KRANTIGURU SHYAMJI KRISHNA VERMA KACHCHH UNIVERSITY,
BHUJ.

Year: 2024-2025

B.SC (HONOURS) BOTANY

(With Research /Without Research)

Semesters: III and IV (Exit option)

FACULTY OF SCIENCE

SYLLABUS

Curriculum as per UGC Guideline
Framed according to National Education Policy (NEP) - 2020
With effect from June – 2024 (and thereafter)

NATURE AND EXTENT OF BACHELOR'S DEGREE PROGRAMME IN BOTANY HONOURS)

A bachelor's degree in Botany with Research or without Research is a 4-year degree course which is divided into 8 semesters.

Sr. No.	Type of Award	Stage of Exit	Mandatory Credits to be secured for the Award
1	Certificate in the Discipline	After successful completion of 1st Year	**Certificate With Exit 4 Credit course (44+4)**
2	Diploma in the Discipline	After successful completion of 1st and 2nd Years	**Diploma With Exit 4 Credit course (88+4)**
3	B.Sc. in Botany	After successful completion of 1st, 2nd, and 3rd Years	**Bachelor's degree (132)**
4	B.Sc. (Honors with Research/ without Research) in Botany	After successful completion of 1st, 2nd, 3rd, and 4th Years	**Bachelor + Honors degree (176) Bachelor + Research degree (176)**

A student pursuing 4 years undergraduate Programme with research in a specific discipline shall be awarded an appropriate Degree in that discipline on completion of 8th Semester if he/she secures 176 Credits. Similarly, for certificate, diploma and degree, a student needs to fulfill the associated credits.

AIMS:

1. To develop the curriculum for fostering discovery-learning.
2. To provide the latest subject matter, both theoretical as well as practical, such a way to foster their core competency and discovery learning. A Botany graduate as envisioned in this framework would be sufficiently competent in the field to undertake further discipline-specific studies, as well as to begin domain-related employment.
3. To mould a responsible citizen who is aware of most basic domain-independent knowledge, including critical thinking and communication.
4. To enable the graduate, prepare for national as well as international competitive examinations, especially UGC - CSIR NET, IIT - JAM and UPSC Civil Services Examination.

COURSE INTRODUCTION

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, Environmentalist etc. can choose B.Sc. Botany course.

Programme outcomes (POs)

Transformed curriculum shall develop educated outcome-oriented candidature, 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.

Programme specific objectives (PSOs): B.Sc. II Year Diploma Course in Basic Botany

- This 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.
- Students will be able to know about habit, habitat, morphology, anatomy, and reproduction of various plant groups.
- Student shall produce 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.
- Certificate and diploma courses are framed to generate self- entrepreneurship and self-employability, if multi exit option is opted. Lifelong learning is achieved by drawing attention to the vast world of knowledge of plants and their domestication.
- Students will increase the ability of critical thinking, development of scientific attitude, handling of problems and generating solutions, improve practical skills, social interaction, and increase awareness in judicious use of plant resources by recognizing the ethical value system.
- 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.,

EVALUATION METHODS:

Academic performance in various courses *i.e.,* **DSC, IDC/MDC, AEC, VAC** and **SEC** are to be considered as parameters for assessing the achievement of students in the Botany subject. Several appropriate assessment methods of Botany will be used to determine the extent to which students demonstrate desired learning outcomes.

A student shall be evaluated through Comprehensive Continuous Assessment (**CCA**)/ (***Internal Evaluation***) as well as the **End of Semester examination** (***External Evaluation***). The weightage of CCA shall be 50%, whereas the weightage of the Semester end examination shall be 50%. CCA will include tests/online –offline exams/seminars/assignments/ submissions/student attendance and active participation (oral/poster), field work, report etc....

The End of Semester Examination will be conducted by the University. A certified journal of the respective practical course must be produced at the time of practical examination by the student. The Botanical Excursion is highly essential for to studying vegetation in its natural state, Botanical Industrial visit, Plant tissue culture lab visit, plant nursery visit, organic farm visit etc..... There shall be at least one Botanical Excursion.

This is compulsory to record laboratory work in the Journal. Certified journals must produce while appearing at the time of Practical examination.

Credit Framework and course code for SECOND YEAR BOTANY Programme (B.Sc.)

Year	Semester	Course Code	Paper Title	Credits	Marks		Total
					CA	UA	
SECOND Year	III	MJ BO 301	Industrial Botany	3	35	40	75
		MJ BO 302-P	Industrial Botany	1	15	10	25
		MJ BO 303	Ecology, Environment, And Biomolecules	3	35	40	75
		MJ BO 304-P	Ecology, Environment, And Biomolecules	1	15	10	25
		MJ BO 305	Physiology, Biochemistry and Plant Metabolism	3	35	40	75
		MJ BO 306-P	Physiology, Biochemistry and Plant Metabolism	1	15	10	25
		MD BO 307	Industrial Botany	3	35	40	75
		MD BO 308-P	Industrial Botany	1	15	10	25
			Total Credits	**16**			400
		SEC (P)	Horticulture	2	25	25	50
		VAC		2	25	25	50
		AEC	.	2	25	25	50
	IV	MJ BO 401	Industrial botany and Botany in human welfare	3	35	40	75
		MJ BO 402-P	Industrial botany and Botany in human welfare	1	15	10	25
		MJ BO 403	Plant Anatomy and Embryology	3	35	40	75
		MJ BO 404-P	Plant Anatomy and Embryology	1	15	10	25
		MJ BO 405	Systematic Botany and Plant Taxonomy	3	35	40	75
		MJBO406-P	Systematic Botany and Plant Taxonomy	1	15	10	25
		MN BO 407	Industrial botany and Botany in human welfare	3	35	40	75
		MN BO 408-P	Industrial botany and Botany in human welfare	1	15	10	25
			Total Credits	16			400
		SEC (P)	Medicinal Botany	2	25	25	50
		VAC		2	25	25	50
		AEC		2	25	25	50

The Structure of the Question Paper for the University Exam

KSKV Kachchh University: BHUJ

SECOND YEAR B.Sc.: Semester: 3 & 4

SUBJECT: BOTANY

Total Marks: 40, Duration: 2 HR

PATTERN OF QUESTION PAPER FOR SEMESTER-END EXAMS

- The structure for FIRST THREE question is as under: 30 Marks (10 X 3)
- **Descriptive type 10 Marks**
- (1) Two questions of 10 Marks each. Out of which one must be answered, the type of questions is varied, like: Flow chart/ labeled diagram with explanation/ writes in detail etc.
  (2) Three questions of 05 Marks each out of which two must be answered.

* **The structure for Fourth question is as under: 10 Marks**

Twelve questions from all three units out of which ten questions shall be answered. Each of 01 mark makes total 10 Marks.

- The types of questions are varied, like one-line answers / two-line answers / definitions / reasoning / drawing small figures/ label the figure / fill in the blanks / multiple choice question/ one word answer / match the pairs etc.

Question No	Question type	Marks	Remarks
Que-1 Unit-1	Descriptive Questions with Internal Option.	10	Question may be of 10 marks/ 5 + 5 marks
Que-2 Unit-2	Descriptive Questions with Internal Option.	10	Question may be of 10 marks/ 5 + 5 marks
Que-3 Unit-3	Descriptive Questions with Internal Option.	10	Question may be of 10 marks/ 5 + 5 marks
Que-4	Do as directed.	10	Total 12 questions from all units will be ask; students must attempt any 10

PATTERN OF PRACTICAL FOR SEMESTER-END EXAMS

There will be FOUR Exercises in each Practical, as under, total of 10 Marks.

