lichens
2. They know the structure and reproduction of various forms included in the syllabus
3. They will acquire the basic knowledge of various plant diseases mentioned in the syllabus and their management

Unit I: MICROBIAL DIVERSITY - 16 Hrs.

A brief account of microbes in soil, air, food and water. Brief account of five kingdoms (Whittaker) and three domains.

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 characters 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.

Unit II: ALGAE AND LICHENS - 16 Hrs.

Cyanobacteria: General characters and economic importance of Cyanobacteria.

Type study: *Nostoc*

Algae: 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.

Unit III: FUNGI AND PHYTOPATHOLOGY - 16Hrs

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.

Suggested readings

1. Alexopolous, J. and Charles, W. M. 1988. Introduction to Mycology. Wiley Eastern, New Delhi.
2. Chopra, G. L. 1973. Text Book of Algae. S. Nagin and Co. Jalandhar.
3. Dube, H. C. 1983. An Introduction of 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. and Datta C. 1935. College Botany. (Vol. II). New Central Book Agency (P) Ltd.
6. Mehrotra, R. S. and Aneja, K. R. 1990. An Introduction of 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 Mc Graw-Hill Co, New Delhi.
10. Presscott, L., Harley, J. and Klein, D. 2005. Microbiology. 6th edition, Tata McGraw- Hill Co. New Delhi.
11. Sambamurthy, A. V. S. S. 2006. A text book of Plant Pathology. I. K. International Pvt. Ltd., New Delhi.
12. Sambamurthy, A.V.S. S. 2006. A Textbook of Algae. I.K. International Pvt. Ltd., New Delhi.
13. Sharma, O. P. 2006. A Text Book of Thallophyta. McGraw Hill Publishing. Co. New Delhi.
14. Singh, R. S.1984. Introduction to Principles of Plant Pathology. Oxford and IBH Publication Co. Pvt. Ltd, New Delhi.
15. Singh, V., Pande, P. C. and 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. 1998. Algae. Pradeep Publications, Jalandar.
18. Srivastava, H. N. 1993. Fungi. Pradeep Publications, Allahabad.
19. Sundarajan, S. 1998. College Microbiology. Vol 1. Vardhana Publications, Bangalore.
20. Sundararajan, S. 1993. College Botany. Vol I and II. Himalaya Publishing Company, Bangalore.
21. Vashishta, B. R., Sinha A. K. and Singh, V. P. 2008. Botany for Degree Students: Algae. S. Chand and Company Ltd, New Delhi.

Scheme of question paper
(Theory)

B.Sc., Degree I Semester Examination

Diversity of Microbes, Algae, Fungi and Phytopathology

Code: GB0101

Time: 3 Hrs **Max Marks: 80**

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

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

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

2 from Unit I
3 from Unit II
2from 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
2from 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	Test	10
C_2	Test	10
C_3	Semester end exam	80

Theory Model Question Paper
I Semester - Paper I (DSCB 1.1)

Diversity of Microbes, Algae, Fungi and Phytopathology

Code: GB0101
Time: 3 Hrs **Max Marks: 80**

Instruction: Draw neat labeled diagrams wherever necessary

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

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

II. Write short notes 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.

Practical Syllabus

I Semester - Paper I (DSCB 1.1)

Diversity of Microbes, Algae, Fungi and Phytopathology

Code: **GB0102** **- 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.
2. Equipments used in Microbiology lab: Laminar air flow chamber, Haemocytometer, Colony counter
3. Photographs /Charts of Microbiologists and their contribution (Antoni Van Leeuwenhoek, Louis Pasteur, Robert Koch, Iwanowski, Joseph Lister)
4. Staining of bacteria: Simple (positive and negative) and Gram staining.
5. Structure and reproduction of *Nostoc* and *Chlorella*
6. Structure and reproduction of *Oedogonium*
7. Structure and reproduction of *Caulerpa*
8. Structure and reproduction *of Sargassum*
9. Structure and reproduction of *Polysiphonia* and Pennate Diatom
10. Structure and reproduction of *Rhizopus*, *Albugo*
11. Structure and reproduction of *Penicillium* and *Puccinia*,
12. Structure and reproduction of *Fusarium* and Lichens
13. Host, causal organism, symptoms and management of Sandal spike, TMV, Citrus canker, Algal rust (Avocado)
14. Host, causal organism, symptoms and management of Tikka disease of Groundnut, Late blight of Potato and Coffee rust
15. Biopesticides (Neem, *Trichoderma*, *Bacillus subtilis*, NPV)

Assessment method

Assessment		Marks
C_1	Test	05
C_2	Test	05
C_3	Semester end exam	40

Practical Question Paper Scheme
I Semester - Practical I (DSCB 1.1)

Diversity of Microbes, Algae, Fungi, and Phytopathology

Code: GB0102

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

I. Perform the 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 critical comment on the materials D, E & F	- 12
IV. Identify the slides G, H & I with reason	-06
V. Record	- 05

Practical Question Paper Scheme (SEB)
I Semester - Practical I (DSCB 1.1)

Diversity of Microbes, Algae, Fungi, and Phytopathology

Code: GB0102

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

I. Perform the experiment A and leave for evaluation - 07
[Simple staining (positive and negative) / differential staining]
(Principle- 1; Procedure- 2; Performance with result- 4)

II. Prepare a temporary stained slide of the materials B & C
Sketch, label, and identify with reasons. Leave the preparation for evaluation - 10
(1 from Cyanobacteria/ Algae, 1 from Fungi)
(Identification- 1; Preparation- 2; Reasons with labeled diagram- 2)

III. Write critical comment on the materials D, E & F - 12
(D- Fungi, Virus / Bacteria/ Mycoplasma disease and Algae/Lichen
E- Equipments; F-Microbiologist/Biopesticides)
(Identification- 1, Causal organism- 1, Symptoms and Management- 2)

IV. Identify the slides G, H & I with reason -06
(1 each from Algae/ Cyanobacteria, Fungi/ Lichen and Phytopathology)
(Identification- 1; Reasons with labeled diagram- 1)

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.

