



SARDAR PATEL UNIVERSITY

Vallabh Vidyanagar

NAAC 'A' Grade (10-01-2023 To 09-01-2028)

NEP-2020 aligned Curriculum with effect from Academic Year 2026-27

Bachelor of Science in BOTANY (Semester-7, Fourth year UG)

SARDAR PATEL UNIVERSITY

NAAC 'A' Grade (10-01-2023 To 09-01-2028)

Vallabh Vidyanagar

Gujarat

Academic Program Structure

&

Curriculum

of

Bachelor of Science in BOTANY

B.Sc. Honours

and

B.Sc. Honours with Research

(Semester-7, Fourth year UG)

(Effective from June 2026)

(2026-27)

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Vallabh Vidyanagar

NAAC 'A' Grade (10-01-2023 To 09-01-2028)

NEP-2020 aligned Curriculum with effect from Academic Year 2026-27

Bachelor of Science in BOTANY (Semester-7, Fourth year UG)

Course structure

B.Sc. BOTANY Semester VII (B.Sc. Honours)

Course type and Course Code	Name/Title of Course	T / P	Credit	Contact Hours Per Week	Exam Duration in hrs	Component of Marks		
						Internal	External	Total
Botany: Major course								
US07MABOT01	Biology and Diversity of Lower Plants	T	4	4	2:30	50	50	100
US07MABOT02	Biology and Diversity of Seed Plants	T	4	4	2:30	50	50	100
US07MABOT03	Botany Practical	P	4	8	3:00	50	50	100
Botany: Minor course								
US07MIBOT01	Ethnobotany	T	2	2	1:30	25	25	50
US07MIBOT02	Botany Practical	P	2	4	2:00	25	25	50
ON JOB TRAINING (OJT)								
US07OJBOT01	On Job Training by Students		6	----	---	75	75	150
OR								
US07MABOT04	Botanical Instrumentation & Analytical Techniques-1	T	4	4	2:30	50	50	100
US07SEBOT01	Botany Practical	P	2	4	2:00	25	25	50
		-	22		-	275	275	550

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Bachelor of Science in BOTANY (Semester-7, Fourth year UG)

Course structure

B.Sc. BOTANY Semester VII (B.Sc. Honours with Research)

Course type and Course Code	Name/Title of Course	T / P	Credit	Contact Hours Per Week	Exam Duration in hrs	Component of Marks		
						Internal	External	Total
Botany: Major course								
US07MABOT01	Biology and Diversity of Lower Plants	T	4	4	2:30	50	50	100
US07MABOT02	Biology and Diversity of Seed Plants	T	4	4	2:30	50	50	100
US07MABOT03	Botany Practical	P	4	8	3:00	50	50	100
Botany: Minor course								
US07MIBOT01	Ethnobotany	T	2	2	1:30	25	25	50
US07MIBOT02	Botany Practical	P	2	4	2:00	25	25	50
Botany: Research Projects (RP)								
US07RPBOT01			6	----	---	75	75	150
		-	22		-	275	275	550

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Bachelor of Science in BOTANY (Semester-7, Fourth year UG)

Bachelor of Science
B. Sc. (Major Botany)
Semester: VII

Course Code	US07HMABOT01	Title of the	Biology and Diversity of Lower Plants
Total Credits of the Course	4	Hours per	4

Course Learning Objectives:

1. To impart knowledge on the origin of lower group of Plants, and their evolution towards non-seed-bearing plants.
2. To provide detailed information on the diversity in vegetative and reproductive organs of different groups.
3. To demonstrate the geological distribution, economic and ecological significance of each groups.

Course Learning Outcomes (CLOs): On completion of this course, students will be able to:

1. Explain the diversity, structure, nutrition, and reproduction of prokaryotic organisms including archaeobacteria, eubacteria, and cyanobacteria, and assess their ecological significance.
2. Describe the diversity, classification, thallus organization, and reproductive strategies of algae, and interpret their ecological roles and economic importance.
3. Analyze the morphology, anatomy, reproduction, and life cycles of bryophytes, and evaluate their evolutionary significance and ecological adaptations.
4. Explain the structural organization, reproductive biology, and classification of pteridophytes, including fossil groups, and assess their evolutionary trends.
5. Interpret evolutionary progression among lower plant groups with special reference to heterospory, origin of seed habit, and vascular system evolution.
6. Evaluate the ecological and economic importance of lower plants and apply this knowledge in environmental and applied biological contexts.