Instructions: Strictly follow the instructions given by examiner(s).	
Ex: 1. specimen A. (Do as Directed)	03
Ex: 2. specimen B (Do as Directed)	02
Ex: 3. specimen C. (Do as Directed)	03
Ex: 4. Journal	02

- The End of Semester Examination will be conducted by the University. The Botanical Excursion is highly essential for to studying vegetation in its natural state. There shall be at least one Botanical Excursion.
- This is compulsory to record laboratory work in the Journal. Certified journal and field visit report have to produce while appearing at the time of Practical examination.
- For the botanical practical fresh material of plants must be need. In absence of fresh material preserved material or specimen can be used.

DETAILED SYLLABUS OF B.Sc. SECOND YEAR FOR DIPLOMA COURSE IN BASIC BOTANY

KSKV Kachchh University, Bhuj - Kachchh

(Effective from June 2024-25 UNDER NEP-2020)

SEMESTER III

(Course code: MJ BO-301)

Course Title: Industrial Botany

Credit: 3

Course Outcome

After the completion of the course, the students will be able to:

1. Students will have opportunities for hands-on learning through field experience, internships, and industry partnerships, gaining practical skills and real-world experience in nursery management and operations.
2. Students will learn principles of landscape design and installation, including plant selection, placement, and installation techniques for creating aesthetically pleasing and functional landscapes using nursery-grown plants.
3. Students will understand applications of plant tissue culture in agriculture and horticulture, including clonal propagation of elite cultivars, and disease-free plant production.
4. Students will understand the nutritional composition and health benefits of mushrooms, including their role as functional foods, sources of bioactive compounds, and potential applications in medicinal and culinary industries.

DISCIPLINE-SPECIFIC CORE COURSE(MAJOR)						
COURSE	**SEMESTER**	**COURSE CODE**	**COURSE TITLE**	**PRACTICAL**		
				Credits	**Lectures**	**Internal/External**
Certificate Course	**B.Sc. III**	**MJ BO-301**	Industrial Botany	**3**	45	35+40
UNIT	***TOPIC***					
Unit 1	***Introduction To Industrial Botany*** 1. Concept of industrial botany 2. Plant resources and industries: food, fodder, fibers, medicines, timber, dyes, gum, tannins. (two examples of each resource and the relevant industries with which they are associated) ***Floriculture Industries*** 1. Introduction to Floriculture 2. Types of Floriculture 3. Important floriculture crops 4. Greenhouse technology, concepts, Advantages, and limitations 5. Favorable Factors for Floricultural Industry in India: 6. Cultivation practices, harvesting, and marketing of Rose and Gerbera 7. Importance of Floriculture 8. Scope of Floriculture					
Unit 2	***Plant nursery industries.*** 1. Concept and types of nurseries: Ornamental nursery, fruit plant nursery, Medicinal plant nursery, Vegetable plant nursery, forest nursery, 2. Propagation method: seed propagation, natural vegetative propagation, and artificial propagation (cutting: stem, layering: Air layering, Grafting: Stone grafting and approach grafting, Budding: T-Budding) ***Plant tissue culture industries.*** 1. Concept of tissue culture 2. Culture technique: Types of explants, preparation media, methods of sterilization, inoculation techniques, incubation, and hardening. 3. Commercial signification.					

Unit 3	***Agri industries.*** 1. Organic Farming: concept, need of organic farming, types of organic fertilizers, advantages, and limitations. 2. Seed industries: Important of seed industries, seed production, seed processing, and seed marketing with the reference of cotton. ***Mushroom industries.*** 1. Mushroom cultivation: Plant resources, cultivation practices of oyster mushroom, uses of mushrooms, value added products, Commercial significations.

KSKV Kachchh University, Bhuj - Kachchh

(Effective from June 2024-25 UNDER NEP-2020)

SEMESTER III

Practical/ Lab course (Course code: MJ BO-302-P)

Course Title: Credit: 1

Course Outcome

After the completion of the course the students will be able to:

1.Students will understand the nutritional composition and health benefits of mushrooms, including their role as functional foods, sources of bioactive compounds, and potential applications in medicinal and culinary industries.

2. Students will understand applications of plant tissue culture in agriculture and horticulture, including clonal propagation of elite cultivars, and disease-free plant production.

DISCIPLINE SPECIFIC CORE COURSE(MAJOR)						
COURSE	**SEMESTER**	**COURSE CODE**	**COURSE TITLE**	**PRACTICAL**		
				Credits	**Lectures**	**Internal/External**
Certificate Course	**B.Sc. III**	**MJ BO-302-P**	Industrial Botany	**1**	30	**15+10 Marks**
UNIT	***TOPIC***					
	Exercise 1: Seed Propagation Techniques Exercise 2: Natural Vegetative Propagation method by Stem (Runners, rhizomes, bulbs, runners, tubers) Root, Leaves (with one example) Exercise 3: Artificial Vegetative Propagation (cutting: stem, layering: Air layering, Exercise 4: Grafting: Stone grafting and approach grafting, Budding: T-Budding) Exercise 5: Plant Tissue Culture Exercise 6: Organic Farming Exercise 7: Seed processing method Exercise 8: Mushroom cultivation method					

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SEMESTER III
B. Sc.: BOTANY INTERNAL PRACTICAL
Course Code: MAJ BOT-***302-P***
Course Title: Industrial Botany
Total Marks: 15

Instructions: Strictly follow the instructions given by examiner(s).	
Ex: 1. specimen A. (Do as Directed)	04
Ex: 2. specimen B (Do as Directed)	04
Ex: 3. specimen C. (Do as Directed)	04
Ex: 4. Viva-*voce* / submission.	03

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SEMESTER III
B. Sc.: BOTANY INTERNAL PRACTICAL
Course Code: MAJ BOT-***302-P***
Course Title: Industrial Botany
Total Marks: 10

Instructions: Strictly follow the instructions given by examiner(s).	
Ex: 1. specimen A. (Do as Directed)	03
Ex: 2. specimen B (Do as Directed)	02
Ex: 3. specimen C. (Do as Directed)	03
Ex: 4. Journal.	02

Note: During semester do field visit and submit field visit report during exam

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(Effective from June 2024-25 UNDER NEP-2020)

SEMESTER III

(Course code: MJ BO- 303)

Course Title: Credit: 3

Course Outcome & objectives

After the completion of the course, the students will be able to:

- To help the students gain knowledge on the activities in which the giant molecules and minuscule structures that inhabit the cellular world of life are engaged.
- This will provide insight into the organization of cells, their features, and their regulation at different levels.
- Through the study of biomolecules and cell organelles, they will be able to understand the various metabolic processes such as respiration, photosynthesis etc. which are important for life.

DISCIPLINE-SPECIFIC CORE COURSES (MAJOR)							
COURSE	**SEMESTER**	**COURSE CODE**	**COURSE TITLE**	**THEORY**			
				Credits	**Lectures**	**External**	**Internal**
Certificate Course	**B.Sc. III**	**MJ BO-303**	Ecology, Environment, And Biomolecules	**3**	**45**	**40 Marks**	**35 Marks**
UNIT	**TOPIC**						
Unit 1	Introduction to ecology Definition, concept, scope, and interdisciplinary approach, autecology, and synecology. Species diversity: definition, concept, scope, and types: Alpha, Beta and Gamma diversity. Methods of vegetation sampling: quadrat method, transect method, plot less method. Genetic Diversity: definition, nature, and origin of genetic variations Species Diversity: definition, origin of species diversity, diversity indices, species abundance Ecosystem Diversity: definition, major ecosystem types of the world, Hotspots in India – concept and basis of 'hotspot' identification.						
Unit 2	• BIOMOLECULES i **Biomolecules and Bioenergetics:** Types and significance of chemical bonds; Structure and properties of water; pH and buffers. ii **Enzymes:** Structure of enzyme: holoenzyme, apoenzyme, cofactors, coenzymes, and prosthetic group; Classification of enzymes; Features of active site, substrate specificity, mechanism of action (activation energy, lock, and key hypothesis, induced - fit theory), Michaelis – Menten equation, enzyme inhibition and factors affecting enzyme activity. iii Carbohydrates: Definition, classification, and significance. ➢ Structure and functions of Monosaccharides (trioses, pentoses and hexoses). ➢ Structure and functions of Disaccharides (sucrose, maltose, lactose). ➢ Structure and functions of Polysaccharides (homo and hetropolysaccharides, 3 types – storage, structural and mucosubstances.).						