Theory Syllabus
II Semester - Paper II (DSCB 1.2)

Bryophytes, Pteridophytes, Gymnosperms, Palaeobotany and Morphology of Angiosperms

Code: GB0201 **48 Hrs (3 Hrs of instruction/ week: 3 Credits)**

Course outcome

1. Students will be able to understand the salient features, classification and economic importance of Bryophytes, Pteridophytes Gymnosperms and Angiosperms
2. They will know the Morphology, Anatomy and Reproduction of Bryophytes, Pteridophytes, Gymnosperms and fossil plants included in the syllabus
3. They will acquire the knowledge of geological time scale, fossils and fossilization
4. Students are able to understand various types of tissues and their functions
5. They will understand the Morphological structures of root, stem, leaf, flower, fruit and seed of Angiosperms.

Unit I - 14 Hrs

Bryophytes: General characters, classification and economic importance of Bryophytes Type Study - *Riccia, Marchantia, Anthoceros* and *Polytrichum* (Developmental details not required).

Paleobotany: Geological time scale, fossils and fossilization; Types of fossils. Type study: *Rhynia* and *Cycadeoidea*

Unit II - 14 Hrs

Pteridophytes: General characters classification and economic importance. Stelar Evolution.

Type study: *Psilotum*, *Selaginella*, *Equisetum*, *Pteris* and *Marsilea* (Developmental details not required); Heterospory and seed habit (Brief account).

Unit III 10 Hrs

Gymnosperms: General characters, classification and economic importance of Gymnosperms. Type study: *Cycas*, *Pinus* and *Gnetum.*

Morphology of Angiosperms: **10 Hrs**

Parts of a flowering plant; monocot and dicot plant root systems; Root modifications- fusiform, napiform, conical fasciculated, tuberous, prop, stilt, climbing, respiratory, parasitic and epiphytic; shoot system; stem modifications-rhizome, tuber, corm, bulb, runner, stolon, offset, sucker, phylloclade (*Opuntia, Euphorbia*), cladode (*Asparagus*); Leaf- parts, phyllotaxy, simple and compound leaves, pinnate and palmate); Leaf modifications -tendril, spine, phyllode, pitcher. Inflorescence- racemose, cymose and special types (cyathium, thyrsus, verticellaster, hypanthodium). Flower: A brief account of floral morphology and floral diagram. Fruits-classification- simple (dry dehiscent, dry indehiscent, Schizocarpic and fleshy types); aggregate and composite; Structure of dicot seed and monocot seed.

Suggested readings

1. Andrews, H. N. 1961. Studies in Paleobotany. John Wiley, New York.
2. Bhatnagar, S. P. and Mitra, A. 1966 Gymnosperms. New age International (P) Ltd. Publishers.
3. Bierhorst, D. W. 1971. Morphology of Vascular Plants. The MacMillan Co., N.Y. and 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. and 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, N.Y.
10. Frank, C. 1990. The inter-relationships of the Bryophytes. New Phytologist. Today and Tomorrow's Printers and Publishers.
11. Gangulee, H. C., Kar and Kumar, A. 1982. College Botany- Vol. II. Central Book Agency, Calcutta.
12. Pandey, S. N., Mishra, S. P. and Trivedi, P. S. 2007. A Textbook of Botany- Vol. II. Rastogi Publications, Meerut.
13. Rashid, A. 1999. An Introduction to Pteridophyta. MKM Publisher Pvt Ltd.
14. Shripad, N. A. 1995. Paleobotany. Oxford and I.B.H. New Delhi.
15. Singh, V., Pande, P. C. and Jain, D. K. 2005. Diversity and Systematics of Seed plants. Rastogi Publications, Meerut.
16. Singh, V., Pande, P. C. and Jain, D. K. 2006. A Textbook of Botany. Rastogi Publications, Meerut.
17. Singh G.2012. *Plant systematics: Theory and Practice*. Oxford and IBH, Pvt. Ltd., New Delhi.
18. Singh V. & Jain - *Taxonomy of Angiosperms* - Rastogi Publications, Meerut
19. Sporne, K. R. 1971. The Morphology of Gymnosperms: The Structure and Evolution of Primitive seed Plants. Hutchinson University Library, London.
20. Sporne, K. R. 1974. Morphology of Pteridophytes. Hutchinson and Co., London.
21. Vashishta, P. C. 1982. Peridophyta. S. Chand and Co. Ltd., New Delhi.

Theory Question Paper Scheme
II Semester - Paper II (DSCB 1.2)

Bryophytes, Pteridophytes, Gymnosperms, Palaeobotany and Morphology of Angiosperms

Code: GB0201

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**

2from Unit I
3 from Unit II
2 from Unit III- Gymnosperms
3 from Unit III- Morphology of Angiosperms

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

2 from Unit I
2 from Unit II
1 from Unit III- Gymnosperms
2 from Unit III- Morphology of Angiosperms

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

2 from Unit I
2 from Unit II
2 from Unit III- Gymnosperms
1 from Unit III- Morphology of Angiosperms

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

2 from Unit I
2 from Unit II
1from Unit III- Gymnosperms
1 from Unit III- Morphology of Angiosperms

Unit	1 Mark	3 Marks	5 Marks	8 Marks	Total
I	1 X 2 = 2	3 X 2 = 6	5 X 2 = 10	8 X 2 = 16	**34**
II	1 X 3 = 3	3 X 2 = 6	5 X 2 = 10	8 X 2 = 16	**35**
III	1 X 5 = 5	3 X 3 = 9	5 X 3 = 15	8 X 2 = 16	**45**

Assessment method

Assessment		Marks
C_1	Test	10
C_2	Test	10
C_3	Semester end exam	80

Theory Model Question Paper
II Semester - Paper I (DSCB 1.2)

Bryophytes, Pteridophytes, Gymnosperms, Palaeobotany and Morphology of Angiosperms

Code: GB0201
Time: 3 Hrs **Max Marks: 80**
Instruction: Draw neat labeled diagrams wherever necessary

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

1.
2.
3.
4.
5.
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8.
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10.

