

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's
New Arts, Commerce, and Science College, Ahmednagar
(Autonomous)
(Affiliated to Savitribai Phule Pune University, Pune)



National Education Policy (NEP)
Choice Based Credit System (CBCS)

Programme Skeleton and Syllabus of
B.Sc. Botany (Major)

Implemented from

Academic Year 2023-24

Credit Distribution: B.Sc. Botany (Major) including Minor and OE and other courses.

	Type of Courses	III Yr	IV Yrs (Honours)	IV Yrs (Research)
Major	Discipline-Specific Courses (DSC)	46	74	66
	Discipline Specific Elective (DSE)	08	16	16
	Skill Enhancement Courses (SEC)	06	06	06
	Vocational Skill Courses (VSC)	08	08	08
	On-Job Training (OJT)	04	08	04
	Field Project (FP)	04	04	04
	Community Engagement and Service (CEP)	02	02	02
	Research project	00	00	12
	Research Methodology	00	04	04
	Indian Knowledge System	02	02	02
	Total (I, II and III Year)	80	124	124
Minor	Minor	20	20	20
Other Courses	Open Elective (OE)/ Multidisciplinary Courses	12	12	12
	Co-Curricular Courses	08	08	08
	Ability Enhancement Courses	08	08	08
	Value Education Courses	04	04	04
	Total	132	176	176

B. Sc. Programme Framework: Credit Distribution

Year	Semester	Level	Major										Minor	OE	CC	AEC	VEC	Total	
			DSC		DSE		SEC		VSC		FP/OJT /IN/CEP								IKS
			T	P	T	P	T	P	T	P	T	P		T/P	-	-	-	-	-
I	I	4.5	4	2	-	-	-	2	-	-	-	-	2	03	3	2	2	2	22
I	II	4.5	6	-	-	-	2	-	2	-	-	-		03	3	2	2	2	22
Exit Option: Award of UG Certificate in Major with 44 credits and an additional 4 credit core NSQF course /Internship or Continue with Major and Minor																			
II	III	5.0	6	2	-	-	2	-	-	-	2		03	3	2	2	-	-	22
II	IV	5.0	6	2	-	-	-	-	2	-	2		03	3	2	2	-	-	22
Exit Option: Award of UG Diploma in Major with 88 credits and an additional 4 credit core NSQF course /Internship or Continue with major and minor																			
III	V	5.5	8	2	2	2	-	-	-	2		2	04	-	-	-	-	-	22
III	VI	5.5	6	2	2	2	-	-	-	2		4	04	-	-	-	-	-	22
Exit Option: Award of UG Degree in Major and Minor with 132 credits or continue with Major for a 4-year Degree																			
IV	VII	6.0	8	6	2	2	RM-4	-	-	-	-		-	-	-	-	-	-	22
IV	VIII	6.0	8	6	2	2	-	-	-	-	4		-	-	-	-	-	-	22

Four Year UG Degree (Honours) with Major and Minor with 176 credits																			
IV	VII	6.0	6	4	2	2	RM-4		-	-	-	4		-	-	-	-	-	22
IV	VIII	6.0	6	4	2	2	-	-	0	-	-	8		-	-	-	-	-	22

Four Year UG Degree (Honours with Research) with Major and Minor with 176 credits

B. Sc. Programme Framework: Course Distribution

Year	Semester	Level	Major										Minor		OE	CC	AEC	VEC	Total	
			DSC		DSE		SEC		VSC		FP/OJT /IN/CEP		IKS	T						P
	-	-	T	P	T	P	T	P	T	P	T	P				T	P	-	-	
I	I	4.5	2	1	-	-	-	1	-	-	-	-	1	1		1	1	1	1	10
I	II	4.5	2	-	-	-		1	-	1	-	-		1		1	1	1	1	09
Exit Option: Award of UG Certificate in Major with 44 credits and an additional 4 credit core NSQF course /Internship or Continue with major and minor																				
II	III	5.0	2	1	-	-		1	-	-	-	1		1		1	1	1	-	09
II	IV	5.0	2	1	-	-		-	-	1	-	1		1		1	1	1	-	09
Exit Option: Award of UG Diploma in Major with 88 credits and an additional 4 credit core NSQF course /Internship or Continue with major and minor																				
III	V	5.5	2	1	1	1	-	-	-	1		1		1		-	-	-	-	08
III	VI	5.5	2	1	1	1	-	-	-	1		1		1		-	-	-	-	08
Exit Option: Award of UG Degree in Major and Minor with 132 credits or continue with Major for a 4-year Degree																				
IV	VII	6.0	3	3	1	1	0	1	-	-	-	-		-	-	-	-	-	-	09
IV	VIII	6.0	3	3	1	1	-	-	-	-	-	1		-	-	-	-	-	-	09
Four Year UG Degree(Honours) with Major and Minor with 176 credits																				
IV	VII	6.0	2	2	1	1	0	1	-	-	-	1		-	-	-	-	-	-	08
IV	VIII	6.0	2	2	1	1	-	-	-	-	-	1		-	-	-	-	-	-	07
Four Year UG Degree (Honours with Research) with Major and Minor with 176 credits																				

Programme Framework (Course Distribution): B.Sc. Botany (Major)

Year	Semester	Level	Major											Total	
			DSC		DSE		SEC		VSC		FP/OJT /IN/CEP/PR		IKS	T	P/PR
			T	P	T	P	T	P	T	P	T	P	T		
I	I	4.5	2	1	-	-	-	1	-	-	-	-	01	03	02
I	II	4.5	2	-	-	-	1	-	1	-	-	-	-	02	02
II	III	5.0	2	1	-	-	1	-	-	-	1	-	02	03	
II	IV	5.0	2	1	-	-	-	-	1	-	1	-	02	03	
III	V	5.5	2	1	1	1	-	-	-	1	-	1	03	04	
III	VI	5.5	2	1	1	1	-	-	-	1	-	1	03	04	
B.Sc. Honours															
IV	VII	6.0	3	3	1	1	RM-1	-	-	-	-	-	05	04	
IV	VIII	6.0	3	3	1	1	-	-	-	-	1	-	04	05	
B.Sc. Honours with Research															
IV	VII	6.0	2	2	1	1	RM-1	-	-	-	1	-	04	04	
IV	VIII	6.0	2	2	1	1	-	-	-	-	1	-	03	04	

Programme Framework (Credit Distribution): B.Sc. Botany (Major)