Unit 3	(i) Lipids: Definition classification (major classes of storage and structural lipids) and significance. Fatty acid's structure and functions. Essential fatty acids. Triacyl glycerol's structure, functions, and properties. (ii) Proteins: Structure of amino acids; Peptide bonds; Levels of protein structure-primary, secondary, tertiary, and quaternary; Isoelectric point; Protein denaturation and biological roles of proteins. (iii)Nucleic acids: Structure of nitrogenous bases; Structure and function of nucleotides; Types of nucleic acids; Structure of A, B, Z types of DNA; Types of RNA; Structure of tRNA.

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(Effective from June 2024-25 UNDER NEP-2020)

SEMESTER III

Practical/ Lab course (Course code: MJ BO-304-P)

Course Title: Credit: 1

Course Outcome

After the completion of the course the students will be able to:

After the completion of the course the students will be able to:

1) To help the students to gain knowledge on the activities in which the giant molecules and miniscule structures that inhabit the cellular world of life are engaged.
2) This will provide inside into the organization of cell, its features and regulation at different levels.
3) Through the study of biomolecules and cell organelles, they will be able to understand the various metabolic processes such as respiration,

photosynthesis etc. which are important for life.

DISCIPLINE SPECIFIC CORE COURSE(MAJOR)						
COURSE	**SEMESTER**	**COURSE CODE**	**COURSE TITLE**	**PRACTICAL**		
				Credits	**Lectures**	**Internal/External**
Certificate Course	**B.Sc. III**	**MJ BO-304-P**	Ecology, Environment, And Biomolecules	1	**30**	**15+10 Marks**
UNIT	***TOPIC***					
Unit 1	Exercise 1: Minimum size of the quadrat by species area curve Exercise 2 Frequency of various species occurring in a given area. Exercise 3: Density/abundance of various species occurring in a given area. Exercise 4: Vegetational cover in a given area. Exercise 5: Estimation of biomass Exercise 6: Determination of local vegetation Exercise 7: Study of species composition of an area for analyzing biological spectrum and comparison with Raunkiaer's normal biological spectrum Exercise 8: Determination of soil pH Exercise 9: Determination of water holding capacity Exercise 10: Tests for detection of Carbohydrates: The following tests are to be performed to detect the nature of carbohydrates available in the suppliedsample (Glucose, Fructose, Maltose & Sucrose). 1. Molisch's test, 2. Benedict's test, 3. Iodine test, Exercise 11: Tests for detection of Lipids *i.e.,* Fats and Oils: Micro-chemical tests on sections of Plant materials- Sudan IIIstain, Solubility test Exercise 12: To detect the presence of proteins.						

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(Effective from June 2024-25 UNDER NEP-2020)
SEMESTER III
B. Sc.: BOTANY INTERNAL PRACTICAL
Course Code: MAJ BOT-***304-P***
Course Title: Ecology, Environment, and Biomolecules

Total Marks: 15

Instructions: Strictly follow the instructions given by examiner(s).	
Ex: 1. specimen A. (Do as Directed)	04
Ex: 2. specimen B (Do as Directed)	04
Ex: 3. specimen C. (Do as Directed)	04
Ex: 4. Viva-*voce* / submission.	03

KSKV Kachchh University, Bhuj - Kachchh
(Effective from June 2024-25 UNDER NEP-2020)
SEMESTER III
B. Sc.: BOTANY INTERNAL PRACTICAL
Course Code: MAJ BOT-***304-P***
Course Title: Ecology, Environment, and Biomolecules

Total Marks: 10

Instructions: Strictly follow the instructions given by examiner(s).	
Ex: 1. specimen A. (Do as Directed)	03
Ex: 2. specimen B (Do as Directed)	02
Ex: 3. specimen C. (Do as Directed)	03
Ex: 4. Journal.	02

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(Effective from June 2024-25 UNDER NEP-2020)
SEMESTER III
(Course code: MJ BO- 305)
Course Title: Physiology and Biochemistry
Credit: 3

Course Objectives

After the completion of the course the students will be able to:

1) To help the students to gain knowledge on the activities in which the giant molecules and miniscule structures that inhabit the cellular world of life are engaged.
2) This will provide inside into the organization of cell, its features and regulation at different levels.
3) Through the study of biomolecules and cell organelles, they will be able to understand the various metabolic processes such as respiration, photosynthesis etc. which are important for life.
4) Gain an understanding of primary metabolism in plants, including the synthesis and degradation of carbohydrates, lipids, proteins, and nucleic acids, and their roles in energy metabolism and cellular processes.
5) Learn about plant-water relationships at the organismal level, including water uptake by roots, water transport in xylem vessels, and water loss through transpiration from leaves.

DISCIPLINE-SPECIFIC CORE COURSES (MAJOR)							
COURSE	**SEMESTER**	**COURSE CODE**	**COURSE TITLE**	**THEORY**			
				Credits	**Lectures**	**External**	**Internal**
Certificate Course	B.Sc. III	MJ BO-305	Physiology, Biochemistry and Plant Metabolism	3	45	40 Marks	35 Marks

UNIT	**TOPIC**
Unit 1	**Cell biology:** Physical and Chemical nature if the protoplasm, Evolution of mitochondria and chloroplasts. **Plant water relations**: structure of water, physical Properties of water and importance of water in plant life, important properties of colloidal solutions, colloidal nature of protoplasm, Osmosis, Diffusion, Imbibition and Plasmolysis (significance and experimental work) **Absorption of water**: mechanism, external factors affecting water absorption, path of water movement, kinds of Transpiration, Guttation, mechanism of stomatal transpiration and its significance, Factors affecting transpiration.
Unit 2	**Photosynthesis**-: Photochemical reactions, Photophosphorylation, and C pathways including Photorespiration, C3, C4, and CAM pathway, Factors affecting photosynthesis. **Respiration**: Definition, types (aerobic, anaerobic including fermentation), Electron transport chain and oxidative phosphorylation, Chemiosmotic theory and ATP synthesis **Carbohydrate metabolism**: common carbohydrate found in plants, breakdown and synthesis of sucrose, breakdown and synthesis of starch, breakdown, and synthesis of cellulose. **Lipid (Fat) metabolism:** fat distribution in plants, Break down of fat, oxidation of glycerol, breakdown of fatty acids, α and β oxidation. synthesis of fatty acids, synthesis of glycerol, condensation of fatty acids and glycerol.

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Unit 3	**Plant growth and development**: Plant Growth regulators (auxine , gibrellins, cytokinins, ethylene, absicisic acid) Disccovery, Chemical nature , occurrence in plants ,physiological effect, Bioassay for auxins, for gibbrellins, for cytokinins. Photoperiodism and flowering, Vernalization, Senescence, Growth movements **Dormancy**: Causes of dormancy, Methods of breaking dormancy **Germination:** Different phases, Factors affecting

Suggested readings.