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

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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.
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Practical Syllabus
II Semester - Practical II (DSCB 1.2)

Bryophytes, Pteridophytes, Gymnosperms, Paleobotany and Morphology of Angiosperms

Code: **GB0202** **- 64 Hrs. (1 practical of 4 Hrs / week: 2 Credits)**

1. Morphology, anatomy and reproduction of *Riccia* and *Marchantia*
2. Morphology, anatomy and reproduction of *Anthoceros* and *Polytrichum*
3. Morphology, anatomy and reproduction of *Rhynia* and *Psilotum*
4. Morphology, anatomy and reproduction of *Selaginella* and *Equisetum*
5. Morphology, anatomy and reproduction of *Pteris* and *Marsilea*
6. Morphology, anatomy and reproduction of *Cycas and Cycadioidea*
7. Morphology, anatomy and reproduction of *Pinus*
8. Morphology, anatomy and reproduction of *Gnetum*
9. Modifications of root.
10. Modifications of stem.
11. Modifications of leaf
12. Study of Inflorescences: Racemose, Cymose and Special types.
13. Study of Fruits-simple, aggregate and composite type
14. Visit to Geology Museum / Fernarium

Assessment method

Assessment		Marks
C_1	Test	05
C_2	Test	05
C_3	Semester end exam	40

Practical Question Paper
II Semester - Practical II (DSCB 1.2)

Bryophytes, Pteridophytes, Gymnosperms, Paleobotany and Morphology of Angiosperms

Code: **GB0202**
Time: 3 Hrs **Max. Marks: 40**

I. Identify the specimens A, B and C with reasons	-09
II. . Identify the specimen D & E	- 05
III. Comment on the materials F, G and H	-09
IV. Identify the slides / Chart I, J, K and L with reasons	- 12
VI. Record	- 05

Practical Question Paper Scheme
II Semester - Practical II (DSCB 1.2)

Bryophytes, Pteridophytes, Gymnosperms, Palaeobotany and Morphology of Angiosperms

Code: GB0202
Time: 3 Hrs **Max. Marks: 40**

I. Identify the specimens A, B and C with reasons **3×3=9**
(1each from Bryophytes, Pteridophytes and Gymnosperms)
(Identification -1; Reasons with labeled diagram- 2)

II. . Identify the specimen D and E. **2.5×2=5**
(from Morphology of angiosperms)
(Identification- 1; Reasons-1 labeled diagram- 0.5)

III. Comment on the materials F, G and H **3×3=9**
(1 each from Bryophytes, Pteridophytes and Gymnosperms/Paleobotany)
(Identification- 1; Reasons with labeled diagram- 2)

IV. Identify the slides / Chart I, J, K and L with reasons **3×4=12**
(1 each from Bryophytes, Pteridophytes, Gymnosperms and Morphology of Angiosperms)
(Identification- 1; Reasons with labeled diagram- 2)

VI. 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.

BOTANY III SEMESTER DSCB 1.3

Theory Syllabus

PLANT ANATOMY, REPRODUCTIVE BIOLOGY, ECOLOGY AND CONSERVATION BIOLOGY

Course code: GB0301 **48 Hrs. (3 Hrs. of instruction per week)**

Credits: 3

Course outcome

1. Students are able to understand various types of tissues and their functions
2. They will understand the anatomical structures of root, stem and leaf of dicots and monocots
3. To study the development and structure of Male and Female Gametophyte, Embryo, Endosperms in Angiosperms
4. To acquire the knowledge of Experimental Embryology
5. To acquire the basic knowledge of Plant community and their adaptations
6. To study the environmental factors and their impact on Plant community
7. To acquire the knowledge of various Ecosystem and energy flow
8. Understanding the fundamental concepts in ecology, environmental science and phytogeography.
9. Concept development in conservation, global ecological crisis, Sustainable development and pros and cons of human intervention.
10. Enable the student to appreciate bio diversity and the importance of various conservation strategies, laws and regulatory authorities and global issues related to climate change and sustainable development.

UNIT I: **12 Hrs.**

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 dicot stem and Anomalous secondary growth in *Dracaena* stem

Embryology of Angiosperms:

Introduction, scope of embryology. Structural organization of 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 & Melittopalynology.

Megasporangium and Megasporogenesis: Structure of pistil, placentation, ovule and types;

Development of female gametophyte (*Polygonum* type), structure of mature embryosac and types of embryosac.

UNIT II: Embryology of Angiosperms (contd..) & **Plant Ecology** **12 Hrs.**

Pollination biology: Types, Contrivances and Significance of Self pollination & Cross pollination.

Fertilization: General account on double fertilization; Post fertilization changes. Endosperm and types of endosperm, Ruminate endosperm and Biological importance of endosperm.

Embryogenesis: Development of 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.

Plant Ecology:

Introduction to Ecology, Scope and importance

Ecosystem: Introduction, types, Biotic and Abiotic components, Structure of ecosystems - Terrestrial (Forest) and Aquatic (Pond).

Ecosystem functions and processes: Food chain, Food web; Ecological pyramids of energy and biomass. Energy flow in the ecosystem.

Unit III: Plant Ecology- contd… 12 Hrs

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.

Ecological groups of plants and their adaptations: Morphological and anatomical adaptations of hydrophytes, xerophytes, epiphytes halophytes and parasites

Bio-geo chemical cycles: Carbon and Nitrogen Pollution; A brief account on air, water and soil pollution, causes and effects. **Ecological succession**: Definition, types- primary and secondary; General stages of succession. Hydrosere and Xerosere.