Year	Semester	Level	Major											Total
			DSC		DSE		SEC		VSC		FP/OJT /IN/CEP/RP		IKS	
			T	P	T	P	T	P	T	P	T	P	T	
I	I	4.5	4	2	-	-	-	2	-	-	-	-	02	10
I	II	4.5	6	-	-	-	2	-	2	-	-	-	-	10
II	III	5.0	6	2	-	-	2	-	-	-	2	-	12	
II	IV	5.0	6	2	-	-	-	-	2	-	2	-	12	
III	V	5.5	8	2	2	2	-	-	-	2	-	2	18	
III	VI	5.5	6	2	2	2	-	-	-	2	-	4	18	
IV	VII	6.0	8	6	2	2	RM-4	-	-	-	-	-	22	
IV	VIII	6.0	8	6	2	2	-	-	-	-	-	4	22	
IV	VII	6.0	6	4	2	2	RM-4	-	-	-	-	4	22	
IV	VIII	6.0	6	4	2	2	-	-	-	-	-	8	22	

Programme Framework (Courses and Credits): B.Sc. Botany (Major)

Sr. No.	Year	Sem.	Level	Course Type	Course Code	Title	Credits
1.	I	I	4.5	DSC-1	BS-BO111T	Cryptogams	02
2.	I	I	4.5	DSC-2	BS-BO112T	Phanerogams	02
3.	I	I	4.5	DSC-3	BS-BO113P	Practical based on BO 111T and BO 112 T	02
4.	I	I	4.5	SEC-1	BS-BO114P	Floricultural practices	02
5.	I	I	4.5	IKS-1	BS-BO115T	Plants in Indian Traditional Medicinal System	02
6.	I	II	4.5	DSC-4	BS-BO121T	Plant Morphology	03
7.	I	II	4.5	DSC-5	BS-BO122T	Principles of Plant Sciences	03
8.	I	II	4.5	SEC-2	BS-BO123P	Pomoculture and Horticulture	02
9.	I	II	4.5	VSC-1	BS-BO124P	Nursery Management	02
10.	II	III	5.0	DSC-6	BS-BO231T	Taxonomy of Angiosperms and Plant Ecology	03
11.	II	III	5.0	DSC-7	BS-BO232T	Plant Physiology	03
12.	II	III	5.0	DSC-8	BS-BO233P	Practical based on BO231T and BO 232T	02
13.	II	III	5.0	SEC-3	BS-BO234P	Biofertilizers and Biopesticides	02
14.	II	III	5.0	FP-01	BS-BO235P	Field Project	02
15.	II	IV	5.0	DSC-9	BS-BO241T	Plant Anatomy and Embryology	03
16.	II	IV	5.0	DSC-10	BS-BO242T	Plant Biotechnology	03
17.	II	IV	5.0	DSC-11	BS-BO243P	Practical based on BO241T and BO242T	02
18.	II	IV	5.0	VSC-2	BS-BO244P	Herbal Technology	02
19.	II	IV	5.0	CEP-01	BS-BO245P	Community Engagement and Service	02
20.	III	V	5.5	DSC-12	BS-BO351T	Systematics of Cryptogams	04
21.	III	V	5.5	DSC-13	BS-BO352T	Spermatophytic and Palaeobotany	04
22.	III	V	5.5	DSC-14	BS-BO353P	Practical based on BO351T and BO352T	02
23.	III	V	5.5	DSE-01	BS-BO354T	Cell and Molecular Biology	02
24.	III	V	5.5	DSE-02	BS-BO355P	Practical based on BO354T	02
25.	III	V	5.5	VSC-3	BS-BO356P	Plant Pathology	02
26.	III	V	5.5	FP-02	BS-BO357P	Field Project	02
27.	III	VI	5.5	DSC-15	BS-BO361T	Plant Physiology and Biochemistry	03
28.	III	VI	5.5	DSC-16	BS-BO362T	Plant Ecology and Evolution	03
29.	III	VI	5.5	DSC-17	BS-BO363P	Practical based on BO361T and BO362T	02
30.	III	VI	5.5	DSE-03	BS-BO364T	Plant Genetics	02

31.	III	VI	5.5	DSE-04	BS-BO365P	Practical based on BO364T	02
32.	III	VI	5.5	VSC-4	BS-BO366P	Plant Breeding and Seed Technology	02
33.	III	VI	5.5	OJT-01	BS-BO367P	On Job Training	04

B.Sc. Botany (Major with Honours)

34.	IV	VII	6.0	DSC-18	BS-BO471T	Botanical Techniques	03
35.	IV	VII	6.0	DSC-19	BS-BO472T	Plant Physiology	03
36.	IV	VII	6.0	DSC-20	BS-BO473T	Cytogenetics and Plant Breeding	02
37.	IV	VII	6.0	DSC-21	BS-BO474P	Practical based on BO471T	02
38.	IV	VII	6.0	DSC-22	BS-BO475P	Practical based on BO472T	02
39.	IV	VII	6.0	DSC-23	BS-BO476P	Practical based on BO473T	02
40.	IV	VII	6.0	DSE-05	BS-BO477T	Forensic Botany	02
41.	IV	VII	6.0	DSE-06	BS-BO478P	Practical based on BO477T	02
42.	IV	VII	6.0	RM-01	BS-BO479T/P	Research Methodology	04
43.	IV	VIII	6.0	DSC-24	BS-BO481T	Computational Botany	03
44.	IV	VIII	6.0	DSC-25	BS-BO482T	Developmental Botany	03
45.	IV	VIII	6.0	DSC-26	BS-BO483T	Biochemistry	02
46.	IV	VIII	6.0	DSC-27	BS-BO484P	Practical based on BO481T	02
47.	IV	VIII	6.0	DSC-28	BS-BO485P	Practical based on BO482T	02
48.	IV	VIII	6.0	DSC-29	BS-BO486P	Practical based on BO483T	02
49.	IV	VIII	6.0	DSE-07	BS-BO487T	Plant Tissue Culture Technology	02
50.	IV	VIII	6.0	DSE-08	BS-BO488P	Practical based on BO487T	02
51.	IV	VIII	6.0	OJT-02	BS-BO489P	On Job Training	04

B.Sc. Botany (Major Honours with Research)

34.	IV	VII	6.0	DSC-20	BS-BO471T	Botanical Techniques	03
35.	IV	VII	6.0	DSC-21	BS-BO472T	Plant Physiology	03
36.	IV	VII	6.0	DSC-22	BS-BO473P	Practical based on BO471T	02
37.	IV	VII	6.0	DSC-23	BS-BO474P	Practical based on BO472T	02
38.	IV	VII	6.0	DSE-05	BS-BO475T	Forensic Botany	02
39.	IV	VII	6.0	DSE-06	BS-BO476P	Practical based on BO475T	02
40.	IV	VII	6.0	RM-01	BS-BO477T/P	Research Methodology	04
41.	IV	VII	6.0	RP-01	BS-BO478P	Research Project	04