- Barsanti, L. and Gualtieri, P. (2014). Algae: Anatomy, Biochemistry and Biotechnology, 2nd Edition. CRC/ Taylor & Francis, NY.
- Books for FY & SY Botany, by Nirav Publication
- Pandey, S.N and Trivedi, P.S. (2015). A textbook of Botany Vol.I Vikas publishing House Pvt/ Ltd, New Delhi.
- A Textbook of Botany Vol I & II, by Pandey S.N., Mishra S.P. & Trivedi P.S.
- A Textbook of Botany Vol I & II, by Ganguli, Das & Dutta
- A Textbook of Botany, by Ganguli & Kar
- Gangulee, S. C., Das, K.S, Dutta, C.D., and Kar, A.K. (1968) College Botany Vol. I and Vol. II
- Smith, G. M. - (1972) Cryptogamic Botany Vol. I and Vol. II.
- Vashishta, B.R. - (2006) Botany for Degree Students
- College Botany, by A.C. Datta
- College Botany, by B.P. Pandey
- A Textbook of Systematic Botany, by R.N. Sutariya
- Pandey, B.P. (2014). Modern Practical Botany Vol. II. S. Chand and Company Ltd., New Delhi.
- Bendre, A.M., and Kumar A. (2003). Manual of Practical Botany Vol. II. Rastogi Publications, Meerut.
- Santra S.C. and Chatterjee (2005). College Botany Practical Vol. II New Central Book Agency Pvt. Ltd.

SEMESTER III

Course Title: Plant ecology and Environment

(Course code: MJ BO-306-P)

Credit: 1

Course Outcome & Objectives

After the completion of the course, the students will be able to:

1. Learn how to measure physiological parameters related to plant growth, development, and metabolism.
2. Develop proficiency in a range of experimental techniques commonly used in plant physiology research, and physiological measurements.
3. Explore the processes of photosynthesis and respiration through experimental investigations.

DISCIPLINE-SPECIFIC CORE COURSE(MAJOR)						
COURSE	**SEMESTER**	**COURSE CODE**	**COURSE TITLE**	**PRACTICAL**		
				Credits	**Lectures**	**Internal/External**
Certificate Course	**B.Sc. III**	**MJ BO-306-P**	**Plant ecology and Environment**	**1**	**30**	**15+10 Marks**
UNIT	***TOPIC***					
	Exercise 1: To demonstrate the osmosis by using potato osmometer. Exercise 2: To study the phenomenon of plasmolysis. Exercise 3: To demonstrate the phenomenon of imbibition. Exercise 4: To demonstrate that water moves through the xylem. Exercise 5: To study the relative rates of water-vapor loss (transpiration) from the leaf surfaces of different plants. Exercise 6: To demonstrate that oxygen is evolved during photosynthesis by inverted funnel method. (Effect of light and shade) Exercise 7: To determine the value of RQ of different respiratory substrates. Exercise 8: Cress root inhibition test for indole auxins Exercise 9: Effect of Gibberellic acid on plant growth Exercise 10: To test the germinability of seeds with tetrazolium Exercise 11: Measurement of growth by auxanometer Exercise 12 :Demonstration of geotropism by clinostat					

SEMESTER III
(Course code: MD BO-307)
Course Title: Industrial Botany
Credit: 3

Course Outcome

After the completion of the course, the students will be able to:

1. Students will have opportunities for hands-on learning through field experience, internships, and industry partnerships, gaining practical skills and real-world experience in nursery management and operations.
2. Students will learn principles of landscape design and installation, including plant selection, placement, and installation techniques for creating aesthetically pleasing and functional landscapes using nursery-grown plants.
3. Students will understand applications of plant tissue culture in agriculture and horticulture, including clonal propagation of elite cultivars, and disease-free plant production.
4. Students will understand the nutritional composition and health benefits of mushrooms, including their role as functional foods, sources of bioactive compounds, and potential applications in medicinal and culinary industries.

DISCIPLINE-SPECIFIC CORE COURSE(MAJOR)						
COURSE	**SEMESTER**	**COURSE CODE**	**COURSE TITLE**	**PRACTICAL**		
				Credits	**Lectures**	**Internal/External**
Certificate Course	**B.Sc. III**	**MD BO-307**	**Industrial Botany**	**3**	**45**	**35+40 Marks**
UNIT	***TOPIC***					
Unit 1	***Introduction To Industrial Botany*** 1. Concept of industrial botany 2. Plant resources and industries: food, fodder, fibers, medicines, timber, dyes, gum, tannins. (two examples of each resource and the relevant industries with which they are associated) ***Floriculture Industries*** 3. Introduction to Floriculture ,Types of Floriculture,Important floriculture crops 4. Greenhouse technology, concepts, Advantages, and limitations 5. Favorable Factors for Floricultural Industry in India. 6. Cultivation practices, harvesting, and marketing of Rose and Gerbera 7. Importance of Floriculture, Scope of Floriculture					
Unit 2	***Plant nursery industries.*** 1. Concept and types of nurseries: Ornamental nursery, fruit plant nursery, Medicinal plant nursery, Vegetable plant nursery, forest nursery, 2. Propagation method: seed propagation, natural vegetative propagation, and artificial propagation (cutting: stem, layering: Air layering, Grafting: Stone grafting and approach grafting, Budding: T-Budding) ***Plant tissue culture industries.*** 3. Concept of tissue culture 4. Culture technique: Types of explants, preparation media, methods of sterilization, inoculation techniques, incubation, and hardening. 5. Commercial signification.					
Unit 3	***Agri industries.*** 1. Organic Farming: concept, need of organic farming, types of organic fertilizers, advantages, and limitations. 2. Seed industries: Important of seed industries, seed production, seed processing, and seed marketing with the reference of cotton. ***Mushroom industries.*** 3. Mushroom cultivation: Plant resources, cultivation practices of oyster mushroom, uses of mushrooms, value added products, Commercial significations.					

KSKV Kachchh University, Bhuj - Kachchh
(Effective from June 2024-25 UNDER NEP-2020)
SEMESTER III
Practical/ Lab course (Course code: MD BO-308-P)

Course Title: Industrial Botany
Credit: 1

Course Outcome

After the completion of the course, the students will be able to:

1. Students should be able to identify and describe the different parts of plants relevant to horticulture, including roots, stems, leaves, flowers, and fruits.
2. Students should gain hands-on experience in various methods of plant propagation, such as seed germination, cutting propagation, grafting, and tissue culture.
3. Students will understand the nutritional composition and health benefits of mushrooms, including their role as functional foods, sources of bioactive compounds, and potential applications in medicinal and culinary industries.