Unit IV: Biodiversity And Conservation 12 Hrs.

Introduction and concept of biodiversity; **Values of biodiversity**: Ecological, Economic and Social value. **Types of biodiversity**: Species and generic diversity

Endemism: 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 legislations in India: Indian forest conservation act, Biodiversity bill 2002.

Earth summits, Role of organization in the conservation of biodiversity - IUCN, UNESCO, WWF and NBPGR

Suggested readings

1. Bhojwani and Bhatnagar, Introduction to Embryology of Angiosperms –Oxford & IBH, Delhi
2. Bhojwani Sant Saran, 2014. Current Trends in the Embryology of Angiosperms, Woong-Young Soh, Springer Netherlands
3. Johri, B.M. l., 1984. Embryology of Angiosperms, Springer-Verlag, Netherlands.
4. Pandey S.N. 1997, Plant Anatomy and Embryology
5. A. Chadha, Vikas Publication House Pvt Ltd; Raghavan, V., 2000. Developmental Biology of Flowering plants, Springer, Netherlands.
6. Saxena M. R. – Palynology – A treatise - Oxford & I. B .H., New Delhi.
7. Shivanna, K.R., 2003. Pollen Biology and Biotechnology. Oxford and IBH Publishing Co. Pvt.Ltd. Delhi.
8. Sharma, P.D. 2018. Fundamentals of Ecology. Rastogi Publications.
9. Odum E.P. (1975): Ecology By Holt, Rinert& Winston.
10. Kochhar, P.L. (1975): Plant Ecology. (9th Edn.) New Delhi, Bombay, Calcutta.
11. Kumar, H.D. (1992): Modern Concepts of Ecology (7th Edn.,) Vikas Publishing Co., New Delhi.
12. Kumar H.D. (2000): Biodiversity & Sustainable Conservation. Oxford & IBH Publishing Co Ltd. New Delhi.
13. Newman, E.I. (2000): Applied Ecology, Blackwell Scientific Publisher, U.K.
14. Saha T. K., 2017. Ecology and Environmental Biology. Books and Allied Publishers.
15. Joshi P.C. and Namita Joshi (2004): Biodiversity and Conservation, APH Publishing Corporation 1
16. Krishnamurthy K.V. Text Book of Biodiversithy, Science Publishers, United States

Theory Question Paper Scheme
III Semester - Paper III (DSCB 1.3)

Plant Anatomy, Reproductive Biology, Ecology and Conservation Biology

Code: GB0301
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**
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 **5 X 3 = 15**
2 from Unit I
2 from Unit II
2from Unit III
1 from Unit IV

III. Answer any FIVE of the following **5 X 5 = 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 **4 X 8 = 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 X 3 =3	3 X 2 = 6	5 X 2 = 10	8 X 1 = 08	**27**
II	1 X 2 = 2	3 X 2 = 6	5 X 2 = 10	8 X 2 = 16	**34**
III	1 X 2 = 2	3 X 2 = 6	5 X 2 = 10	8 X 2 = 16	**34**
IV	1 X 3 = 3	3 X 1 = 3	5 X 2 = 10	8 X 2 = 16	**32**

Assessment method

Assessment		Marks
C_1	Test	10
C_2	Test	10
C_3	Semester end exam	80

Theory Question Paper Scheme
III Semester - Paper III (DSCB 1.3)

Plant Anatomy, Reproductive Biology, Ecology and Conservation Biology

Code: GB0301
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**

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

11.
12.
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14.
15.
16.
17.

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

18.
19.
20.
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24.
25.

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

26.
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32.

BOTANY—III SEMESTER
PRACTICAL--III DSCB 1.3
Practical Syllabus

Plant Anatomy, Reproductive Biology, Ecology and Conservation Biology

Code: GB0302 **64 Hrs.**
Credits: 2 **(1 practical of 4 Hrs / week)**

Practicals

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

Assessment method

Assessment		Marks
C_1	Test	05
C_2	Test	05
C_3	Semester end exam	40

Practical Question Paper
III Semester - Practical III (DSCB 1.3)

Plant Anatomy, Reproductive Biology, Ecology and Conservation Biology

Code: GB0302 **Time: 3 Hrs.**
Max. Marks: 40

I. Perform the experiment **A & B** **10 Marks**

II. Prepare a temporary stained slide, identify and comment on material **C** **05 Marks**

III. Mount the material **D**. Identify with reasons &leave the preparation for evaluation **05 Marks**

IV. Comment on **E & F** **08 Marks**

V. Mapping of given area of **G** **04 Marks**

VI. Identify **H** **03 Marks**

VII 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
III Semester - Practical III (DSCB 1.3)

Plant Anatomy, Reproductive Biology, Ecology and Conservation Biology

Code: GB0302 **Time: 3 Hrs.**
Max. Marks: 40

I. Perform the experiment **A & B** **10 Marks**

A- Anatomy (Stem, root, leaf and tissues)

B -Soil pH/Water holding capacity of soil/Soil texture

II. Prepare a temporary stained slide, identify and comment on material **C** **05 Marks**

(Hydrophyte/Xerophyte)

III. Mount the material **D**. Identify with reasons & leave the preparation for evaluation **05 Marks**

(Endosperm/Embryo/Pollen grain & pollinia/ Pollen germination by Hanging drop method)

IV. Comment on **E & F** **08 Marks**

(1 each from Ecological adaptation, Ecological instruments,)

V. Mapping of given area of **G** **04 Marks**

(Biodiversity hotspots/ National parks / Sanctuaries/Vavilov centres)

VI. Identify **H** **03 Marks**

(Slide/Chart from Reproductive biology)

VII **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.