Department of Botany, New Arts, Commerce and Science College, Ahmednagar

42.	IV	VIII	6.0	DSC-20	BS-BO481	Computational Botany	03
43.	IV	VIII	6.0	DSC-21	BS-BO482	Developmental Botany	03
44.	IV	VIII	6.0	DSC-22	BS-BO483	Practical Based on BO481T	02
45.	IV	VIII	6.0	DSC-23	BS-BO484	Practical Based on BO482T	02
46.	IV	VIII	6.0	DSE-07	BS-BO485	Plant Tissue Culture Technology	02
47.	IV	VIII	6.0	DSE-08	BS-BO486	Practical Based on BO485T	02
48.	IV	VIII	6.0	RP-02	BS-BO487	Research Project	08

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's
New Arts, Commerce and Science College, Ahmednagar
(Autonomous)

Board of Studies in Botany

Sr. No.	Name	Designation
1.	Dr. D. D. Ahire	Chairman
2.	Dr. Y. R. Gahile	Member
3.	Dr. B. A. Karle	Member
4.	Dr. S. B. Palve	Member
5.	Mrs. L. K. Dhumal	Member
6.	Miss. M. N. Jagtap	Member
7.	Miss. T. M. Pagare	Member
8.	Mr. A. S. Wani	Member (co-opt)
9.	Dr. A. A. Kulkarni	Member (co-opt)
10.	Dr. B. N. Sonawane	Subject Expert
11.	Dr. P. P. Sharma	Academic Council Nominee
12.	Dr. M. L. Ahire	Academic Council Nominee
13.	Dr. S. G. Auti	Vice-Chancellor Nominee
14.	Mr. D. K. Jadhav	Alumni
15.	Dr. S. A. Punekar	Industry Expert

1. Prologue/ Introduction of the programme:

The new curriculum of B.Sc. in Science (Botany) offers essential knowledge and technical skills to study plants in a holistic manner. Students would be trained in all areas of plant biology using a unique combination of core, elective and vocational papers with significant inter-disciplinary components. B.Sc. Botany Programme covers academic activities within the classroom sessions along with practical concepts at laboratory sessions. Infield, outstation activities and projects would also be organized for real-life experience and learning. Candidates who have curiosity in plants kingdom, ecosystem,

love exploring exotic places and wish to work as researchers or professions like Botanist, Conservationist, Ecologist, etc. can choose B.Sc. Botany course.

1. To provide thorough knowledge about various plant groups from primitive to highly evolved.
2. Accurately interpretation of collected information and use taxonomical information to evaluate and formulate a position of plant in taxonomy.
3. Critically evaluation of ideas and arguments by collection relevant information about the plants, so as recognize the position of plant in the broad classification and phylogenetic level.
4. Identify problems and independently propose solutions using creative approaches, acquired through interdisciplinary experiences, and a depth and breadth of knowledge/expertise in the field of Plant Identification.
5. Students will be able to identify the major groups of organisms with an emphasis on plants and be able to classify them within a phylogenetic framework. Students will be able to compare and contrast the characteristics of plants, algae, and fungi that differentiate them from each other and from other forms of life.
6. Students will be able to use the evidence of comparative biology to explain how the theory of evolution offers the only scientific explanation for the unity and diversity of life on earth. They will be able to use specific examples to explicate how descent with modification has shaped plant morphology, physiology, and life history.
7. Students will be able to explain how plants function at the level of the gene, genome, cell, tissue, Flower development. Drawing upon this knowledge, they will be able to give specific examples of the physiological adaptations, development, reproduction and mode of life cycle followed by different forms of plants.
8. Students will be able to demonstrate proficiency in the experimental techniques and methods of analysis appropriate for their area of specialization within botany.
9. To make the students aware of applications of different plants in various industries.
10. To highlight the potential of these studies to become an entrepreneur.
11. To equip the students with skills related to laboratory as well as industries based studies
12. To equip the students with skills related to laboratory as well as field based studies.
13. To make the students aware about conservation and sustainable use of plants.
14. To create foundation for further studies in Botany.
15. To address the socio-economical challenges related to plant sciences.
16. To facilitate students for taking up and shaping a successful career in Botany.

2. Programme Outcomes (POs)

Students enrolled in the programme complete a curriculum that exposes and trains in the full range of essential skills and abilities. Transformed curriculum shall develop educated outcome-oriented candidature, fostered with discovery- learning, equipped with practice & skills to deal practical problems and versed with recent pedagogical trends in education including e-learning, flipped class and hybrid learning to develop into responsible citizen for nation-building and transforming the country towards the future with their knowledge gained in the field of plant science.

Students will have the opportunity to master the following objectives.

1. Educate students about plant science.
2. Inculcate strong fundamentals on modern and classical aspects of Botany.
3. Create platform for higher studies in Botany.
4. Facilitate students to take-up successful career in Botany
5. Acquire practical skills to gather information, assess, create and execute new ideas to develop entrepreneurial skills.
6. Learn to respect and conserve nature and the environment.
7. CBCS syllabus with a combination of general and specialized education shall introduce the concepts of breadth and depth in learning.
8. It produces competent plant biologists who can employ and implement their gained knowledge in basic and applied aspects that will profoundly influence the prevailing paradigm of agriculture, industry, healthcare and environment to provide sustainable development.
9. Will increase the ability of critical thinking, development of scientific attitude, handling of problems and generating solutions, improve practical skills, enhance communication skill, social interaction, and increase awareness in judicious use of plant resources by recognizing the ethical value system.
10. The training provided to the students will make them competent enough for doing jobs in Govt. and private sectors of academia, research and industry along with graduate preparation for national as well as international competitive examinations, especially UGC-CSIR NET, UPSC Civil Services Examination, IFS, NSC, FCI, BSI, FRI etc. 2 Botany UG (NEP) KUN
- 11 Certificate and diploma courses are framed to generate self- entrepreneurship and self-employability, if multi exit option is opted.
12. Lifelong learning is achieved by drawing attention to the vast world of knowledge of plants and their domestication.

Programme specific objectives (PSOs):

B.Sc. I Year Certificate Course in Basic Botany

- This certificate course will provide knowledge on various fields of basic Botany.

- The syllabus is prepared to enable students for competitive exams in frontier areas of plant sciences and start-up floriculture, horticulture or nursery related business.
- Students will be able to know the role of medicinal plants in India from ancient to recent year. Students from other faculty can gain knowledge related plants through Open Elective course

Programme specific outcomes (PSOs):

B.Sc. II Year/ Diploma Course in Botany

- This programme will provide knowledge of formulation, preparation and applications of Biofertilizers and biopesticides. On the basis of this knowledge students will able to start up a small scale industry of biofertiliozesr and biopesticides.
- Laboratory sessions following theory will provide easy understanding of plant taxonomy, ecology, plant anatomy, embryology, plant biotechnology and plant physiology.
- This course will help students to become a plant Taxonomist.

