ST. XAVIER'S COLLEGE (AUTONOMOUS)

AHMEDABAD

Botany Syllabus
for
Four-Year Undergraduate Programme
as per
National Education Policy (NEP-2020)

(Semester V)

(EFFECTIVE FROM JUNE 2025)

ST. XAVIER'S COLLEGE (Autonomous), AHMEDABAD
BOTANY
Theory syllabus

PROGRAMME SPECIFIC OUTCOMES

PSO1: Knowledge: Understanding the nature and basic concepts of all the plant groups, their morphonology, anatomy, taxonomy, physiology, biochemistry, genetics, components at the molecular level, the relationship between structure and function, plant diversity, and ecology.

PSO2: **Laboratory skills**: Students learn to carry out practical work in the field and in the laboratory related to interpreting plant morphology and anatomy, plant identification and collection, vegetation analysis techniques, physiochemical analyses of plant materials, analysis of data using appropriate statistical methods, documentation of field visits, visits to gardens and nurseries.

PSO3: **Environmental concern**: Students become aware of natural resources and understand the impact of plant diversity in societal and environmental contexts and demonstrate the knowledge of, and need for, sustainable development with respect to assessment, conservation and utilization of floral diversity.

PSO4: **Employability/future prospects**: Students develop critical thinking, scientific attitudes, problem-solving skills, presentation skills, teamwork capacities, and an aptitude that is highly valuable to employers in the sector of academia, research and industry and which will facilitate them for taking up and shaping successful careers in Botany.

PSO5: **Scientific communication**: Effective written and oral scientific communication skills, especially the ability to transmit the fundamental concepts of the subject in a clear and concise manner.

PSO6: Life-long learning: Students are prepared for lifelong learning by drawing attention to the vast world of knowledge of plants and by enhancing their ability to engage in independent learning by introducing them to the methodology of systematic academic inquiry.

ST. XAVIER'S COLLEGE (AUTONOMOUS), AHMEDABAD

Syllabus of Semester – V of the following department under the Faculty of Science based on the Undergraduate Curriculum Framework - 2023, to be implemented from the Academic Year 2025-26.

FACULTY OF SCIENCE

DEPARTMENT OF BOTANY

Course	Title	Content	Hours /week	Credit
DSC-1 (Theory)	Advanced Botany I	U-1: Algae U-2: Fungi U-3: Bryophyta U-4: Cell Biology and Genetics	4 hrs	4
DSC-2 (Theory)	Advanced Botany II	U-1: Systematic Botany and Ethnobotany U-2: Angiosperms U-3: Embryology U-4: Anatomy	4 hrs	4
DSC-3 (Lab)	Advanced Botany Practicals- I	Practical based on the Theory syllabus, Paper I and II.	8 hrs	4
Subject Specific Minor (Theory)	Advanced Botany III	U-1: Plant Physiology U2: Biochemistry	2 hrs	**2**
Subject Specific Minor (Lab)	Advanced Botany III	Practical based on the Theory syllabus	4 hrs	**2**
Minor (Theory)	Essentials of Botany II	U-I: Anatomy U-II: Embryology	2 hrs	2
Minor (Lab)	Essentials of Botany II	Practical based on the syllabus as per theory	4 hrs	2
SEC	Principles of Landscaping & Gardening	As per the Swayam Curriculum	2 hrs	2

St. Xavier's College (Autonomous), Ahmedabad

Syllabus of Semester – V of the following departments under the Faculty of Science, based on Under Undergraduate Curriculum Framework - 2023, to be implemented from the Academic Year 2025-26.

FACULTY OF SCIENCE

DEPARTMENT OF BOTANY

BSc. (Hons.) Botany

Major Course – Advanced Botany I

CREDIT DISTRIBUTION, ELIGIBILITY, AND PRE-REQUISITES OF THE COURSE

Course Title & Code	Credit Distribution of The Course			Eligibility Criteria	Pre-requisite(s) of the Course (if any)
	Lecture	Tutorial	Practical / Practice		
Advanced Botany I BOMC551C	4	0	0	10 + 2 from a recognized board in any stream	Basics of Biology