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Unit	Course Content US07MABOT01
1.	Archaeobacteria and Eubacteria: General account, and classification; ultra-structure, mode of nutrition and reproduction biology and economic importance Cyanobacteria – Cell Ultrastructure, ecological importance, Reproduction and life cycles, Symbiotic associations
2.	Phycology: Algae in diversified habits (terrestrial, freshwater, marine); thallus organization; cell ultra-structure; reproduction (vegetative, asexual, sexual) Classification of algae (including Criteria for classification: pigments, reserve food, flagella); Algal phylogeny (molecular insights) Salient features of Chlorophyta, Charophyta, Xanthophyta, Bacillariophyta, Phaeophyta and Rhodophyta. Ecological and economical importance and algal blooms.
3.	Bryophyta: Habit and Habitat of bryophytes. Classification of Bryophytes. Evolutionary significance and Evolution of sporophyte. Salient features of Marchantiales; Jungermanniales, Anthocerotales, Sphagnales, Funariales and Polytrichales. Economic and Ecological Importance, Bryophytes as bioindicators.
4.	Pteridophyta: Classification of Pteridophyta with examples and salient features of each class. Origin and Evolution of sporophyll, Organization and evolution of stele (vascular elements); Heterospory and Origin of Seed habit. Salient features of fossil Pteridophyta; Psilopsida, Lycopsida, Sphenopsida and Pteropsida.



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Assessment and Evaluation Pattern		
Sr. No.	Details of the Evaluation –NEP 2020, KCG and CCE (Continuous and Comprehensive Evaluation).	Weightage
1.	Internal Examination Evaluation includes Internal Formative Assessment (30 marks) (60%) a) Quiz (2 quizzes): 10 marks (20%) b) Seminar: 05 marks (10%) c) Assignment: 05 marks (10%) d) Attendance: 05 Marks (10%) e) Group Learning: 05 marks (10%) Internal Summative Assessment (20 marks) (40%): Class test at least one This makes total 50 Marks.	50%
2.	Semester End Examination (50 Marks)	50%

Suggested Learning Materials Books:

Sr. No.	Title	Author(s)	Edition/ Year	Publisher
1	Introductory Phycology.	Kumar, H. D.	1999	Affiliated East - West Press Ltd., New Delhi
2	The Biology of Algae	Round, F. E.	1976	Cambridge University Press, Cambridge.
3	Bryophyta.	Parihar, N. S.	5 th Ed. 2013	Central Book Depot, Allahabad.
4	Cryptogamic Botany (Vol. II) Bryophytes and Pteridophytes.	Smith, G. M.	2 nd Ed. 2021	McGraw- Hill.
5	The Morphology of Pteridophytes.	Sporne, K. R.	2 nd 2022	B. I. Publishing Pvt. Ltd., Bombay.
6	Palaeobotany and the Evolution of Plants.	Stewart, W. N. and Rathwell, G. W.	2 nd 1993	Cambridge University Press.

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Online Resources (Open Source)

Sr. No.	Description of Resource(s)	Web link
1	Lecture 2: Archaea and Bacteria	https://archive.nptel.ac.in/content/storage2/courses/102103015/module8/lec2/5.html
2	Lecture 51: Introduction to Algal Biomass	http://digimat.in/nptel/courses/video/103105680/L51.html
3	Plant groups (Plant Diversity)	https://onlinecourses.swayam2.ac.in/e-learning/preview/cec22_bt19
4	Lecture 2: Classification of Living Organisms	https://archive.nptel.ac.in/content/storage2/courses/122103039/module1/lec2/4.html

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Bachelor of Science in BOTANY (Semester-7, Fourth year UG)

Bachelor of Science
B. Sc. (Major Botany)
Semester: VII

Course Code	US07HMABOT02	Title of the	Biology and Diversity of Seed Plants
Total Credits of the Course	4	Hours per	4

Course Learning Objectives:

1. To impart knowledge on the origin and evolution of seed plants, their advantages over non-seed-bearing plants.
2. To provide detailed information on the diversity in vegetative and reproductive organs of different groups of gymnosperms.
3. To demonstrate the geological distribution, economic and ecological significance of gymnosperms. To demonstrate various theories on the origin of angiosperms.
4. To impart knowledge on evolution of flower and diversity in floral structures