Programme specific outcomes (PSOs):

B.Sc. III Year/ Bachelor of Science

- Third year graduation programme will provide an understanding of plant systematic, economic botany, molecular and developmental biology, ecology, plant pathology, physiology, plant genetics and biochemistry.
- It will provide expertise in plant breeding and seed technology.
- After completing this course successfully students will be able to contribute in the field of plant sciences. The research project will help to develop research aptitude for higher education and scientific research.

**Ahmednagar Jilha Maratha Vidya Prasarak Samaj's
New Arts, Commerce and Science College,
Ahmednagar (Autonomous)
Syllabus NEP S.Y.B.Sc. Botany (Major)**

Title of Course: Taxonomy of Angiosperms and Plant Ecology								
Year: II				Semester: III				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-6	BS-BO231T	03	00	03	45	30	70	100

Learning Objectives:

1. To give knowledge about plant taxonomy.
2. To give the knowledge about primitive and advanced characters in plant taxonomy.
3. To understand the botanical nomenclature and classification of plants according to systems.
4. To understand the diversity of plants and knowledge about different vegetation methods for study of vegetation.
5. To understand the ecological habit and habitat diversity of angiosperms.

Course Outcomes (Cos)

The students will be able:

On completion of program students will be specifically able to

- 1) Know about the systematic position of Generas, Species and, Families.
- 2) The students develop knowledge about plant nomenclature.
- 3) Learn about various systems of classification of Angiosperms.
- 4) Learn about various Angiosperm families.
- 5) Understand various methods of vegetation sampling.
- 6) Learn about ecological adaptations in plants.

Detailed Syllabus:		
Unit I	<p>Introduction to Angiosperms Taxonomy</p> <p>1.1 Definition, scope, objectives and importance of taxonomy,</p> <p>1.2 Exploration, Description, Identification, Nomenclature and classification, Concept of Systematics with brief historical background</p>	2
Unit II	<p>Systems of classification</p> <p>2.1 Comparative account of various systems of classification</p> <p>2.2 Artificial system- Carl Linnaeus</p> <p>2.3 Natural system- Bentham and Hooker</p> <p>2.4 Phylogenetic system- Engler and Prantl</p> <p>2.5 APG system- A brief review</p> <p>2.6 General trends for primitive and advanced characters (After Hutchinson, 1959)</p>	8
Unit III	<p>Botanical Nomenclature Concept of nomenclature, brief history, Binomial nomenclature</p> <p>4.1 International Code for Nomenclature of Algae, Fungi and Plants (ICN)/ICBN code, Rules and Recommendations;</p> <p>4.2 Concept of Typification. Ranks and endings of taxa names, Coining of Genus and Species Names Single, double and multiple authority citations</p> <p>4.3 Taxonomic Hierarchy</p> <p>4.4 Nomina Conservanda</p>	9
Unit IV	<p>Study of Plant Families</p> <p>3.1 Study of following families with reference to systematic position (As per Bentham and Hooker's system of classification), salient features, floral formula, floral diagram and any five examples with their economic importance –Magnoliaceae (Polypetalae Thalamiflorae), Brassicaceae (Polypetalae Thalamiflorae), Fabaceae (Polypetalae Calciflorae), Myrtaceae (Polypetalae Calciflorae), Rubiaceae (Gamopetalae Inferae), Asteraceae (Gamopetalae Inferae) Apocynaceae (Gamopetalae Bicarpelatae), Asclepiadaceae (Gamopetalae Bicarpelatae) Solanaceae (Gamopetalae Bicarpelatae), Nyctaginaceae (Monochlamydeae), Amaryllidaceae and Cannaceae (Monocotyledons)</p>	8
Unit V	<p>Plant Identification</p> <p>5.1 Herbaria</p> <p>5.2 Botanical Garden (Any Two)</p> <p>5.3 Taxonomic Literature (Any Three) Floras, Manuals, Monographs,</p>	4

	Revisions and Periodicals 5.4 Preparation and use of keys (Bracketed and Indented Keys)	
Unit VI	<p>Introduction to Ecology</p> <p>Definition, concept, scope, and interdisciplinary approach,</p> <p>6.1 Autecology and Synecology.</p> <p>6.2 Species diversity: definition, concept, scope, and types: Alpha, Beta and Gammadiversity.</p> <p>6.3 Genetic Diversity: definition, nature and origin of genetic variations</p> <p>6.4 Origin of species diversity, diversity indices,</p> <p>6.5 Ecosystem Diversity: definition, major ecosystem types of the world,</p> <p>6.6 Hotspots in India – concept and basis of ‘hotspot’ identification.</p> <p>6.7 Methods of vegetation sampling: quadrat method, transect method, plot less method, Line transect and belt method</p>	8
Unit VII	<p>7.1 Ecological grouping of the plants with reference to their significance of adaptive external and internal features with examples:</p> <p>a) Hydrophytes,</p> <p>b) Mesophytes</p> <p>c) Xerophytes</p> <p>d) Halophytes.</p>	3
Unit VIII	<p>Phytogeography</p> <p>8.1 Concept, Definition</p> <p>8.2 Phytogeographic regions in World and India</p> <p>8.3 Continental Drift Theory</p>	3

Suggested Readings/Material:

1. Balfour Austin (2016). Plant Taxonomy. Syrawood Publishing House
2. Chapman, J.L. and Reiss, M.J. (1998). Ecology: Principles and applications. Cambridge, University Press.
3. Chopra G.L. (1984). Angiosperms: Systematics and Life-Cycle., Pradeep Publications
4. Cooke, Theodore (1903-8). The Flora of the Presidency of the Bombay Vol. I, II, III (Repr. ed), Botanical Survey of India.
5. Cronquist, A. (1968). The Evolution and Classification of Flowering Plants. Thomas Nel and Sons Ltd. London.
6. Datta S.C. (1988). Systematic Botany. New Age Publ.
7. Davis P.H and V.H Heywood (1963). Principles of Angiosperm Taxonomy. Oliver and Boyd, London. 8. Heywood V.H. (1967). Plant Taxonomy, Hodder & Stoughton Educational, London.
8. Judd Walter S., Campbell, C. S., Kellogg, E. A., Stevens, P.F. and M. J. Donoghue. (2008). Plant Systematics- A Phylogenetic Approach. Sinauer Associates, INC, Publishers. Sunderland, Massachusetts, USA.
9. Kormondy Edward (1995). Concepts of Ecology, Pearson Publ.
10. Lawrence G.H.M. (1955). An Introduction to Plant Taxonomy. McMillan, New York.
11. Lawrence, G.H.M. (1951). Taxonomy of Vascular Plants. McMillan, New York.
12. Michael P. (1984). Ecological Methods for field and Laboratory investigations TMH Co. ltd. Bombay. 14. Mondol A.K. (2016) Advanced Plant Taxonomy, New Central Book Agency (NCBA)
13. Naik V.N. (1988) Taxonomy of Angiosperms. Oxford and IBH
14. Odum E.P., (2004). Fundamentals of Ecology, Publ. Cengage Learning, Australia
15. Pande B.P. (1997). Taxonomy of Angiosperms. S. Chand.
16. Pande B.P. (2001) Taxonomy of Angiosperms. S. Chand.
17. Radford A.E. 1986. Fundamentals of Plant Systematics, Harper and Row N Y.
18. Santapau H. (1953). The Flora of Khandala on the Western Ghats of India. BSI
19. Sharma O.P. (2011), Plant Taxonomy, Tata Mc grow Hill
20. Shivrajan V.V. & N.K.P. Robson (1991). Introduction to Principles of Plant Taxonomy. Cambridge Univ. Press
21. Shukla Priti and Shital Mishra (1982). An introduction to Taxonomy of angiosperms. Vikas Publ.
22. Simpson, M.G. (2010). Plant Systematics. Elsevier, Amsterdam.
23. Singh Gurucharan (2005). Systematics: Theory and Practice. Oxford IBH.
24. Singh J.S., S.P. Singh, and S.R. Gupta (2006). Ecology, Environment and Resource Conservation. Anamaya Publ. New Delhi.
25. Singh N.P. (2001) Flora of Maharashtra Volume-II BSI, Kolkatta
26. Singh N.P. (2003) Flora of Maharashtra Volume-III BSI, Kolkatta
27. Singh N.P., S. Karthikeyan (1996) Flora of Maharashtra Volume-I, BSI, Kolkatta
28. Singh V. and D.K. Jain, (1981). Taxonomy of Angiosperms. Rastogi Publication, Meerut.
29. Singh, Gurcharan. (2012). Plant Systematics: Theory and Practice. Completely revised and enlarged 3rd edition. Oxford & IBH, New Delhi.

30. Stuessy, Tod F. (2009). Plant Taxonomy: The Systematic Evaluation of Comparative Data, second edition. Columbia University Press.
31. Swingle D.B. (1946). A Text book of Systematic Botany. McGraw Hill Book Co. New York.
32. Takhtajan A. (1969). Flowering Plants: Origin and Disposal.

IMPORTANT WEBSITES

- THE FAMILIES OF FLOWERING PLANTS- L. Watson and M.J. Dallwitz
<https://www.delta-intkey.com/angio/index.htm>
- ANGIOSPERM PHYLOGENY WEBSITE, version 14.
<http://www.mobot.org/MOBOT/research/APweb/>
- THE PLANT LIST- <http://www.theplantlist.org>
- THE PLANTS OF THE WORLD ONLINE PORTAL
<http://www.plantsoftheworldonline.org/>
- INTERNATIONAL PLANT NAME INDEX (IPNI) <https://www.ipni.org/>
- TROPICOS <https://www.tropicos.org/home>
- BIODIVERSITY HERITAGE LIBRARY <https://www.biodiversitylibrary.org/>
- BOTANICUS DIGITAL LIBRARY <https://www.botanicus.org/>
- INTERNET ARCHIVE- DIGITAL LIBRARY <https://archive.org/>
- DATABASE OF PLANTS OF INDIAN SUBCONTINENT
<https://sites.google.com/site/efloraofindia/>
- BOTANICAL SURVEY OF INDIA
https://bsi.gov.in/content/1416_1_FloraofIndia.aspx
- FLOWERS OF INDIA <http://www.flowersofindia.net/>
- **eFLORAS OF WORLD** <http://www.efloras.org/>

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's
New Arts, Commerce and Science College, Ahmednagar
(Autonomous)
Syllabus
S.Y.B.Sc. Botany

Title of the Course: Plant Physiology								
Year: II				Semester: III				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-7	BS-BO232T	03	00	03	45	30	70	100

Learning Objectives:

1. Identify basics of plant physiology.
2. Explain different physiological phenomenon in plants .
3. Understand water absorption, mineral absorption.
4. Explain elements and its roles
5. Explain nitrogen metabolism.
6. Learn Transpiration and its significance.
7. Describe seed dormancy, physiology of flowering.

Course Outcomes (Cos)

On completion of the course, students are able to:

1. Understand the role of water in plants life.
2. Know the absorption of water and ascent of sap.
3. Understand the element their role in plants
4. Know about transpiration, its mechanism and significance in plants
5. Learn the nitrogen metabolism, biological nitrogen fixation.
6. Know about seed dormancy and seed dormancy breaking methods.
7. Understand physiology of flowering, photoperiodism and vernalization.

Detailed Syllabus:		
Unit I	Introduction to Plant Physiology 1.1 History, 1.2 Scope and applications of plant physiology	3
Unit II	Absorption of water 2.1 Role of water in plants 2.2 Pathway and Mechanisms of water absorption 2.3 Factors affecting rate of water absorption	5
Unit III	Ascent of sap 3.1 Introduction and definition. 3.2 Transpiration pull or cohesion-tension theory, evidences and objections 3.3 Factors affecting ascent of sap	5
Unit IV	Mineral Nutrition of plants 4.1 Essential and non-essential elements	6

	<p>4.2 Major elements, minor elements 4.3 General functions of essential elements 4.4 Specific role and deficiency symptoms of essential elements.</p>	
Unit V	<p>Absorption of Mineral Salts 5.1 Mechanism 5.2 Ion-exchange, Passive absorption, Active absorption 5.3 Carrier concept 5.4 Electrochemical potential gradient 5.5 Influx and efflux 5.6 Membrane Transporter proteins 5.7 Factors affecting salt absorption</p>	5
Unit VI	<p>Transpiration 6.1 Definition and Types of transpiration – cuticular, lenticular and stomatal 6.2 Structure of stomata 6.3 Mechanism of opening and closing of stomata –Steward’s hypothesis 6.4 Active K⁺ transport mechanism 6.5 Factors affecting the rate of transpiration 6.6 Significance of transpiration 6.7 Antitranspirants 6.8 Guttation 6.9 Exudation</p>	7
Unit VII	<p>Nitrogen metabolism 7.1 Introduction and role of nitrogen in plants 7.2 Biological Nitrogen fixation 7.3 Symbiotic nitrogen fixation, 7.4 Non-symbiotic nitrogen fixation 7.5 Nitrogenase enzyme- structure and function 7.6 Denitrification, ammonification and nitrification 7.7 Reductive amination and transamination 7.8 Importance and production technique of BGA</p>	6
Unit VIII	<p>Seed dormancy and germination 8.1 Definition, types of seed dormancy 8.2 Methods to break seed dormancy 8.3 Seed germination and types 8.4 Metabolic changes during seed germination 8.5 Role of phytohormones to improve seed germination 8.6 Vigor Index</p>	4
Unit IX	<p>Physiology of flowering 9.1 Photoperiodism – Concept, definition, short day plants, long day plants and day neutral plants. 9.2 Phytochrome theory, role of phytohormones in induction and inhibition of flowering 9.3 Applications of photoperiodism 9.4 Vernalization–concept and definition, mechanism of vernalisation, 9.5 Applications of vernalisation and devernalization</p>	4