BOTANY—III SEMESTER -- DSEB 1.1
Elective Paper
Theory Syllabus
HORTICULTURE AND FLORICULTURE

Course code: GB0303 **48 Hrs.**
Credits: 3 **(3 Hrs. of instruction per week)**
Course outcome

1. To understand the techniques of Plant Propagation, Horticulture, Floriculture, Olericulture and Pomology
2. To learn the Applications of Plant Propagation, Horticulture, Floriculture, Olericulture and Pomology

Unit I: HORTICULTURE **12 Hrs.**

Introduction, scope and importance, Soil and types of soil (black, red and sandy), Nursery- introduction, objectives

Brief description, their merits and demerits of the following

Infrastructure- Polyhouse, Green house, Mist chamber, Shade house, Glass house, net house, nursery beds- types (flat, raised and sunken),

Media- sand, peat soil, sphagnum mass, vermiculite, perlite, leaf mold, saw dust, 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)

Unit II: HORTICULTURE CROPS **12 Hrs.**

Botanical name, Common name, Family & Uses of the following

Leafy vegetables (Amaranthus and coriander); **perennial vegetables** (Drumstick, Flax), **Leguminous vegetables** (cluster 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, knol khol) **Tuber crops** (taro, elephant foot yam and potato). **Root crops** (sweet potato, tapioca, carrot, radish, turnip and beet root). **Plantation crops** (coconut, areca nut, betel leaves).

Unit III: HORTICULTURE CROPS **12 Hrs.**

Botanical name, Common name, Family & Uses of the following

Aromatic plants (patchouli, davana, lemon grass, rosemerry, geranium, chamapaka, lavancha). **Medicinal plants** (amla, ashwagandha, coleus, sarpagandha, hippali, madhunashini, brahmi, tulsi, amruthaballi, sogadeberu, lole sara, and stevea), **Spices and condiments** (garlic, coriander, turmeric, fennel, vanilla, clove, nutmeg, ginger, black pepper, cinnamon, tamarind, cardamom, onion, allspice**), Fertilizers and manures** (chemical fertilizers, compost, vermi composting, biofertilizer (Azolla) and jeevaamrutha/ panchagahavya), Organic farming.

Unit IV: FLORICULTURE & POMOLOGY **12 Hrs.**

Floriculture & Pomology: introduction, cultivation practices and varieties of mango, banana, pomegranate, papaya; Cut flowers - rose, gerbera, orchids and chrysanthemum,

Olericulture: introduction, cultivation practices of Solanaceous vegetables (tomato, chilli, brinjal and potato).

Flower arrangement: floral greetings, bouquet, vegetable carvings and dry flowers and ikabana, flower arrangement in functions, Bonsai and terrarium

Suggested readings

1. Bose, T. K. and Mukherjee, D. 1972. Gardening in India, Oxford & IBH Publishing Co., New Delhi.
2. Kader, A. A. 2002. Post- Harvest Technology of Horticultural Crops. UCANR Publications, USA
3. Jules, J. 1979. Horticultural Science. W.H. Freeman and Co., San Francisco, 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
III Semester - Elective Paper (DSEB 1.1)

HORTICULTURE AND FLORICULTURE

Code: GB0303
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.
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II. Write short notes on any FIVE of the following **5 X 3 = 15**
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III. Answer any FIVE of the following **5 X 5 = 25**
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IV. Describe any FOUR of the following in detail **4 X 8 = 32**
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Theory Question Paper Scheme
III Semester - Elective Paper (DSEB 1.1)

HORTICULTURE AND FLORICULTURE

Code: GB0303
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**
- 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 **5 X 3 = 15**
- 2 from Unit I
- 2 from Unit II
- 2from Unit III
- 1 from Unit IV

III. Answer any FIVE of the following **5 X 5 = 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 **4 X 8 = 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 X 3 =3	3 X 2 = 6	5 X 2 = 10	8 X 1 = 08	**27**
II	1 X 2 = 2	3 X 2 = 6	5 X 2 = 10	8 X 2 = 16	**34**
III	1 X 2 = 2	3 X 2 = 6	5 X 2 = 10	8 X 2 = 16	**34**
IV	1 X 3 = 3	3 X 1 = 3	5 X 2 = 10	8 X 2 = 16	**32**

Assessment method

Assessment		Marks
C_1	Test	10
C_2	Test	10
C_3	Semester end exam	80

BOTANY—III SEMESTER -- DSEB 1.2
Elective paper Theory Syllabus

MUSHROOM CULTURE & BIOFERTILIZER

Course code: GB0304 **48 Hrs.**
Credits: 3 **(3 Hrs. of instruction per week)**

Course outcome

1. To enable the students to identify edible and poisonous mushrooms
2. To learn spawn production and mushroom cultivation
3. To motivate the students to take mushroom cultivation as a means for self employment and income generation
4. To learn types, methods and importance of biofertilizers

Unit I: MUSHROOM CULTURE TECHNOLOGY **12 Hrs.**

Introduction and scope of mushroom cultivation.

Edible and poisonous mushrooms: Common edible mushrooms- Button mushroom (*Agaricus bisporus*), Milky mushroom (*Calocybe indica*), Oyster mushroom (*Pleurotus sajorcaju*) and paddy straw mushroom (*Volvariella volvcea*).

Mushroom cultivation: Structure and construction of mushroom house. Sterilization of substrates

Unit II: **12 Hrs.**

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.

Post harvest technology: Value added products of mushrooms.

Unit III: BIOFERTILIZER **12 Hrs**.

Introduction, General account about the microbes used as biofertilizer.

Bacteria: *Rhizobium*- isolation, identification, mass multiplication, carrier based inoculants,

Actinorrhizal 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.

Unit IV: **12 Hrs.**

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 Vermicomposting (methods and field Application).