DISCIPLINE SPECIFIC CORE COURSE(MAJOR)						
COURSE	**SEMESTER**	**COURSE CODE**	**COURSE TITLE**	**PRACTICAL**		
				Credits	**Lectures**	**Internal/External**
Certificate Course	**B.Sc. III**	**MD BO-308-P**	Industrial Botany	**1**	30	**15+10 Marks**
UNIT	***TOPIC***					
	Exercise 1: Seed Propagation Techniques Exercise 2: Natural Vegetative Propagation method by Stem (Runners, rhizomes, bulbs, runners, tubers) Root, Leaves (with one example) Exercise 3: Artificial Vegetative Propagation (cutting: stem, layering: Air layering, Exercise 4: Grafting: Stone grafting and approach grafting, Budding: T-Budding) Exercise 5: Plant Tissue Culture Exercise 6: Organic Farming Exercise 7: Seed processing method Exercise 8: Mushroom cultivation method					

Course Code: MD BO-***308-P***
Course Title: Industrial Botany
Total Marks: 15

Instructions: Strictly follow the instructions given by examiner(s).	
Ex: 1. specimen A. (Do as Directed)	04
Ex: 2. specimen B (Do as Directed)	04
Ex: 3. specimen C. (Do as Directed)	04
Ex: 4. Viva-*voce* / submission.	03

KSKV Kachchh University, Bhuj - Kachchh
(Effective from June 2024-25 UNDER NEP-2020)
SEMESTER III
B. Sc.: BOTANY INTERNAL PRACTICAL
Course Code: MD BO-***308-P***
Course Title: Industrial Botany
Total Marks: 10

Instructions: Strictly follow the instructions given by examiner(s).	
Ex: 1. specimen A. (Do as Directed)	03
Ex: 2. specimen B (Do as Directed)	02
Ex: 3. specimen C. (Do as Directed)	03
Ex: 4. Journal.	02

Note: During semester do field and submit field visit report during exam

KSKV Kachchh University, Bhuj - Kachchh
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SEMESTER III
Course Title:

(Course code: SEC BO)
Credit: 2

Course Outcome & Objectives

After the completion of the course, the students will be able to:

1. To develop an interest in nature and plant life.
2. To gain knowledge of gardening, cultivation, multiplication, and rising ofseedlings of garden plants.
3. To get knowledge of new and modern techniques of plant propagation.
4. Students will explore principles of landscape design and installation, including plant selection, placement, and installation techniques for creating aesthetically pleasing and functional landscapes using horticultural plants.

DISCIPLINE-SPECIFIC CORE COURSE(MAJOR)						
COURSE	SEMESTER	COURSE CODE	COURSE TITLE	PRACTICAL		
				Credits	Lectures	Internal/External
Certificate Course	B.SC. III	SEC BO		2	30	Total Marks 50 (25+25)
UNIT	TOPIC					
1	**HORTICULTURE-I** 1. Introduction: Aims, Objectives and Scope of Horticulture 2. Plant Propagation-Vegetative, Asexual and Sexual reproduction 3. Important Horticulture crops of Gujarat					
2	**HORTICULTURE-II** 1. Principles and Elements of Landscape Designs. 2. Garden Elements and Designs. 3. Tools and Implements Used in Landscape Design. 4. Layout of Different Styles of Gardens. 5. Layout of Formal Types of Gardens, Informal Gardens, Special Types of Gardens, Rock Garden and Gravel Garden. 6. Landscaping Of Places of Public Importance. 7. Gardening Of Public Places.					
3	**HORTICULTURAL TECHNIQUES** 1. Hydroponics (History, concept, A growing medium, types of hydroponic systems, Components of a hydroponic system, advantage and disadvantages, Hydroponics in the Home Garden 2. Aeroponic. (Introduction, Needs of Aeroponic Farming, Components of Aeroponic, Advantages, Disadvantages) 3. Bonsai: Equipment and tools for Bonsai, Plants parts for Bonsai making, Potting mixture, Bonsai design styles, Technique, care, Advantages of Bonsai.					

Textbooks and References

1. Agrawal, P.K. (1993). Handbook of Seed Technology. New Delhi, Delhi: Dept. ofAgriculture and Cooperation, National Seed Corporation Ltd.
2. Bose T.K., Mukherjee, D. (1972). Gardening in India. New Delhi, Delhi: Oxford &IBH Publishing Co.
3. Jules, J. (1979). Horticultural Science, 3rd edition. San Francisco, California: W.H. Freeman and Co.
4. Kumar, N. (1997). Introduction to Horticulture. Nagercoil, Tamil Nadu: Rajalakshmi Publications.
5. Musser E., Andres. (2005). Fundamentals of Horticulture. New Delhi, Delhi: McGrawHill Book Co.
6. Sandhu, M.K. (1989). Plant Propagation. Madras, Bangalore: Wile Eastern Ltd.
7. Marimuthu, T. et al. (1991). Oster Mushroom. Department of Plant Pathology. Tamil Nadu Agricultural University, Coimbatore.
8. Nita Bhal. (2000). Handbook on Mushrooms. 2nd ed. Vol. I and II. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi. 3. Pandey R.K, S. K Ghosh, 1996.
9. A Hand Book on Mushroom Cultivation. Emkey Publications.
10. Pathak, V. N. and Yadav, N. (1998). Mushroom Production and Processing Technology. Agrobios, Jodhpur.
11. Tewari Pankaj Kapoor, S. C. (1988). Mushroom Cultivation. Mittal Publication, New Delhi.

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(Effective from June 2024-25 UNDER NEP-2020)

SEMESTER III

Course Title:

(Course code: VAC)

Credit: 2

Course Outcome & Objectives

After the completion of the course, the students will be able to:

1. To study the relationship between plants and human societies, focusing on their economic importance.
2. To understand the uses of plants for food, medicine, materials, and other commercial purposes.
3. To explore the cultivation, processing, and utilization of economically important plant species.
4. Identify economically important plant species and assess their uses, cultivation practices, and market value.

DISCIPLINE-SPECIFIC CORE COURSE(MAJOR)						
COURSE	SEMESTER	COURSE CODE	COURSE TITLE	PRACTICAL		
				Credits	Lectures	Internal/External
Certificate Course	B.SC. III	VAC		2	30	Total Marks 50 (25+25)
UNIT	TOPIC					

KSKV Kachchh University, Bhuj - Kachchh

(Effective from June 2024-25 UNDER NEP-2020)

SEMESTER IV

Course Title: Industrial botany and Botany in human welfare

Course code: MA BO-401

Credit: 3

Course outcomes and objectives:

After the completion of the course, the students will be able to:

1. To understand applied botany, plant applications, and uses.
2. Demonstrate knowledge of food processing and pharmaceutical manufacturing techniques, including methods for ingredient selection, processing optimization, and product formulation.
3. Apply principles of quality assurance and regulatory compliance to ensure the safety, efficacy, and legality of food and drug products.
4. Evaluate the sensory attributes, nutritional value, and stability of food products through sensory evaluation and shelf-life studies.

DISCIPLINE-SPECIFIC CORE COURSE(MAJOR)							
COURSE	**SEMESTER**	**COURSE CODE**	**COURSE TITLE**	**THEORY**			
				Credits	**Lectures**	**External**	**Internal**
Certificate Course	**B.SC. IV**	**MJ BO 401**	Industrial botany and Botany in human welfare	**3**	**45**	**40 Marks**	**35 Marks**
UNIT	**TOPIC**						
Unit 1	***Bio-fuel industry:*** Introduction and advantages, concept of biofuel and its need, plants used for bio fuel, commercial significance. ***Bio-pesticide industry***: concept of bio control; Integrated post management(IPM),importance of bio pesticides, Types of bio pesticides,Azadiractin , commercial significance ***Bio-Fertilizer industry:*** Concept and need,Types of biofertilizers, commercial significance						
Unit 2	***Fruit processing industry:*** Concept and need, cold storage, Types of fruit processing (canned fruit, dried fruit chips, fruit pulp, squash, jam, jelly, pickle, and ketchup), commercial significance. ***Plant Pharmaceutical industry:*** concern and advantages, Types of pharmaceutical products (Churna, Asva and Arishta), Drug plant with reference to botanical sourse, principal and medicinal uses of *Adathoda ,Tinospora cordifolia*, and *Asperagusracemosus* , commercial significance of Amla and Aloe.						
Unit 3	***Introduction of economic botany:*** Food plant, Plants and plant products of industrial value, Medicinal plant and drugs, Lower plants in economic botany ***Cereals and millets:*** Brief account of Rice, Wheat, and common millets ***Legumes and nuts***: General account of Gram, Pea, peanuts, ***Essential oils:*** brief account of various method essential oil extracted from plant tissue, Camphor, Eucalyptus oil, jasmine oil. ***Pulp and paper industry:*** Raw materials, supply of raw materials in India, manufacture of pulp, kinds of paper and paper industry. ***Spices:*** Listing of important spices, their family and part used, economic importance with special reference to Asafetida, saffron, clove and black pepper Beverages: Tea, Coffee (morphology, processing & uses)						