Suggested Readings/Material:

1. Jain V. K. 2018 Plant Physiology, 19 E, S. Chand Publication, New Delhi.
2. Pandey S N., Sinha B. K. 2000 Plant Physiology, Vikas Publication, New Delhi.
3. Buchanan B. B., Gruissem W. and Jones R. L. (2000), Biochemistry and Molecular Biology of Plants, American Society of Plant Physiologists, Maryland, USA.
4. Dennis D. T., Turpin D. H., Lefebvre D. D. and Layzell D. B. (eds) (1997), Plant Metabolism (second edition), Longman, Essex, England.
5. Galstone A. W. (1989), Life Processes in Plants, Scientific American Library, Springer - Verlag, New York, USA.
6. Moore T. C. (1989), Biochemistry and Physiology of Plant Hormones, Springer – Verlag, New York, USA. 5. Nobel P. S. (1998), Physicochemical and Environmental Plant Physiology (Second Edition), Academic Press, San Diego, USA.
7. Salisbury F.B. and Ross C. W. (1992), Plant Physiology (Fourth Edition), Wadsworth Publishing Company, California, USA.
8. Singhal G. S., Renger G., Sopory S.K., Irrgang K.D. and Govindjee (1999), Concept in Photobiology; Photosynthesis and Photomorphogenesis, Narosa Publishing House, New Delhi.
9. Jain, V.K. 2000: Fundamentals of Plant Physiology. S. Chand & Co, New Delhi.
10. Pandey, S.N. 1991: Plant Physiology, Vikas Publishing House (P) Ltd., New Delhi, India.
11. Verma, V. 2000): Text Book of Plant Physiology, Ane Books India, New Delhi.
12. Nobel, P.S. 2009. Physicochemical and Environmental Plant Physiology.4th edition Academic Press, UK.

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's
New Arts, Commerce and Science College, Ahmednagar
(Autonomous)
Syllabus
S.Y.B.Sc. Botany

Title of the Course: Practical Based on BO 231 and 232								
Year: II				Semester: III				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-8	BS-BO233P	00	02	02	60	15	35	50

Learning Objectives:

1. To teach the laboratory instruments and its applications.
2. Expose the students to various physiological phenomenon through practical's.
3. Demonstration of certain physiological phenomenon.

Course Outcomes (Cos)

On completion of the course, students are able to:

1. Learn about tools and equipment's required for taxonomy.
2. Know morphological characters of plants.
3. Learn to describe the plant families in botanic terms.
4. Know about transpiration and other basics physiological phenomena in plants.
5. Learn about nutrients requirement and nutrient deficiency in plants.

Taxonomy of Angiosperms and Plant Community

- | | |
|---|----|
| 1. Study of tools of taxonomy (any six) | 1P |
| 2. Description of flowering plant in botanical terms | 1P |
| 3. Study of plant families (any Six) | 3P |
| 4. Preparation of herbarium | 1P |
| 5. Study of ecological instruments (any six) | 1P |
| 6. Study of ecological adaptations in Hydrophytes with any two examples | 1P |
| 7. Study of ecological adaptations in Xerophytes with any two examples | 1P |
| 8. Study of vegetation by list count quadrat method. | 1P |

Plant Physiology

- | | |
|--|----|
| 1. Introduction to laboratory instruments | 1P |
| 2. Determination of Diffusion Pressure Deficit (DPD) | 1P |
| 3. Determine rate of transpiration under different conditions. | |

4. Demonstration of the following 1P
 - a. Imbibition in seeds
 - b. Ringing experiment
 - c. Arc Auxanometer
 - d. Nitrogen fixing bacteria / BGA (specimen/ slide)
5. Study of effect of N, P and K on growth of plants 2P
6. Study of deficiency symptoms of N, P and K 2P
7. Calculate seed germination percentage and vigor index 1P
8. Botanical study tour / field visit/ visit to Floriculture industry / Soil testing center / Seed testing center / biofertilizer unit 1P

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's

**New Arts, Commerce and Science College, Ahmednagar
(Autonomous)
Syllabus
S.Y.B.Sc. Botany**

Title of the Course: Biofertilizers and Biopesticides								
Year: II				Semester: III				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
SEC-3	BS-BO234P	00	02	02	60	15	35	50

Learning Objectives:

1. To teach types of biofertilizers.
2. To explain applications of biofertilizers.
3. To teach isolation and mass production of various biofertilizers.
4. To explain production of biopesticides.

Course Outcomes (Cos)

On completion of the course, students are able to:

1. Isolate nitrogen fixing bacteria.
2. Isolate and purify Rhizobium bacteria.
3. Perform the isolation of PSBs
4. Perform the methods of application of biofertilizers.
5. Isolate VAM fungi.
6. Know about production of biopesticides.

Practicals:

1. Isolation of any two Nitrogen fixing cyanobacteria using suitable media. 2P
2. Estimation of enzyme nitrogenase form root nodules of legumes. 2P
3. Isolation and purification of Rhizobium from soil. 2P
4. Isolation of phosphate solubilizing microorganisms. 1P
5. Study of methods of mass multiplications of biofertilizers. 2P
6. Study of carrier material for biofertilizers. 1P
7. Study of methods of application of biofertilizers. 1P
8. Isolation of VAM fungi. 1P
9. Isolation and mass production of *Trichoderma*. 2P
10. Demonstration of isolation and mass production of *Trichogramma*. 1P

Institutional visit/ Industrial visit and submission of report is compulsory

**Ahmednagar Jilha Maratha Vidya Prasarak Samaj's
New Arts, Commerce and Science College, Ahmednagar
(Autonomous)
Syllabus
NEP S.Y.B.Sc. Botany (Major)**

Title of Course : Plant Anatomy and Embryology								
Year: II				Semester: IV				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ES E	Total
DSC-9	BS-BO241T	03	00	03	45	30	70	100

Learning Objectives:

1. To give knowledge about plant anatomy and embryology.
2. To give the knowledge about principles and different types of tissue organization in plant anatomy.
3. To understand the development of male and female gametophyte in plants.
4. To understand the phenomenon of double fertilization and its significance in angiosperms.
5. To understand the nutritive tissue endosperms in angiosperms.