Course Learning Outcomes (CLOs) On completing the course, the students will be able to:

1. Understanding the evolution of seed plants over the lower plants.
2. Knowledge of evolutionary trends of gymnosperms and classification.
3. Appreciate the advancement in life cycles of seed plants over the lower plants.
4. Recognize and identify the diversity and differences among various families of gymnosperms and angiosperms
5. Demonstrate the linkages of floral diversity with pollinators.
6. They will have the knowledge of evolutionary trend in seed plants

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Unit	Course Content US07MABOT02
1.	Characteristics of seed plants; evolution of the seed habit; seed plants with (angiosperms) and without (gymnosperms) fruits; fossil and living seed plants. General features of gymnosperms and their classification; evolution and diversity of gymnosperms and their distribution in India.
2.	Geological time scale, fossilization and fossil gymnosperms: Pteridospermales Morphology of vegetative and reproductive parts; anatomy of root, stem and leaf; reproduction and life cycle of Cycadales, Ginkgoales, Coniferales, Ephedrales, Welwitschiales and Gnetales.
3.	Origin and evolution of Angiosperms; primitive and fossil angiosperms; advance features of angiosperms. Morphological and anatomical diversity of vegetative parts of angiosperms.
4.	Origin and evolution of flower. Diversity in floral morphology; evolution of inflorescence patterns. Origin and evolution of ploypetaly, sympetaly, apetaly, monoecy, dioecy; co-evolution of flower vis-à-vis pollinators. Origin and evolution of stamens and carpels.

Assessment and Evaluation Pattern		
Sr. No.	Details of the Evaluation –NEP 2020, KCG and CCE (Continuous and Comprehensive Evaluation).	Weight age
1.	Internal Examination Evaluation includes Internal Formative Assessment (30 marks) (60%) f) Quiz (2 quizzes): 10 marks (20%) g) Seminar: 05 marks (10%) h) Assignment: 05 marks (10%) i) Attendance: 05 Marks (10%) j) Group Learning: 05 marks (10%) Internal Summative Assessment (20 marks) (40%): Class test at least one This makes total 50 Marks.	50%
2.	Semester End Examination (50 Marks)	50%



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Suggested Learning Materials Books:

Sr. No.	Title	Author(s)	Edition /Year	Publisher
1	An Introduction to Palaeobotany	Arnold C. A.	1972	McGraw Hill Book Company Inc.
2	Gymnosperms	Bhatnagar, S.P. and Moitra, A.	1996	New Age International Pvt.Ltd. New Delhi.
3	Gymnosperms-Structure and Evolution	Chamberlein C.J	1966	University of Chicago Press
4	Plant anatomy	Cutter E.G	1971	London; E. Arnold
5	Morphology of Gymnosperms	Cutter E.G and Chamberlein C.J	1978	University of Chicago Press
6	Morphology of Angiosperms	Eames A J	1961	McGraw Hill Book Co
7	Plant Anatomy – Anatomy of Seed Plants	Easu K	1962	Wiely, New York
8	Plant Anatomy.	Fahan A.	1969	Oxford press; New York
9	Comparative Morphology of Vascular Plants.	Foster A. S. and Gifford E. M.	1959	San Francisco, W.H. Freeman
10	Anatomy of the Dicotyledons	Metcalf C. R. and L. Chalk	1950	Oxford At The Clarendon Press.
11	Essentials of Palaeobotany	Shukla A. C. and Mishra S. D.	1975	Vikas Publisher.
12	The Morphology of gymnosperms	Sporne, K. R.	1967	B. I. Publishing Pvt. Ltd., Bombay
13	Morphology of Angiosperms	Sporne K R	1974	Hutchinson University Library, London.
14	Aquatic angiosperms	Subrahmanya m K	2024	BSI. India
15	Gymnosperms	Vashistha P. C.	1976	Chand and Company.
16	Paleobotany and the Evolution of Plants	Stewart, W. N. and Rathwell, G. W.	2005	Cambridge University Press.