Suggested readings

1. Bhal, N. 2000. Handbook on Mushrooms. Vol. I and 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. Kumaresan, V. 2005. Biotechnology. Saras Publications, New Delhi.
4. Krishnamoorthy, A. S. Sivaprakasam, K. and Jayarajan. R. 1991. Oyster Mushrooms, Department of Plant Pathology. Tamil Nadu Agricultural University, Coimbatore.
5. Marimuthu, T. 1991. Oyster Mushroom. Department of Plant Pathology. Tamil Nadu Agricultural University, Coimbatore
6. Pandey, R. K. and Ghosh, S. K. 1996. A Hand Book on Mushroom Cultivation. Emkey Publications.
7. Pathak, V. N., Yadav, N. and 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., No. 88, Mysore Road, Bangalore.
12. Tewari, Kapoor, P. 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. and Modi, H. A. 1998. Bio- fertilizers and organic Farming. Akta Prakashan, Nadiad.

BOTANY—III SEMESTER -- DSEB 1.2
Elective paper Theory Syllabus

MUSHROOM CULTURE & BIOFERTILIZER

Course code: GB0304
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**
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II. Write short notes on any FIVE of the following **5 X 3 = 15**
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III. Answer any FIVE of the following **5 X 5 = 25**
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IV. Describe any FOUR of the following in detail **4 X 8 = 32**
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BOTANY—III SEMESTER -- DSEB 1.2
Elective paper Theory Syllabus

MUSHROOM CULTURE & BIOFERTILIZER

Course code: GB0304
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**
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 **5 X 3 = 15**
2 from Unit I
2 from Unit II
2from Unit III
1 from Unit IV

III. Answer any FIVE of the following **5 X 5 = 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 **4 X 8 = 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 X 3 =3	3 X 2 = 6	5 X 2 = 10	8 X 1 = 08	**27**
II	1 X 2 = 2	3 X 2 = 6	5 X 2 = 10	8 X 2 = 16	**34**
III	1 X 2 = 2	3 X 2 = 6	5 X 2 = 10	8 X 2 = 16	**34**
IV	1 X 3 = 3	3 X 1 = 3	5 X 2 = 10	8 X 2 = 16	**32**

Assessment method

Assessment		Marks
C_1	Test	10
C_2	Test	10
C_3	Semester end exam	80

BOTANY—IV SEMESTER -- DSCB 1.4
Theory Syllabus

PLANT PHYSIOLOGY, CELL BIOLOGY & MOLECULAR BIOLOGY

Course code: GB0401 **48 Hrs.**
Credits: 3
(3 Hrs. of instruction per week)

Course outcome

1. To understand the underlying principles of various physiological processes and metabolism in plants
2. To study the roles of minerals in plant metabolism
3. To study plant growth and development
4. To study the ultra structure of cell organelles
5. To acquire the knowledge of underlying principles of different microscopes
6. To learn chromosomal aberrations and their significance
7. To understand Mendel's principles, deviations from Mendelism, Mutation and its significance
8. To acquire the knowledge on chemistry, structure, types of genetic material and protein synthesis
9. To learn the concepts of gene and mechanism of gene regulation
10. To acquire the knowledge on chemistry, structure, types of genetic material and protein synthesis
11. To learn the concepts of gene and mechanism of gene regulation

Unit I: PLANT PHYSIOLOGY **12 Hrs.**

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+ uib ciceot), antitranspirants, significance of transpiration and Guttation;

Mineral nutrition: Essential elements, macro (NPK) and micro (Zn, Mo, B) nutrients, role of essential elements.

Translocation in phloem

Composition of phloem sap, girdling experiment; Phloem transport- Munch's hypothesis

Enzymes: Structure and properties, Mode of action**.**

Vitamins: Types and their functions**.**

Respiration: Aerobic respiration - Glycolysis, Krebs's cycle, Terminal oxidation; Anaerobic respiration. Alcoholic and lactic acid fermentation.

Unit II: PLANT PHYSIOLOGY **12 Hrs.**

Photosynthesis: Photosynthetic Pigments (Chl_a, $_b$, xanthophylls, carotene); Photosystem I and II, reaction center, antenna molecules; Electron transport and mechanism of ATP synthesis; C3, C4 and CAM pathways of carbon fixation; Photorespiration, factors affecting photosynthesis.

Nitrogen metabolism: Biological nitrogen fixation; Nitrate reduction, synthesis of amino acids

Proteins: Classification, primary, secondary, tertiary and quarternary

Phytohormones: Application of auxins, gibberellins, cytokinin, ABA, ethylene

Tropic movements: Phototropism, thigmotropism, geotropism and hydrotropism

Photoperiodism: Photoperiodism (SDP, LDP, Day neutral plants); Phytochrome (discovery and structure), red and far red light responses on photomorphogenesis; **Vernalization**

Unit III: CELL BIOLOGY **12 Hrs.**

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

Cell Division: Cell cycle, Mitosis, Meiosis and their significance**.**

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

Unit IV: MOLECULAR BIOLOGY **12 Hrs.**

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;