Course Outcomes (Cos)

On completion of program students will be specifically able to:

1. Know about the concept of plant anatomy and embryology.
2. The students develop knowledge about plant anatomy and embryology in plant nomenclature.
3. Learn about various principles involved in plant anatomy.
4. Learn about plant embryogenesis, double fertilization and endosperm development.
5. Understand abnormalities in plant embryology.

Detailed Syllabus:		
Unit I	Introduction 1.1 Definition 1.2 Scope of plant anatomy 1.3 History	2

Unit II	Epidermal tissue system Structure, types and functions of epidermis 2.1 Structure, types and functions of Stomata 2.2 Epidermal outgrowths- non-glandular and glandular 2.3 Motor cells	3
Unit III	Mechanical tissue system Principles involved in distribution of mechanical tissues with one example each a) Inflexibility, b) Incompressibility, c) Inextensibility and d) Shearing stress	2
Unit IV	4.1Vascular tissue system Structure and function of xylem, phloem and cambium 4.2 Normal secondary growth Introduction, Concept of primary and secondary growth Normal secondary growth in dicotyledonous stem Development of annual rings, periderm, bark, tyloses and lenticel	4
Unit V	Anomalous secondary growth 5.1 Introduction 5.2 Causes of anomalous secondary growth 5.3 Anomalous secondary growth in: Dicotyledonous stem (<i>Bignonia</i>), 5.4 Dicotyledonous root (<i>Raphanus</i>), 5.5 Monocotyledonous stem (<i>Dracaena</i>)	5
Unit VI	Plant Embryology 6.1 Introduction, Definition and scope of plant embryology	2
Unit VII	Microsporangium and male gametophyte 7.1 Structure of tetrasporangiate anther 7.2Types of tapetum 7.3 Sporogenous tissue 7.4 Microsporogenesis: process and its types 7.5 Types of microspore tetrad 7.6 Male gametophyte: structure and development of male gametophyte	5
Unit VIII	Megasporangium and female gametophyte 8.1 Structure 8.2 Types of ovules 8.3 Types of megaspore tetrads 8.4 Female gametophyte: structure of typical embryo sac 8.5 Types of embryo sacs – monosporic, bisporic and tetrasporic	5
Unit IX	Pollination and Fertilization: 9.1 Introduction and definition 9.2Types of pollination 9.3Germination of pollen grain 9.4 Entry of pollen tube- porogamy, mesogamy and chalazogamy 9.5 Double fertilization and its significance.	5
Unit X	Sexual Incompatibility 10.1 Self Incompatibility 10.2 Genetic Basis of Self Incompatibility 10.3 Physiology and Biochemistry of Incompatibility	5

	10.4 Barriers of Fertilization 10.5 Biological Significance of incompatibility	
Unit XI	Endosperm and embryo 11.1 Endosperm: Types – nuclear, helobial and cellular. 11.2 Structure of Dicotyledonous and Monocotyledonous embryo.	3
Unit XII	Experimental and Applied Embryology 12.1 Tissue Culture Technique 12.2 Haploid Production 12.3 Androgenesis and Gynogenesis 12.4 Embryo Culture	4

Suggested Readings/Material:

1. Plant Anatomy, Chandurkar P J, Plant Anatomy Oxford and IBH publication Co. New Delhi 1971
2. B P Pandey, Plant Anatomy. S Chand and Co. Ltd, New Delhi 1978
3. Greulach V A and Adams J E Plant- An introduction to Modern Biology, Toppen Co. Ltd, Tokyo,
4. Eams and Mc Daniel, An Introduction to Plant Anatomy, McGraw –Hill Book Co. Ltd and Kogakusha Co, Tokyo, Japan
5. Adriance S Foster Practical Plant Anatomy, D Van Nostrand Co. INC, New York
6. Esau, Plant Anatomy, Wiley Toppan Co. California, USA
7. Pijush Roy, Plant Anatomy. New Central Book Agency Ltd, Kolkata
8. Pandey S N and Ajanta Chadha, Plant Anatomy and Embryology, Vikas Publishing House, Pvt, Ltd, New Delhi
9. Bhojwani S S and Bhatnagar S P, An Embryology of Angiosperms
10. Maheshwari P, An introduction to Embryology of Angiosperm
11. Nair P K K Essentials of Palynology.
12. Fahn A. Plant Anatomy, Pergamon Press, Long Island City, New York, 1967

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's
New Arts, Commerce and Science College, Ahmednagar
(Autonomous)
Syllabus
S.Y.B.Sc. Botany

Title of the Course: Plant Biotechnology								
Year: II				Semester: IV				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-10	BS-BO242T	03	00	03	45	30	70	100

Learning Objectives:

1. Identify basics of plant Biotechnology.
2. Explain different concepts of biotechnology.
3. Understand enzymes and its application.
4. Understood fermentation technology
5. Explain single cell proteins and its applications.
6. Learn plant tissue cultures.
7. Describe plant genetic engineering, genomics, proteomics.
8. Learn biofuel technology and bioremediation.

Course Outcomes (Cos)

On completion of the course, students are able to:

1. Understand the role of biotechnology in human life.
2. Know the enzyme and its day to day application.
3. Understand the fermentation technology and its products.
4. Know about single cell proteins and its application
5. Learn the plant tissue culture.
6. Know about gene isolation, gene transfer and its applications.
7. Understand role of plants and microbes in biofuel and bioremediation.

Detailed Syllabus:		
Unit I	Introduction to Plant Biotechnology 1.1 History and definition 1.2 Scope and importance of plant biotechnology 1.3 Current status of biotechnology in India.	3
Unit II	Enzyme Technology 2.1 Introduction, definition and properties of enzymes. 2.2 Classification of enzymes	7