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Online Resources (Open Source)

Sr. No.	Description of Resource(s)	Web link
1	The Systematics and Evolution of Gymnosperms with an Emphasis on a Few Problematic Taxa	https://doi.org/10.3390/plants13162196
2	Paleobotany and Global Change: Important Lessons for Species to Biomes from Vegetation Responses to Past Global Change	https://doi.org/10.1146/annurev-arplant-042817-040405
3	Anatomy of Flowering Plants: An Introduction to Structure and Development	https://doi.org/10.1017/CBO9780511801709
4	Anatomy of the Primary Vascular System in Dicotyledonous Plants	https://www.nature.com/articles/158737a0#citeas

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Bachelor of Science in BOTANY (Semester-7, Fourth year UG)

Bachelor of Science B. Sc. (Major Botany Practical) Semester: VII

Course Code	US07HMABOT03	Title of the	Major Botany Practical (Lower groups to Seed plants)
Total Credits of the Course	4	Hours per	8

Course Objectives:

1. To identify and classify various groups of plants with their features.
2. To observe vegetative and reproductive structures of all groups of plants.
3. To know local flora for developing field observation skill.
4. To preserve dry samples through herbarium techniques.

Course Learning Outcomes (CLOs): On completion of this course, students will be able to:

1. Identify and classify major groups of plants (algae, bryophytes, pteridophytes, gymnosperms, and angiosperms) based on morphological and anatomical characteristics.
2. Examine and interpret vegetative and reproductive structures using microscopic and macroscopic techniques.
3. Compare structural and reproductive diversity across plant groups to understand evolutionary relationships.
4. Demonstrate skills in specimen collection, preservation, herbarium preparation, and field documentation.
5. Analyze plant specimens and experimental observations to draw scientific conclusions.
6. Communicate scientific findings effectively through practical records, diagrams, and viva-voce.

Course Content: Practical Aim

1. Observation of Thallus organization of freshwater, marine and terrestrial algae.
2. Observation of Reproductive structure of freshwater, marine and terrestrial algae.
3. Identification and observation of Algae and their diversity in the nearby water body.
4. Identification and observation of different species of bryophyte from the fixed samples.
5. Observation of reproductive structures of bryophytes from permanent slides.
6. Observation of anatomical structure of bryophytes from permanent slides.
7. Observation of sporophyte structure of different species of Pteridophytes from fresh or preserved specimen.

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8. Observation of reproductive structures of Pteridophytes from fresh specimen or permanent slides.
9. Observation of anatomical structure of Pteridophytes from permanent slides.
13. Comparative study of anatomy of vegetative and reproductive parts of Cycas, Cedrus, Cupressus, Araucaria, Ephedra and Gnetum.
14. Study of important fossil gymnosperms and angiosperms from permanent slides/specimens/photos.
15. Morphological description of different angiosperms to record the diversity among those plants. (This will cover the locally available plant families through repeated lab exercises).
16. Field trips within and around the campus to be conducted for compilation of field notes and preparation of herbarium sheets of a 15 local, wild or cultivated plants.

Assessment and Evaluation Pattern

Sr. No.	Details of the Evaluation –NEP 2020, KCG and CCE (Continuous and Comprehensive Evaluation).	Weightage
1.	Internal Formative assessment (30 marks) (60%) a. Quiz/spotting: 10 marks (20%) b. Laboratory record: 05 marks (10%) c. Attendance: 05 Marks (10%) d. Viva Voce: 10 marks (20%) Internal Summative Assessment: Problem Based Learning (20 marks) (40%); Internal Practical examination. This makes total 50 marks.	50%
2.	External Assessment: End of Term Practical Examination (50 marks) Lab works (40 marks) (80%), Viva-voce/Lab Quiz (10 marks) (20%)	50%

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Bachelor of Science in BOTANY (Semester-7, Fourth year UG)

Suggested Learning Materials Books:

Sr. No.	Title	Author(s)	Edition/Year	Publisher
1	Round, F. E.	The Biology of Algae		Cambridge University Press, Cambridge
2	Sporne, K. K.	The Morphology of Pteridophytes.		B. I. Publishing Pvt. Ltd., Bombay.
3	Puri, P.	Bryophytes		Atma Ram & Sons, Delhi.
4	Coulter and Chamberlain J. M.	Morphology of Gymnosperms.	1978	Cambridge university press London and edinburgh
5	Eames A J	Morphology of Angiosperms	1961	McGraw Hill Book Co.
6	Foster A. S. and Gifford E. M.	Comparative Morphology of Vascular Plants.	1959	W. H. Freeman and Company, San Francisco

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SARDAR PATEL UNIVERSITY

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Bachelor of Science in BOTANY (Semester-7, Fourth year UG)

Bachelor of Science
B. Sc. (MINOR BOTANY)
Semester: VII

Course Code	US07HMIBOT01	Title of the Course	Ethnobotany
Total Credits of the Course	2	Hours per Week	2

Course Objectives:

1. To learn History, Scope and Importance of ethnobotany.
2. To learn various methods to interact with local people to bring out the traditional knowledge on plants.
3. To learn various methods of ethnobotanical practices.
4. To understand few plant species for their traditional uses.