Reference Books:

1. Casida, L. E. J. R. (2016). Industrial Microbiology. New Age International Publisher.
2. Sivakumaar, P.K. (2010). 2. An Introduction to Industrial Microbiology. S Chand publishing.
3. Waites, M.J., Morgan, N.L., Rockey, Higton G. (2001). Industrial Microbiology: An Introduction. Blackwell Science.
4. Okafor, N., Benedict, C. and Okeke. (2017). Modern Industrial Microbiology and Biotechnology. Taylor & Francis.
5. Ruzin, S.E. (1999). Plant Microtechnique and Microscopy, Oxford University Press, New York. U.S.A
6. University granthnirman board Vanaspati sastra
7. B. P. Pandey (2017) Economic Botany. S. Chand Publication, New Delhi.
8. Kochhar, S.L. (2012). Economic Botany in Tropics, MacMillan & Co. New Delhi, India.
9. Samba Murty and Subrahmanyam (2011).
10. Textbook of Modern Economic Botany, CBS Publishers and Distributors, New Delhi.
11. Hill, Albert F. Economic Botany, Tata Mc Grow Hill Publishing Company, Ltd. New Delhi.
12. Wickens, G.E. (2001). Economic Botany: Principles & Practices. Kluwer Academic Publishers, The Netherlands.
13. Singh, Pandey and Jain (2017). Economic Botany, Rastogi Publication, Meerut.
14. B. Baruah (2017). Economic Botany, Kalyani Publishers, New Delhi.
15. Textbook of Botany Angiosperms by Dr.B.P.Pandey

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(Effective from June 2024-25 UNDER NEP-2020)

SEMESTER IV

Course Title: Industrial botany and Botany in human welfare

(Course code: *MJ BO-402-P*)

Credit: 1

Course outcomes & objectives:

1. To understand applied botany, plant applications and uses.
2. To understand the principles of biofuel and biofertilizer production.
3. To explore the various types of biofuels, such as biodiesel, bioethanol, and biogas, and their potential applications.
4. To study the sources of biomass feedstock for biofuel and biofertilizer production.
5. To analyze the environmental, economic, and social impacts of biofuel and biofertilizer production.

DISCIPLINE-SPECIFIC CORE COURSE(MINOR)						
COURSE	**SEMESTER**	**COURSE CODE**	**COURSE TITLE**	**PRACTICAL**		
				Credits	**Lectures**	**Internal/External**
Certificate Course	**B.Sc. IV**	**MJ BT-402-P**	Industrial botany and Botany in human welfare	1	**30**	**25 Marks (15+10)**
UNIT	**TOPIC**					
Unit 1	1. List plants used for biofuel. 2. List plant used for bio pesticides. 3. Visit Fruit processing industrynearby you write and submit report. 4. List plant used for pharmaceutical products and their used by visitlocalAyurvedic doctor/ethnobotanist/industry. 5. Study of Cereals and millets:Rice, Wheat, and common millets 6. Study of Legumes and nuts: Gram, Pea, peanuts 7. Study ofEssential oils: Camphor, Eucalyptus oil, jasmine oil. 8. Study of Spices: Asafetida, saffron, clove and black pepper 9. Study of Beverages: Tea, Coffee 10. Write the process of paper making.					

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(Effective from June 2024-25 UNDER NEP-2020)

SEMESTER IV

B. Sc.: BOTANY INTERNAL/UNIVRSITY PRACTICAL EXAM

Course Code: MAJ BOT-***402-P***

Course Title: Industrial botany and Botany in human welfare

Total Marks: 15 /10

Instructions: Strictly follow the instructions given by examiner(s).	Internal	university
Ex: 1. specimen A. (Do as Directed)	04	03
Ex: 2. specimen B (Do as Directed)	04	02
Ex: 3. specimen C. (Do as Directed)	04	03
Ex: 4. Viva-*voce* / submission.	03	02
	15	10

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(Effective from June 2024-25 UNDER NEP-2020)

SEMESTER IV

(Course code: MJ BO-403)

Course Title: Plant Anatomy and Embryology

Credit: 3

Course outcomes and objectives:

After the completion of the course, the students will be able to:

1. To understand the principles and applications of palynology, including pollen and spore morphology, pollen preservation, and pollen analysis.
2. To explore the role of palynology in various fields such as paleobotany, archaeology, forensic science, environmental monitoring, and allergy research.
3. To study the diversity of pollen and spore morphology among different plant taxa and its significance in plant systematics, evolution, and ecology.
4. To gain practical skills in microscopic techniques, tissue sectioning, staining, and imaging for the study of plant anatomy and embryology.

DISCIPLINE-SPECIFIC CORE COURSE(MAJOR)							
COURSE	**SEMESTER**	**COURSE CODE**	**COURSE TITLE**	**THEORY**			
				Credits	**Lectures**	**External**	**Internal**
Certificate Course	**B.SC. IV**	**MJ BO-403**	Plant Anatomy and Embryology	**3**	**45**	**40 Marks**	**35 Marks**
UNIT	**TOPIC**						
Unit 1	***Plant Anatomy:*** Anomalous primary growth in Nyctanthes stem and Anomalous secondary growth in Salvadora stem Secondary growth in monocotyledonous stem Anatomy of Leaf and petiole. Vascular tissue system,Types of Vascular Bundles, Nodal Anatomy (Four main types of dicotyledonous nodes)						
Unit 2	***Palynology***: meaning of palynology, Common Terms to study pollen, NPC System, Application of Palynology in Taxonomy, coal, oil Exploration and forensic Science ***Embryology:*** Endosperms: Types and functions Embryo development in Dicotyledons: Crucifer type Embryo development in Monocotyledons: - Sagittariasagittifolia type Polyembryony: Definition, classification, causes, importance Apomixis, Apospory, parthenogenesis						
Unit 3	***Applications of Plant Anatomy*** Formation of Lateral root, root hairs, Root-Stem transition: Definition and Types Anomalous secondary growth in Tinospora aerial root, and beet root ***Tools and Techniques use for anatomical study:*** Microscopy and micrometry, techniques, instruments, section cutting, how to prepare microscope slides of simple object, maceration technique, mounting media and mounting						

Suggested readings.