	2.3 Industrial applications of enzymes. 2.4 Production of amylase, proteases and lipase enzyme 2.5 Enzymes immobilization - concept and techniques of immobilization	
Unit III	Fermentation Technology. 3.1 Introduction. 3.2 Liquid and solid state fermentations 3.3 Principles of microbial growth 3.4 Bioreactors used in fermentations- stirred tank and tubular tower and digestive tank fermenters 3.5 Media composition for liquid and solid state fermentations 3.6 Industrial applications of fermentation 3.7 Downstream processing- citric acid production	6
Unit IV	Single Cell Protein (SCP) 4.1 Concept and definition 4.2 Importance of proteins in diet 4.3 Production of SCP from <i>Spirulina</i> and Yeast 4.4 Importance & acceptability of SCP	4
Unit V	Plant Tissue Culture 5.1 Concept of plant tissue culture and cellular totipotency 5.2 Basic techniques: Types of culture, Media preparation, sterilization, inoculation, incubation, hardening 5.3 Applications with reference to: Micropropagation, Somaclonal variation, Haploid production, Protoplast fusion & Somatic hybrids, Embryo rescue, Production of secondary metabolites. 5.4 Commercial Plant Tissue culture laboratories in Maharashtra and India.	8
Unit VI	Plant Genetic Engineering 6.1 Introduction, concept 6.2 Tools of genetic engineering (plasmid vectors, restriction enzymes, ligases) 6.3 DNA isolation, DNA replication 6.3 Gene cloning Technique 6.4 Applications of plant genetic engineering: insect pest resistance, abiotic stress tolerance, herbicide resistance	7
Unit VII	Genomics, Proteomics and Bioinformatics 7.1 Genomics- concept, types, methods used for whole genome sequencing 7.2 Proteomics-concept, types, methods used in proteome analysis 7.3 Bioinformatics-concept, database and its classification, data retrieval tools	7
Unit VIII	Biofuel technology 8.1 Definition, Concept and types of Renewable and nonrenewable energy sources 8.2 Definition and concept of Biogas, Bioethanol, Biobutanol, Biodiesel and Biohydrogen	3

Suggested Readings/Material:

1. B.D. Singh (4thEdn 2012) Biotechnology-expanding horizons, Kalyani Publishers.
2. K.S. Bilgrami & A.K. Pandey (2007) Introduction to Biotechnology CBS Publishers and Distributors PVT LTD

3. M.K. Razdan (2002) Introduction to Plant Tissue Culture. Oxford and IBH Publishing Co., New Delhi.
4. H.S. Chawla (2005) Introduction to Plant Biotechnology. Oxford and IBH Publishing Co. New Delhi.
5. Bionanotechnology: concepts, Lessons from Nature”, David.S. Goodsell, 2004 Wiley-Liss
6. Fundamental Molecular Biology ; Allison LA; 2007
7. Recombinant DNA, Watson et al ; 5th Ed; 2006
8. Techniques for Engineering Genes ; Curell BR et al;2004
9. Techniques for Molecular Biology ; Tagu D & Moussard C; INRA; 2006.
10. Text book of biotechnology, R.C.Dubey, 2009, S.Chand, Delhi

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's
New Arts, Commerce and Science College, Ahmednagar
(Autonomous)
Syllabus
S.Y.B.Sc. Botany

Title of the Course: Practical Based on BO 241 and 242								
Year: II				Semester: IV				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-11	BS-BO243P	00	02	02	60	15	35	50

Learning Objectives:

1. To teach basic anatomical and embryological characters.
2. To explain normal and anomalous secondary growth.
3. To explain plant tissue cultures.
4. To teach DNA isolations.
5. To explain citric acid productions.

Course Outcomes (Cos)

On completion of the course, students are able to:

1. Know about anatomical and embryological characters of plants.
2. Learn normal and anomalous secondary growth.
3. Perform plant tissue cultures.
4. Know about SCP production.
5. Learn DNA isolation and transgenic crops.

Plant Anatomy and Embryology

1. Study of epidermal tissue system – non-glandular and glandular trichomes, multilayeredepidermis, typical stomata (Dicotyledonous and Monocotyledonous). **2P**
2. Study of mechanical tissues and their distribution in root, stem and leaves. **1P**
3. Study of normal secondary growth in dicot stem – *Annona* and *Moringa* (Double stained temporary preparation). **1P**
4. Study of anomalous secondary growth in *Bignonia* and *Dracaena* stem (Double stainedtemporary preparation). **1P**

5. Study of tetrasporangiate anther and types of ovules with the help of permanent slides. **1P**
6. Study of dicot and monocot embryo. **1P**

Plant Biotechnology

1. Instruments/equipments used in plant tissue culture laboratory: Principle and working of Autoclave, oven, laminar air flow cabinet, micropipette, culture bottles/tubes with cotton plug. **1P**
2. Preparation and sterilization of MS medium. **1P**
3. Surface sterilization and Inoculation of nodal sector/ leaf/ anther and maize embryo. **2P**
4. Laboratory cultivation of *Spirulina* **1P**
5. Demonstration practical on transgenic crops viz; Bt-Cotton, Golden rice **1P**
6. Demonstration of principle and working of agarose gel electrophoresis, centrifuge, spectrophotometer **1P**
7. Production of citric acid by *Aspergillus niger* and estimation of citric acid by titration method. **2P**
8. Production of single cell protein production i.e. *Spirulina* / yeast and study of commercial products (01 P)
9. Demonstration of fermentation and fermentation products **1P**
10. Demonstration of separation of plasmid DNA by agarose gel electrophoresis **1P**
11. Demonstration of enzyme immobilization **1P**
12. Study of NCBI/BLAST/FASTA **1P**

Visit to plant tissue culture laboratory/ Research institute

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's
New Arts, Commerce and Science College, Ahmednagar
(Autonomous)
Syllabus
S.Y.B.Sc. Botany

Title of the Course: Herbal Technology								
Year: II				Semester: III				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
VSC-2	BS-BO244P	00	02	02	60	15	35	50

Learning Objectives:

1. To explain different herbal products.
2. To teach role of plants in cosmetics, medicines, and nutraceuticals
3. To explain various herbal cosmetics, medicines and nutraceuticals available in market.
4. To teach to prepare herbal cosmetics, medicines and nutraceuticals

Course Outcomes (Cos)

On completion of the course, students are able to:

1. Know about role of herbs in cosmetics, medicines and nutraceuticals.
2. Prepare some herbal herbal cosmetics, medicines and nutraceuticals
3. Gain the skills of processes of packaging of dry, liquid and aromatic herbal products.
4. Know about preparation and standardization of herbal formulations.

Practicals:

1. To perform preliminary phytochemical screening of crude drugs. 2P
2. Study of any six herbal medicines w.r.t source, botanical name and active ingredients. 1P
3. Study of any six herbal cosmetics from market w.r.t source and botanical name 1P
4. Study of any six herbal nutraceuticals from market w.r.t source and botanical names 1P
5. Preparation of any two herbal cosmetics. 2P
6. Preparation of any one herbal formulation. 2P
7. Extraction of oil from flowers by steam distillation/soxhlet apparatus. 1P

8. Study of different processes of packaging of dry, liquid and aromatic herbal products. 1P
9. Demonstration of separation techniques (TLC, HPLC, HPTLC) 2 P

Visits to industry related to herbal products and quality testing centres related to herbal products.