Course Learning Outcomes (CLOs): Having completed this course, the learner will be able to

1. Know the ethnobotanically important plants based on traditional uses.
2. Know various traditional methods to extract constituents from plants.
3. Learn methods to interact with local people to get their knowledge on plants.

Course Content

Unit	Description	Weightage* (%)
1.	<u>Fundamentals of Ethnobotany:</u> History of ethnobotany, Concept of ethnobotany, Scope of ethnobotany, Importance of ethnobotany, Ethnobotany as an interdisciplinary science. Ethnobotanical studies: Collection of ethnobotanical data, Manners of collection of ethnobotanical data (Direct and indirect approach, Miscellaneous), Interviewing and Interviewing Protocol, Documentation of the Information.	50%

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2.	<u>Ethnobotanical Practices:</u> Problems occur during ethnobotanical survey, Strategies to overcome the problems. Different methods of preparation of traditional medicines: (i) Maceration (ii) Infusion (iii) Digestion (iv) Decoction (v) Percolation. Medico-ethnobotanical sources in India; Significance of the following plants in ethnobotanical practices (along with their habitat and morphology) - Artemisia spp., - Azadiractha indica, - Bombax ceiba, - Cassia auriculata, - Gloriosa superba, - Indigofera tinctoria, - Madhuca indica, - Ocimum sanctum, - Pongamia pinnata, - Rauvolfia serpentina, - Terminalia bellerica, - Tinospora cordiflora, - Tribulus terrestris, - Trichopus zeylanicus, - Vitex negundo, - Withania somnifera.	50%
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Teaching-Learning Methodology	Classroom interaction, Power point presentation, Charts, quiz, assignments, seminars, online content from internet, field visit.
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Assessment and Evaluation Pattern		
Sr. No.	Details of the Evaluation –NEP 2020, KCG and CCE (Continuous and Comprehensive Evaluation).	Weightage
1.	Internal Examination Evaluation includes Internal Formative Assessment (15 marks) (60%) - Quiz (at least one): 05 marks (20%) - Home Assignment: 05 marks (20%) - Attendance: 05 Marks (20%) Internal Summative Assessment (10 marks) (40%): Class test at least one This makes total 25 Marks.	50%
2.	Semester End Examination (25 Marks)	50%

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Bachelor of Science in BOTANY (Semester-7, Fourth year UG)

Suggested References:

1. Jain S. K., A manual of Ethnobotany by published by scientific publishers Jodhpur.
2. Jain, S. K., (Ed) 1981. Glimpses of Indian Ethnobotany. Oxford & 1BH Co. New Delhi.
3. Jain, S. K., 1964. The role of a Botanist in folklore Research. Folklore 5: 145-150.
4. Jain, S. K., 1964. Wild plant foods of the tribals of Bastar (Madhya Pradesh), Proc. nation. Inst Sci. India 30B: 56-80.
5. Jain, S. K., 1965. Medicinal plant lore of the tribals of Bastar. Econ. Bot. 19:236-250.
6. Jain, S. K., 1967. Ethnobotany, its scope and study. Indian Mus Bull. 2:39-43.
7. Jain, S.K., 2010. Manual of Ethnobotany. Rajasthan: Scientific Publishers.
8. Dr. Pooja Juyal et al., (2023) Ethnobotany by Uttarakhand open university press, Haldwani, Nainital-263139

On-line resources to be used if available as reference material Web links: (Open source)

<https://www.bionity.com/en/encyclopedia/Ethnobotany.html>

<https://www.biologydiscussion.com/botany/ethno-botany-definitions-development-and-importance/7158>

<http://www.ub.edu/irbio/the-importance-of-ethnobotany-n-1028-en>

<https://unacademy.com/content/upsc/study-material/biology/importance-of-ethnobotany>

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Bachelor of Science in BOTANY (Semester-7, Fourth year UG)

Bachelor of Science
B. Sc. (Minor Botany Practical)
Semester: VII

Course Code	US07HMIBOT02	Title of the Course	Botany Practical (Ethnobotany)
Total Credits of the Course	2	Hours per Week	4

Course Objectives:

1. To understand traditional knowledge of plants and their role in human life.
2. To learn ethnobotanical practices and methods.
3. To learn few plant species in perspective of traditional uses.