- College Botany, by B.P. Pandey
- Singh, Pandy and Jain (2017). Reproductive Biology of Angiosperms, Rastogi Publications, Meerut Reference Books: 1. P Maheswari (2009). Embryology of Angiosperms.
- Shivanna, K.R. (2003). Pollen Biology and Biotechnology. Oxford and IBH Publishing Co. Pvt.Ltd. Delhi.
- Raghavan, V. (2000). Developmental Biology of Flowering plants, Springer, Netherlands.
- Johri, B.M. l (1984). Embryology of Angiosperms, Springer-Verlag, Netherlands.
- Bhojwani, S.S. and Bhatnagar, S.P. (2011). The Embryology of Angiosperms, Vikas Publishing House. Delhi. 5th edition.
- B. K. Mishra (2017). Reproductive Biology of Angiosperms Kalynai Publishers, New Delhi..
- Gangulee, H.C., Das, K.S, Dutta, C.D. and Kar, A.K. (1968) College Botany Vol. III
- Dutta A.C. - (1964) Botany for degree students.
- Hickey M, King .C.(2002) The Cambridge Illustrated Glossary of Botanical Terms, Cambridge University press.
- Sporne K.R. - (1968) The morphology of vascular plants.
- Sharma O.P - (1968) Plant Taxonomy
- Pandey B.P. - (1968) Taxonomy of Angiosperms.
- Vashishta P.C - (1968) Taxonomy of Angiosperms.
- K. Esau - (1961) Plant Anatomy.
- A Fahn - (1968) Plant Anatomy.
- B.P. Pandey - (1978) Plant Anatomy
- Practical botany Vol 2 (Ashok and Ashok)
- Parihar, N.S. (1991). An Introduction to Embryophyta Vol. I Bryophyta. Central Book Depot, Allahabad.
- B.M. Johri and P.S. Srivastava 2001 Reproductive biology of plants

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(Effective from June 202425 UNDER NEP-2020)

SEMESTER IV

Course Title: Plant Anatomy and Embryology

(Course code:MJ BO-404-P)

Credit: 1

Course outcomes & objectives:

1. Understanding of plant anatomy and tissues using practical examples and skills.
2. To learn to prepare and to studying plant embryology and processes using suitable examples.
3. To learn practically about economically useful plants and their resources.1. To understand the structure and function of plant tissues and organs at the microscopic level, including cells, tissues, meristems, and vascular systems.
4. To study the reproductive structures of plants, including flowers, fruits, seeds, and gametophytes, and their roles in sexual reproduction.
5. To investigate the cellular and molecular mechanisms underlying plant embryogenesis, including cell division, cell differentiation, and hormonal regulation.
6. To gain practical skills in microscopic techniques, tissue sectioning, staining, and imaging for the study of plant anatomy and embryology.

DISCIPLINE-SPECIFIC CORE COURSE(MAJOR)						
COURSE	**SEMESTER**	**COURSE CODE**	**COURSE TITLE**	**PRACTICAL**		
				Credits	**Lectures**	**Internal/External**
Certificate Course	**B.SC. IV**	**MAJ BOT-404-P**	Plant Anatomy and Embryology	1	30	**25 Marks (15+10)**
UNIT	**TOPIC**					
	Study of Anomalous primary growth in Nyctanthes stem Study of Anomalous secondary growth in Salvadora stem Study of secondary growth in Dracaena stem Study of internal structure of Acacia (T.s. Phyllode) Study of Anomalous secondary growth in Tinospora aerial root Study Types of Vascular Bundles through permeant slide or chart. Study Characters used for study of pollen grains. Study of development of dicot embryo through permanent slides. Dissection of developing seeds for embryos at various developmental stages. Study types of embryos through permeant slide or chart. Study types of Root-Stem transitionthrough chart. Study of Anomalous secondary growth in Tinospora aerial root. Study of Anomalous secondary growth in beet root.					

B. Sc.: BOTANY INTERNAL/UNIVRSITY PRACTICAL EXAM

Course Code: MAJ BOT-***404-P***

Course Title: Plant Anatomy and Embryology

Total Marks: 15 /10

Instructions: Strictly follow the instructions given by examiner(s).	Internal	university
Ex: 1. specimen A. (Do as Directed)	04	03
Ex: 2. specimen B (Do as Directed)	04	02
Ex: 3. specimen C. (Do as Directed)	04	03
Ex: 4. Viva-*voce* / submission.	03	02
	15	10

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SEMESTER IV

(Course code: MJ BO-405)

Course Title: Systematic Botany and Plant Taxonomy

Credit: 3

Course Objectives & outcome:

After the completion of the course, the students will be able to:

1. Develop critical understanding on Plant systematic and morphological characters of selected family.
2. Demonstrate proficiency in plant identification and classification using morphological, anatomical, cytological, and molecular characters.
3. Apply taxonomic principles and methodologies to identify and classify unknown plant specimens to the appropriate taxonomic rank.
4. Construct and interpret phylogenetic trees based on molecular data, morphological characters, or a combination of both.

DISCIPLINE-SPECIFIC CORE COURSE (MAJOR)							
COURSE	**SEMESTER**	**COURSE CODE**	**COURSE TITLE**	**THEORY**			
				Credits	**Lectures**	**External**	**Internal**
Certificate Course	**B.SC. IV**	**MJ BO-405**	Systematic Botany and Plant Taxonomy	3	**45**	**40 Marks**	**35 Marks**

UNIT	**TOPIC**
Unit 1	• Introduction: systematic botany and plant taxonomy • History, Fundamental Components of Taxonomy, Aims of Taxonomy • Basic Principles, Plant Nomenclature And ICBN (Objectives,Introduction, Binomial nomenclature,ICN, Principles, Focal points of ICN,Phylocode, The rule: Rank of taxa, type method, Principle of Prinity, Effective and valid publication, Publication of names , Citation of Author's name, Retention, choice and rejection of names, Rejection of names, Names of cultivated plants, Names of hybrid plants) • Species Concept ,Genus concept.
Unit 2	Methods in Systematics and Families of Angiosperms **Polypetalae:** Annonaceae,Portulacaceae,Rutaceae, Rhamnaceae ,Combretaceae, Apiaceae. **Gamopetalae:** Rubiaceae, Sapotaceae, Apocynaceae, Brassicaceae, Convolvulaceae **Monoclamydae:** Polygonaceae, Casuarinaceae **Monocotyledonae**: Commelinaceae.
Unit 3	• Sources of taxonomical evidence: Morphological, vegetative anatomy, cytotaxonomy, taxonomy and embryology, palynology, phytochemistry and taxonomy, ecology and taxonomy, palaeo botany and taxonomy, numerical taxonomy. • Phyto Geography of india • Endemism: Definition, types of endemism • Vegetation of Gujarat

Refrence book

Gurucharan Singh. Plant Systematics

O.P. Sharma. Plant Taxonomy.

Judd. Plant Systematics

Avrutbijdhari nu vardikaran book ,university granth nrman board.

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(Effective from June 2024-25 UNDER NEP-2020)

SEMESTER IV

Course Title: Systematic Botany and Plant Taxonomy

Practical/Lab course (Course code: MJ BO-406 P)

Credit: 1

Course outcomes:

1.Develop critical understanding on Plant systematic and morphological characters of selected family.
2.Demonstrate proficiency in plant identification and classification using morphological, anatomical, cytological, and molecular characters.
3. Apply taxonomic principles and methodologies to identify and classify unknown plant specimens to the appropriate taxonomic rank.
4. Construct and interpret phylogenetic trees based on molecular data, morphological characters, or a combination of both.

DISCIPLINE SPECIFIC CORE COURSE (MAJOR)						
COURSE	SEMESTER	COURSE CODE	COURSE TITLE	PRACTICAL		
				Credits	Lectures	Internal/External
Certificate Course	B.Sc. IV	MA BO 406– P	Systematic Botany and Plant Taxonomy	1	30	25 Marks (15+10)
UNIT	*TOPIC* (Class work material / temporary / permanent slide/Chart/ Photograph)					
	Study of vegetative and floral characters of the families prescribed in the theory 1. Annonaceae, 2. Portulacaceae, 3. Rutaceae, 4. Rhamnaceae , 5. Combretaceae, 6. Apiaceae. 7. Rubiaceae, 8. Sapotaceae, 9. Apocynaceae, 10. Brassicaceae, 11. Convolvulaceae 12. Polygonaceae, 13. Casuarinaceae 14. Commelinaceae 15 Study of Phyto Geography of india 16. Vegetation of Gujarat 17. Make a plantcheck list and pictorial album found endemic species found in Gujarat/ kachchh.					