Suggested readings

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. and Bertoni, G. P. 2009. The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco
3. Cooper G. M. and Hausman R. E., 2009. The Cell: A Molecular Approach. 5th edition. ASM Press and Sunderland, Washington, D.C., Sinauer Associates, MA.
4. Day, P. M. and Harborne, J. B. 2000. Plant Biochemistry. Harcourt Asia (P) Ltd., India and Academic Press, Singapore.
5. De Robertis, E. D. P. and De Robertis, E. M. F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.
6. Hopkins W.G., Huner, N. P. 2009. Introduction to Plant Physiology. John Wiley and Sons, U.S.A.
7. Lawlor, D.W. 1989. Photosynthesis, metabolism, control and Physiology. ELBS/ Longmans-London.
8. Mayer, B.S. Anderson, D. B. and Bohning, R. H. and Fratianne, D. G. 1973. Introduction to Plant Physiology. 2nd edition Van Nostrand. Co.
9. Mukherjee, S. and Ghosh, A. K. 1998. Plant Physiology, Tata McGraw Hill Publishers Ltd., New Delhi.
10. Noggle, G. R. and Fritz, G. J.1989. Introductory Plant Physiology. Prentice Hall of India.
11. Plummer, D. 1989. Biochemistry- The Chemistry of life. McGraw Hill Book Co
12. Salisbury, F.B and Ross, C. W. 1999. Plant Physiology. CBS Publishers and Printers, New Delhi.
13. Steward. F.C. 1964. Plants at Work (A summary of Plant Physiology) Addison- Wesley Publishing Co., London.
14. Taiz, L. and Zeiger, E. 2010. Plant Physiology. Sinauer Associates Inc., U.S.A.
15. Brown, T. A. 2010. Gene Cloning and DNA Analysis, 6th edition, Wiley and Blackwell publishers
16. Brown, T. A. 1990. Gene Cloning. Chapman and Hall.
17. De Robertis, E. D. P. and De Robertis, E. M. F. 2006. Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia
18. Rashid, A. 2009. Molecular physiology and Biotechnology of Flowering plants. Narosa Publishing House Pvt. Ltd., New Delhi
19. Singh, S. K. 2007. Cytology, Genetics and Molecular Biology. Commonwealth Publishers
20. Sinha, U. and Sinha, S. 1998. Cytogenetics. Plant Breeding and Evolution, Vikas Publications.
21. Verma, P. S. and Agarwal, P. K. 1998. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand and Company Ltd.

Theory Question Paper Scheme

IV Semester - Paper IV (DSCB 1.4)

PLANT PHYSIOLOGY, CELL BIOLOGY & MOLECULAR BIOLOGY

Code: GB0401

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

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 5 X 3 = 15

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

III. Answer any FIVE of the following 5 X 5 = 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 4 X 8 = 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 X 3 =3	3 X 2 = 6	5 X 2 = 10	8 X 1 = 08	**27**
II	1 X 2= 2	3 X 2 = 6	5 X 2 = 10	8 X 2 = 16	**34**
III	1 X 2= 2	3 X 2 = 6	5 X 2 = 10	8 X 2 = 16	**34**
IV	1 X 3= 3	3 X 1 = 3	5 X 2 = 10	8 X 2 = 16	**32**

Assessment method

Assessment		Marks
C_1	Test	05
C_2	Test	05
C_3	Semester end exam	40

Theory Question Paper Scheme

IV Semester - Paper IV (DSCB 1.4)

PLANT PHYSIOLOGY, CELL BIOLOGY & MOLECULAR BIOLOGY

Code: GB0401

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 notes 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.
25.

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

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

BOTANY—IV SEMESTER

PRACTICL--IV DSCB 1.4

Practical Syllabus

PLANT PHYSIOLOGY, CELL BIOLOGY & MOLECULAR BIOLOGY

Code: GB0402 **64 Hrs.**
Credits: **(1 practical of 4 Hrs / week)**

Practicals

Major experiments

1. Determination of osmotic potential of plant cell sap by plasmolytic method.
2. Experiment to demonstrate effect of temperature and solvent on cell membrane permeability using beet cylinders.

   Calculation of stomatal index and stomatal frequency of a mesophyte and a xerophyte.
3. Hill reaction; Effect of temperature, pH and concentration of enzyme on the activity of catalase

   Experiment on the relation between transpiration and absorption
4. To study the effect of light intensity on O2 evolution in photosynthesis
5. Comparison of the rate of respiration in any two plant parts
6. Separation of chlorophyll pigments by paper chromatography

Minor experiments

7. Suction due to transpiration, Respiration in roots, Cobalt chloride test
8. 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.
9. **Instruments**: Spectrophotometer, Centrifuge, Colorimeter

   Photographs: Mineral nutrition deficiency symptoms, Photoperiodism, Light spectrum, Growth hormones
10. Study of Photographs and charts from molecular biology and cell biology: DNA replication, Lac Operon, genetic disorder: sickle cell anemia
11. Study of fixatives and stains & Study of mitosis e.g., Onion root tip
12. Study of meiosis: Onion/ Chlorophytum flower buds.
13. Study of micrometry, karyotype and ideogram study

    Photographs/charts – Cell organelles (Nucleus, Mitochondria, Chloroplast), Salivary gland chromosome, lamp brush chromosome, DNA replication, Lac operon, Thalassemia and sickle cell anemia

Practical Question Paper

IV Semester - Practical IV (DSCB 1.3)

PLANT PHYSIOLOGY, CELL BIOLOGY & MOLECULAR BIOLOGY

Code: GB0402

Time: 3 Hrs. **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 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

IV Semester - Practical IV (DSCB 1.4)

PLANT PHYSIOLOGY, CELL BIOLOGY & MOLECULAR BIOLOGY

Code: GB0402

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

I. Perform the experiment **A** **07 Marks**

(Physiology major experiment)

II. Perform the experiment **B and C** **08 Marks**

(Physiology minor experiment and Karyotype and Ideogram)

III. Comment on **C, D and E** **12 Marks**

(1 each from Demo experiment, Instrument/growth hormone /Mineral nutrition and Permanent slide or chart from Cell biology & Molecular biology)

IV. Prepare a temporary squash of the material **F** **08 Marks**

(Mitosis/ Meiosis)

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.

BOTANY—IV SEMESTER -- DSEB 1.3
Elective paper Theory Syllabus
MEDICINAL PLANTS AND HERBAL TECHNOLOGY

Course code: GB040 **48 Hrs.**
Credits: 3 **(3 Hrs. of instruction per week)**
Course outcome

1. To understand basic aspects of Herbal technology

2. To learn about isolation and characterization of secondary metabolites

Unit I: HERBAL MEDICINES **12 Hrs.**

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

Unit II: PHARMACOGNOSY **12 Hrs.**

Systematic position 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.