Course Learning Outcomes (CLOs): Having completed this course, the learner will be able to

1. Identify ethnobotanically important plants based on traditional uses.
2. Know various traditional methods to extract constituents from plants.
3. Learn methods to interact with local people to get their knowledge on plants.
4. Prepare and submit a scientific project related to Ethnobotany.

	Course Content: Practical Aim	Weightage* (%)
1.	To study the Collection of ethnobotanical data.	
2	To study the Interviewing and Interviewing Protocol of ethnobotanical data.	
3.	To study the Documentation of the Information of ethnobotanical data.	
4.	An overview of Different methods of preparation of traditional medicines.	
5.	To study the Significance of the following plants in ethnobotanical practices: <i>Artemisia</i> spp., <i>Azadirachta indica</i> , <i>Bombax ceiba</i> , <i>Cassia auriculata</i> , <i>Gloriosa superba</i> , <i>Indigofera tinctoria</i> ,	



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6.	To study the Significance of the following plants in ethnobotanical practices: Madhuca indica, Ocimum sanctum, Pongamia pinnata, Rauvolfia serpentina, Terminalia bellerica,	
7.	To study the Significance of the following plants in ethnobotanical practices: Tinospora cordiflora, Tribulus terrestris, Trichopus zeylanicus, Vitex negundo, Withania somnifera.	
8.	To List out the Tribes of Gujarat, Madhya Pradesh, Rajasthan and Maharashtra with their specific geographic locations.	
9.	Fieldtrip/Submission	

Teaching-Learning Methodology	Laboratory work and interaction, Power point presentation, Charts, models, photographs, online content, quiz, assignments, field visit.
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Assessment and Evaluation Pattern		
Sr. No.	Details of the Evaluation –NEP 2020, KCG and CCE (Continuous and Comprehensive Evaluation).	Weightage
1.	Internal Formative assessment (15 marks) a) Viva Voce/ Lab Quiz: 10 marks (40%) b) Laboratory record: 05 marks (20%) Internal Summative Assessment: Problem Based Learning Internal Practical examination. Lab work (10 marks) (40%) This makes total 25 marks.	50%
2.	External Assessment: End of Term Practical Examination (25 marks) Lab works (20 marks) (80%), Viva-voce/Lab Quiz (05 marks) (20%)	50%

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SARDAR PATEL UNIVERSITY

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NAAC 'A' Grade (10-01-2023 To 09-01-2028)

NEP-2020 aligned Curriculum with effect from Academic Year 2026-27

Bachelor of Science in BOTANY (Semester-7, Fourth year UG)

Suggested References:

1. Jain S.K., A manual of Ethnobotany by published by Scientific publishers Jodhpur.
2. Jain, S. K., (Ed) 1981. Glimpses of Indian Ethnobotany. Oxford & 1BH Co. New Delhi.
3. Jain, S. K., 1964a. The role of a Botanist in folklore Research. Folklore 5: 145-150.
4. Jain, S. K., 1964b. Wild plant foods of the tribals of Bastar (Madhya Pradesh), Proc. nation. Inst Sci. India 30B : 56-80.
5. Jain, S. K., 1965. Medicinal plant lore of the tribals of Bastar. Econ. Bot. 19:236-250.
6. Jain, S. K., 1967. Ethnobotany, its scope and study. Indian Mus Bull. 2:39-43.
7. Jain, S.K., 2010. Manual of Ethnobotany. Rajasthan: Scientific Publishers.
8. Dr. Pooja Juyal et al., (2023) Etthnobotany by Uttarakhand open university press, Haldwani, Nainital-263139

On-line resources to be used if available as reference material

<https://www.bionity.com/en/encyclopedia/Ethnobotany.html>

<https://www.biologydiscussion.com/botany/ethno-botany-definitions-development-and-importance/7158>

<http://www.ub.edu/irbio/the-importance-of-ethnobotany-n-1028-en>

<https://unacademy.com/content/upsc/study-material/biology/importance-of-ethnobotany>

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Bachelor of Science in BOTANY (Semester-7, Fourth year UG)

Bachelor of Science (BOTANY)

B. Sc. (BOTANY)

Semester: VII

In Option to OJT as Major Course

Course Code	US07HMABOT04 (T)	Title of the	Botanical Instrumentation & Analytical Techniques-1
Total Credits of the Course	4	Hours per	4

Course Objectives:

1. To learn basic and advance microscopy principles and application.
2. To learn small scale measurements, sectioning and staining techniques.
3. To learn functioning of lab essential equipment.