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(Effective from June 2024-25 UNDER NEP-2020)

SEMESTER IV

Course Title: Systematic Botany and Plant Taxonomy

B. SC.: BOTANY INTERNAL / UNIVERSITY PRACTICAL EXAM

Course Code: **MA BO-406-P**

Total Marks: 15 / 10

Instructions: Strictly follow the instructions given by examiner(s).	Internal	university
Ex: 1. specimen A. (Do as Directed)	04	03
Ex: 2. specimen B (Do as Directed)	04	02
Ex: 3. specimen C. (Do as Directed)	04	03
Ex: 4. Viva-*voce* / submission.	03	02
	15	10

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(Effective from June 2024-25 UNDER NEP-2020)

SEMESTER IV

(Course code: MI BO-407)

Course Title:: Industrial botany and Botany in human welfare

Credit: 3

Course outcomes and objectives:

After the completion of the course the students will be able to:

1. To understand applied botany, plant applications and uses.
2. To understand the principles of biofuel and biofertilizer production.
3. To explore the various types of biofuels, such as biodiesel, bioethanol, and biogas, and their potential applications.
4. To study the sources of biomass feedstock for biofuel and biofertilizer production.
5. To analyze the environmental, economic, and social impacts of biofuel and biofertilizer production.

DISCIPLINE-SPECIFIC CORE COURSE(MINOR)							
COURSE	***SEMESTER***	***COURSE CODE***	***COURSE TITLE***	***THEORY***			
				Credits	***Lectures***	***External***	***Internal***
Certificate Course	***B.SC. IV***	***MI BO-407***	Industrial botany and Botany in human welfare	**3**	45	***40 Marks***	***35 Marks***
UNIT	***TOPIC***						
Unit 1	***Bio-fuel industry:*** Introduction and advantages, concept of biofuel and its need, plants used for bio fuel, commercial significance. ***Bio-pesticide industry***: concept of bio control; Integrated post management (IPM), importance of bio pesticides, Types of bio pesticides, Azadiractin , commercial significance ***Bio-Fertilizer industry:*** Concept and need, Types of biofertilizers, commercial significance						
Unit 2	***Fruit processing industry:*** Concept and need, cold storage, Types of fruit processing (canned fruit, dried fruit chips, fruit pulp, squash, jam, jelly, pickle, and ketchup), commercial significance. ***Plant Pharmaceutical industry:*** concern and advantages, Types of pharmaceutical products (Churna, Asva and Arishta), Drug plant with reference to botanical sourse, principal and medicinal uses of *Adathoda* ,*Tinospora cordifolia*, and *Asperagusracemosus* , commercial significance of Amla and Aloe.						
Unit 3	***Introduction of economic botany:*** Food plant, Plants and plant products of industrial value , Medicinal plant and drugs, Lower plants in economic botany ***Cereals and millets:*** Brief account of Rice, Wheat, and millets ***Legumes and nuts***: General account of Gram, Pea, peanuts, ***Essential oils:*** brief account of various method essential oil extracted from plant tissue, Camphor, Eucalyptus oil, jasmine oil. ***Pulp and paper industry:*** Raw materials, supply of raw materials in India, manufacture of pulp, kinds of paper and paper industry. ***Spices:*** Listing of important spices, their family and part used, economic importance with special reference to Asafetida, saffron, clove and black pepper Beverages: Tea, Coffee (morphology, processing & uses)						

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(Effective from June 2024-25 UNDER NEP-2020)

SEMESTER IV

Course Title: Industrial botany and Botany in human welfare

(Course code: *MJ BO-408-P*)

Credit: 1

Course outcomes & objectives:

1. To understand the principles of biofuel and biofertilizer production.
2. To explore the various types of biofuels, such as biodiesel, bioethanol, and biogas, and their potential applications.
3. To study the sources of biomass feedstock for biofuel and biofertilizer production.
4. To analyze the environmental, economic, and social impacts of biofuel and biofertilizer production.

DISCIPLINE-SPECIFIC CORE COURSE(MINOR)						
COURSE	SEMESTER	COURSE CODE	COURSE TITLE	PRACTICAL		
				Credits	Lectures	Internal/External
Certificate Course	B.Sc. IV	MJ BT-408-P	Industrial botany and Botany in human welfare	1	30	25 Marks (15+10)
UNIT	TOPIC					
Unit 1	1. List plants used for biofuel. 2. List plant used for bio-pesticides. 3. Visit Fruit processing industrynearby you write and submit report. 4. List plant used for pharmaceutical products and their used by visitlocal Ayurvedic doctor/ethnobotanist/industry. 5. Study of Cereals and millets:Rice, Wheat, and common millets 6. Study of Legumes and nuts: Gram, Pea, peanuts 7. Study ofEssential oils: Camphor, Eucalyptus oil, jasmine oil. 8. Study of Spices: Asafetida, saffron, clove and black pepper 9. Study of Beverages: Tea, Coffee 10. Write the process of paper making.					

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(Effective from June 2024-25 UNDER NEP-2020)

SEMESTER IV

Course Title: Industrial botany and Botany in human welfare

B. SC.: BOTANY INTERNAL / UNIVERSITY PRACTICAL EXAM

***Course Code:* MA BO-408-P**

Total Marks: 15 / 10

Instructions: Strictly follow the instructions given by examiner(s).	Internal	university
Ex: 1. specimen A. (Do as Directed)	04	03
Ex: 2. specimen B (Do as Directed)	04	02
Ex: 3. specimen C. (Do as Directed)	04	03
Ex: 4. Viva-*voce* / submission.	03	02
	15	10

KSKV Kachchh University, Bhuj - Kachchh
(Effective from June 2024-25 UNDER NEP-2020)
SEMESTER III
Course Title:
(Course code: SEC BO)
Credit:2

Course Outcome & Objectives

After the completion of the course, the students will be able to:

1. Study the diversity of plant species used in traditional and modern medicine across different cultures and regions.
2. Understand the chemical composition and pharmacological properties of medicinal plants and their active compounds.
3. Identify medicinal plant species and their traditional and contemporary uses in healthcare systems worldwide.
4. Analyze the chemical composition and bioactivity of medicinal plant extracts.

DISCIPLINE-SPECIFIC CORE COURSE(MAJOR)						
COURSE	**SEMESTER**	**COURSE CODE**	**COURSE TITLE**	**PRACTICAL**		
				Credits	**Lectures**	**Internal/External**
Certificate Course	**B.SC. III**	**SEC BO-P**	**Medicinal Botany**	**2**	**30**	**Total Marks 50 (25+25)**
UNIT	**TOPIC**					
1	History, Scope and Importance of Medicinal Plants. Indigenous Medicinal Sciences; Definition and Scope-Ayurveda Conservation of endangered and endemic medicinal plants. Definition: endemic and endangered medicinal plants, Red list criteria; In situ conservation: Biosphere reserves, sacred groves, National Parks; Ex situ conservation: Botanic Gardens, Ethnomedicinal plant Gardens.					
2	Ethnobotany and Folk medicines. Definition; history and development of Ethnobotany Ethnobotany in India: Methods tostudy ethnobotany; Plants in religious belif: bili, Dharo,tulsi, vad, khijdo, piplo, rukhdo, nariyal, limbdo, kesudo, chandan, sevan, gugal, salai gugal, pilu.etc... Applications of Ethnobotany.					

Suggested Readings

1. Trivedi P C, 2006. Medicinal Plants: Ethnobotanical Approach, Agrobios, India.
2. Purohit and Vyas, 2008. Medicinal Plant Cultivation: A Scientific Approach, 2nd edn.
_Agrobios, India.