Unit III: PHYTOCHEMISTRY **12 Hrs.**

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

Unit IV: ANALYTICAL PHARMACOGNOSY **12 Hrs.**

Drug adulteration- types, methods of drug evaluation, Biological testing of herbal drugs

Phytochemical screening for secondary metabolites (alkaloids, flavonoids, steroids, triterpenoids, phenolic compounds).

Suggested readings

1. Chopra, R. N., Nayar, S. L. and Chopra, I. C. 1956. Glossary of Indian medicinal plants, C.S.I.R, New Delhi.
2. Kanny, Lall, Dey and 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. and Indra, B. 1994. Ayurvedic Drugs and their Plant Source. Oxford IBH publishing Co.
5. Miller, L. and Miller, B.1998. Ayurved and Aromatherapy. Motilal Banarsidass Publications, Delhi.
6. Green, G. 2000. Principles of Ayurveda. Thomsons, London.
7. Kokate, C. K., Purohit, A. P. and Gokhale, S. B. 1999. Pharmacognosy. Nirali Prakashan.

Theory Question Paper Scheme
IV Semester - Elective Paper-1 (DSEB 1.3)
MEDICINAL PLANTS AND HERBAL TECHNOLOGY

Code: GB040

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

Instruction: Draw neat labeled diagrams wherever necessary

I. Define/ Explain any EIGHT of the following

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

II. Write short notes on any FIVE of the following

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

III. Answer any FIVE of the following

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

Theory Question Paper Scheme

IV Semester - Elective Paper I (DSEB 1.3)

MEDICINAL PLANTS AND HERBAL TECHNOLOGY

Code: GB040
Time: 3 Hrs **Max Marks: 40**
Instruction: Draw neat labeled diagrams wherever necessary

I. Define/ Explain any EIGHT of the following **8 X 1 = 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 **4 X 3 = 12**

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

III. Answer any Four of the following **4 X 5 = 20**

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

Unit	1 Mark	3 Marks	5 Marks	Total
I	1 X 2 =2	3 X 1 = 3	5 X 2 = 10	**15**
II	1 X 3= 3	3 X 2 = 6	5 X 1 = 5	**14**
III	1 X 3= 3	3 X 2 = 6	5 X 1 = 5	**14**
IV	1 X 2= 2	3 X 1 = 3	5 X 2 = 10	**15**

Assessment method

Assessment		Marks
C_1	Test	05
C_2	Test	05
C_3	Semester end exam	40

BOTANY—IV SEMESTER -- DCB 1.1

Compulsory Elective Practical paper Syllabus

NURSERY GARDENING AND LANDSCAPING

Course code: GB040 **64 Hrs.**
Credits: 2 **(4 Hrs. of instruction per week)**

Learning objectives

The program is aimed to teach students the basic knowledge required to develop entrepreneurship skills in the development of Nursery, Gardening and Landscaping. This course would train students to initiate a remunerative enterprise owing to a high demand of skilled professionals in this field.

Course outcome

1. To describe and differentiate between the types of gardens.
2. To execute several nursery and gardening operations.
3. Practice different methods for propagation of plants.
4. Assess growing conditions of different horticultural plants, their general requirements and understand their role in landscaping.

Practicals

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, Flowerbeds, 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 - foliage and flowering, Avenue trees – foliage and flowering, Climbers, Lianas, Epiphytes, Creepers, Trailers, Aquatic plants, Succulents, Weeds. 02 Weeks
8. Study of important gardens of India (any five). 01 Week
9. Methods of Landscape designing of Residential areas and Public Gardens, Aquatic Garden, Rock Garden, Industrial gardens. 01 Week

10. Concept and Application of Computer aided Designing (CAD) for landscape designing/ Preparation of landscape designs for school and college using CAD technology. 01 Week
11. Study of Interior designing with plants- Terrarium, miniature landscape. 01 Week
12. Preparation and application of herbal pesticides. 01 Week
13. Demonstration of different composting methods for Biofertilizers. 01 Week
14. Visit to a nursery/ Tissue culture Laboratory/ horticulture garden/ Aqua culture Laboratory 01 Week

Suggested readings

1. A handbook of Landscape: CPWD
2. Gopalaswamiengar, K. S., Parthasarathy, G., Mukundan, P. (1991). Complete Gardening in India. India: Gopalaswamy Parthasarathy, 'Srinivasa'.
3. Hartmann, H. T., Kester, D. E., Hartmann, H. T., Kester, D. E. (1975). Plant Propagation: Principles and Practices. India: Prentice-Hall.
4. Hodge, G., Hodge, G. (2014). Practical Botany for Gardeners: Over 3,000 Botanical Terms Explained and Explored. United Kingdom: University of Chicago Press
5. Littlepage, R., Littlepage, R. (2017). Fundamentals of Garden Design: An Introduction to Landscape Design. (n.p.): CreateSpace Independent Publishing Platform.
6. Roy, R. K., Roy, R. K. (2013). Fundamentals of Garden Designing: A Colour Encyclopedia. India: New India Publishing Agency.
7. The Royal Horticultural Society Gardening Manual. (2000). United Kingdom: Dorling Kindersley.

Practical Question Paper

IV Semester – Compulsory Elective Practical I (DCB 1.1)

NURSERY GARDENING AND LANDSCAPING

Code: GB040

Time: 3 Hrs. **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
IV Semester - Compulsory Elective Practical I (DCB 1.1)
NURSERY GARDENING AND LANDSCAPING

Code: GB040
Time: 3 Hrs. **Max. Marks: 40**

I. Perform the experiment A **07 Marks**

(Media for propagation of plants major experiment)

II. Perform the experiment B and C **08 Marks**

(Propagation methods viz., cutting, layering, division, grafting and budding)

III. Comment on C, D and E **12 Marks**

(Identification of key horticultural plants and implements)

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.

Assessment method

Assessment		**Marks**
C_1	Test	05
C_2	Test	05
C_3	Semester end exam	40