Course Learning Outcomes (CLOs): Having completed this course, the learner will be able to

1. Use the light microscopes, stereo-microscopes, research microscopes for laboratory experiments.
2. Get the knowledge of principles and functioning of advance microscopy.
3. Measures the size of cell structures using micrometry techniques.
4. Understand principles of the microtome and apply staining techniques for preparation of plant material samples.
5. Understand the uses of essential basic equipment for research laboratory applications.

Course Content

Unit	Description	Weightage* (%)
1.	Microscopy & Imaging Microscopy Principles: Light (Simple and Compound), Simple & Compound Light Microscopes: Parts, magnification principles, and handling. Stereo/Dissecting Microscopes: Used for embryo separation and whole-mount taxonomic studies. Quantitative Micrometry: Use of ocular and stage micrometres for measuring cell dimensions.	50%

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2.	Advanced Microscopy & Imaging Principles and parts of phase contrast, Polarizing, fluorescence, confocal microscopy High-Resolution Imaging: Principles, design and applications of Scanning Electron Microscopy (SEM) and Transmission Electron Microscopy (TEM). Digital Integration: Basics of photomicrography and digital imaging systems.	50%
3.	Sectioning and staining techniques Simple Hand Knife sectioning. Microtome: Rotary, Cryostat, Ultramicrotome Common basic staining techniques: Simple staining, Double staining, Metachromatic staining Preparation of Frequently used stains and their targets: Safranin O, Fast green, Iodine, Lactophenol Cotton blue, Methylene blue, Crystal violet, Toluidine blue O, Acetocarmine, Phloroglucinol-HCl, Sudan III/IV	
4.	Laboratory Essentials & Equipment: pH Meter: Measuring acidity/alkalinity in water-based solutions and culture media. Precision Measurement: Handling of Micropipettes. Electronic Analytical Balances: High-precision weighing for chemical and media preparation. Incubator: Temperature-controlled chambers for growing microbial and plant cell cultures. B.O.D. and Seed Germinators for controlled plant growth. Physiological Apparatus: Use of Potometers (transpiration), Respirometers (respiration), and Auxonometers (growth). Double Distillation units: Principles and Operation.	

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Bachelor of Science in BOTANY (Semester-7, Fourth year UG)

Teaching-Learning Methodology	Classroom interaction, Power point presentation, Charts, quiz, assignments, seminars, online content from internet.
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Assessment and Evaluation Pattern		
Sr. No.	Details of the Evaluation –NEP 2020, KCG and CCE (Continuous and Comprehensive Evaluation).	Weightage
1.	Internal Examination Evaluation includes Internal Formative Assessment (30 marks) (60%) a) Quiz (2 quizzes): 10 marks (20%) b) Seminar: 05 marks (10%) c) Assignment: 05 marks (10%) d) Attendance: 05 Marks (10%) e) Group Learning: 05 marks (10%) Internal Summative Assessment (20 marks) (40%): Class test at least one This makes total 50 Marks.	50%
2.	Semester End Examination (50 Marks)	50%

Suggested References:
1. Textbook of Modern Analytical Techniques (2024) by Dr. Brijesh Shivhare et al.. 2. Plant Microtechnique by D.A. Johansen. 3. Staining Techniques: A Manual by N.N. Bhandari. 4. Introduction to Plant Biotechnology (4th Edition) by H.S. Chawla. 5. Practical Plant Biotechnology and Genetics by Archana Rani. 6. Practical Botany: For Advanced Level and Intermediate Students by C. J. Wallis. 7. Practical Botany (Vols. I & II) by Bendre and Kumar. 8. Laboratory Manual of Plant Biotechnology by H.S. Chawla. 9. Methods in Plant Molecular Biology by Mary A. Schuler and Raymond E. Zielinski. 10. Botanical Microtechnique: A Handbook of Methods by Alpha Edition. 11. Plant Anatomy and Microtechniques by Saras Publication. 12. Laboratory Manual of Plant Sciences (3rd Ed) by O.P. Sharma.

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On-line resources to be used if available as reference material
Biology LibreTexts: Introduction to Staining for fundamental principles.



SARDAR PATEL UNIVERSITY

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NAAC 'A' Grade (10-01-2023 To 09-01-2028)

NEP-2020 aligned Curriculum with effect from Academic Year 2026-27

Bachelor of Science in BOTANY (Semester-7, Fourth year UG)

Bachelor of Science

B. Sc. (Minor Botany Practical)

Semester: VII

In option to OJT as Subject elective

Course Code	US07HSEBOT01	Title of the Course	Botany Practical
Total Credits of the Course	2	Hours per Week	4

Course Objectives:

1. To operate light and research microscopes.
2. To operate stereomicroscope.
3. To prepare permanent slides for plant material.
4. To measure cell size using micrometry techniques.
5. To study various stages of mitosis cell division through squash techniques.
6. To calibrate essential laboratory equipments.
7. To handle micropipettes, and electronic balance.
8. To determine quality of water samples.

Course Learning Outcomes (CLOs): Having completed this course, the learner will be able to

1. To carry out sectioning, staining, and observation using different kinds of microscopes for permanent and temporary slide preparations.
2. To apply micrometry and squash techniques.
3. To handle essential laboratory equipment.
4. To handle micropipettes, and electronic balance.
5. To carry out water sample analysis.

	Course Content: Practical Aim	Weightage* (%)
1.	To study the parts of Light (Simple and Compound) and Stereo/Dissecting microscopes.	
2	To study microscopy handling by temporary slide preparation of plant specimen.	

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3.	To study microscopy handling by permanent slide preparation of any dicot young stem.	
4.	To study the measurement of cell size using ocular and stage micrometers to determine the dimensions of onion epidermal cell and pollen grains.	
5.	To study a root tip squash (e.g., onion) to observe mitotic stages using a compound microscope.	
6.	To study parts of rotary microtome.	
7.	To study calibrating a pH meter and determine pH value of given samples.	
8.	To study principles and operations of double distillation unit.	
9.	To study the High-precision weighing for chemical and media preparation by electronic balance.	
10.	To study the handling of Micropipettes.	
11.	To determine the BOD of given water samples from polluted and non-polluted sources.	
12.	Field visit to nearby Instrumentation laboratory (e.g., SICART) or Biotechnology industry. Prepare and submit scientific report.	

Teaching-Learning Methodology	Laboratory work and interaction, Power point presentation, Charts, models, photographs, online content, quiz, assignments, field visit.
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Assessment and Evaluation Pattern		
Sr. No.	Details of the Evaluation –NEP 2020, KCG and CCE (Continuous and Comprehensive Evaluation).	Weightage
1.	Internal Formative assessment (15 marks) c) Viva Voce/ Lab Quiz: 10 marks (40%) d) Laboratory record: 05 marks (20%) Internal Summative Assessment: Problem Based Learning Internal Practical examination. Lab work (10 marks) (40%) This makes total 25 marks.	50%
2.	External Assessment: End of Term Practical Examination (25 marks) Lab works (20 marks) (80%), Viva-voce/Lab Quiz (05 marks) (20%)	50%

Suggested References:

1. Textbook of Modern Analytical Techniques (2024) by Dr. Brijesh Shivhare et al..
2. Plant Microtechniques by D.A. Johansen.
3. Staining Techniques: A Manual by N.N. Bhandari.
4. Introduction to Plant Biotechnology (4th Edition) by H.S. Chawla.
5. Practical Plant Biotechnology and Genetics by Archana Rani.
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7. Practical Botany (Vols. I & II) by Bendre and Kumar.
8. Laboratory Manual of Plant Biotechnology by H.S. Chawla.
9. Methods in Plant Molecular Biology by Mary A. Schuler and Raymond E. Zielinski.
10. Botanical Microtechniques: A Handbook of Methods by Alpha Edition.
11. Plant Anatomy and Microtechniques by Saras Publication.
12. Laboratory Manual of Plant Sciences (3rd Ed) by O.P. Sharma.

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