LEARNING OBJECTIVES (LO)	
LO-1	To classify various groups of algae, describe their life cycles, and explain their ecological and economic importance.
LO-2	To describe the structure, reproduction, and classification of fungi and demonstrate knowledge of mushroom cultivation techniques.
LO-3	To distinguish among different bryophyte groups, explain their life cycles, and identify features that facilitate their adaptation to land environments.
LO-4	To explain cellular processes such as differentiation, cell cycle progression, and programmed cell death, and describe the structure and behavior of chromosomes.
LO-5	To analyze the mechanisms of genetic inheritance, including linkage, crossing over, and mutations, and to understand the basics and applications of DNA fingerprinting and the role of introns.
Course OUTCOMES (CO)	

On Completion of this course, the student will be able to	
CO-1	Differentiate between major groups of algae, understand their life cycles, and explain their role in human welfare.
CO-2	Understand the classification, distribution, structure, reproduction, and life histories of selected fungi, and gain basic knowledge of mushroom cultivation.
CO-3	Identify different groups of bryophytes, understand their life cycles, and describe their adaptations for terrestrial life.
CO-4	Gain knowledge of plant cell biology and programmed cell death (PCD), along with the structure and morphology of chromosomes.
CO-5	Understand the principles of linkage, crossing over, mutation, and their roles in heredity and variation.
CO-6	Comprehend the fundamentals of DNA fingerprinting, understand its applications, and learn about its significance.

Unit I: ALGAE **(15L)**

1. Structure, Reproduction (excluding development), and life history:
    a) CYANOPHYTA: *Scytonema,* ***Spirulina***
    b) CHLOROPHYTA: *Chara, Chlamydomonas*
    c) PHAEOPHYTA: *Sargassum*,
    d) RHODOPHYTA: *Polysiphonia*
    e) CHRYSOPHYTA: General characters of *Diatoms* (Bacillariophyceae)
2. Algal Toxins.
3. Algal Species as Indicators of Industrial Wastes.

Unit II: FUNGI **(15L)**

1. Occurrence, Distribution, Structure, Reproduction, Utilization, and Life History (excluding development):
    a) MASTIGOMYCOTINA: *Phytophthora*
    b) ASCOMYCOTINA: *Aspergillus* (Eurotium)
    c) BASIDIOMYCOTINA: *Agaricus*
    d) MIXOMYCOTINA: General account

2. General account on Deuteromycetes (Imperfect Fungi) and their economic importance.

3. General account of Mushroom cultivation.
4. **Lichens: Habitats, types, and economic importance**.

Unit III: BRYOPHYTA **(15L)**

1. Adaptation in Bryophytes as Land Plants.
2. Comparative account of morphology, reproduction, and adaptation in Marchantia, Anthoceros, and Funaria.
3. Structure, Reproduction, and Life History (excluding development):
    a) HEPATICOSPODIA: *Marchantia*
    b) ANTHOCEROTOPSIDA: ***Notothylas***
    c) BRYOPSIDA: *Sphagnum*
4. Vegetative reproduction in Bryophytes.

Unit II: CELL BIOLOGY & GENETICS (15L)

CELL BIOLOGY:

1. Ultrastructure of Chromatin.

2. Cell Cycle:- Interphase, Mitosis, Meiosis

3. Programmed Cell Death (PCD) in plants.

GENETICS

1. **Gene Linkage: characteristics, theories of linkage, kinds of linkage, significance.**

2. **Crossing over: characteristics, types, mechanism, factors affecting crossing over, 3-point test cross, & significance.**

3. Gene mutations- Types- somatic/germline, spontaneous/induced, substitutions- transversion, transition; effect of substitution mutation on phenotype- Missense, Nonsense, Neutral, and Silent mutations.

4. DNA damage and repair.

5. DNA fingerprinting and its importance.

Reference Books:

- Smith, Gilbert M; *Cryptogamic Botany Algae & Fungi* Volume 1; 2nd edition; McGraw-hill Book Comp. Tokyo, 1955.
- Vasishtha B.R. And Sinha A. K. - *Botany for degree students Part 1 ALGAE*; S. Chand & Company Ltd, 1st edition, revised 2005.
- Vasishtha B.R. And Sinha A. K. - *Botany for degree students Part 2 FUNGI*; S. Chand & Company Ltd, 1st edition, revised 2005.
- Ainsworth, G.C.; Bisby, G.R.; Kirk, P.M. (ed.); *Ainsworth & Bisby's Dictionary of the Fungi*, 10th edition; CABI Publishing: 2008.
- Alexopoulos, Constantine J.; Mims, Charles W; *Introductory Mycology*; 3rd edition; New Delhi: Wiley Eastern Limited, 1983.
- Webster, J; *Introduction to Fungi;* Cambridge University Press, 1985.
- Smith, Gilbert M; *Cryptogamic Botany Bryophyta & Pteridophyta* Volume 2; 2nd edition; McGraw-hill book Comp. Tokyo, 1955.
- Kar, Ashok Kumar; Gangulee, Hirendra Chandra; *College botany*: Volume II; 2nd edition; Kolkata: New Central Book Agency (P) Ltd, 1989, 2006.
- Arumugon, N.; *Cell Biology, Genetics, Evolution*. Kanyakumari: Saras Publication.
- De Robertis, E.D.P.; Nowinski, Wiktor W.;Saez, Francisco A.; *Cell Biology*; Philadelphia: W.B. Saunders Company , 1970.
- Gupta, P.K.; *Cytogenetics*; 1st edition, reprint; Meerut: Rastogi Publications, 2004.
- Kleinsmith, L.J. and Kish, V.M.; Principles of Cell and Molecular Biology,2nd Ed.,.NewYork,USA: Harper Collins College Publishers, 1995.
- Lewin, B..Genes VIII; New York: Oxford University Press, 2000.
- Powar, C.B; *Genetics*; Vol 1 & 2; Himalaya Publishing House*, 2003.*
- Russel, P.J; *Genetic;* Harper Collins College, 1992.
- Stent, G.S.; *Molecular Genetics*; San Francisco: W.H. Freeman, 1971.
- Strickberger, M.W.; *Genetics*. New Delhi: PHI Learning Pvt. Ltd., 2008.
- Watson, J.D;T. A. Baker, S. P. Bell, A. Gann, M. Levine, R. Losick; Molecular Biology of the

Gene,5th Edition; Pearson Education, 2004.
- Wolfe, S. L.; Molecular and Cellular Biology. California, USA: Wadsworth Publishing Co.,1993.

Suggested Online Links/Readings:

https://swayam.gov.in
https://www.iscnagpur.ac.in/knowledge_learning_files/5.7_General_Open_Access_e-Resources.pdf
https://www.tkdl.res.in/tkdl/langdefault/common/Home.asp?GL=Eng
https://ndl.iitkgp.ac.in
https://nptel.ac.in/course.html
www.ncert.in
https://books.google.co.in

Pedagogy:

1. Lecture method with teaching aids.
2. Audio-Visual Teaching mode with Projector Method.
3. Dialogue and context-based class.
4. Assignments, Learning seminars, Class Tests etc.
5. Open Online Sources and Tutorials.

MODE OF EVALUATION:

The evaluation will be divided into two parts.

ASSESSMENT	MARKS
INTERNAL	
Attendance	05
Assignment (Research component)	10
Continuous Internal Assessment I and II	35
TOTAL	50 marks
EXTERNAL	
End Semester Exam	50 marks

Students will prepare and present (in pairs) a Submission related to the topic of the Research Assignment on allotted topics. These submissions will be presented in the form of PPT/ Activity/Handwritten notes/ Article/Poster/ etc. Points for evaluation: Presentation (20%) + Content (20%) + Explanation (20%) + Creativity (20%) + Overall

St. Xavier's College (Autonomous), Ahmedabad

Syllabus of Semester – V of the following departments under the Faculty of Science, based on Under Undergraduate Curriculum Framework - 2023, to be implemented from the Academic Year 2025-26.

FACULTY OF SCIENCE

DEPARTMENT OF BOTANY

BSc. (Hons.) Botany

Major Course – II: Advanced Botany -II

CREDIT DISTRIBUTION, ELIGIBILITY, AND PRE-REQUISITES OF THE COURSE

Course Title & Code	Credit Distribution of The Course			Eligibility Criteria	Prerequisite(s) of the Course (if any)
	Lecture	Tutorial	Practical / Practice		
Advanced Botany II (BOMC552C)	4	0	0	10 + 2 from a recognized board in any stream	Basic Knowledge of Biology and familiarity with scientific terminology

LEARNING OBJECTIVES (LO)	
LO-1	To explain the rules and significance of botanical nomenclature, including the ICBN, and compare different systems of plant classification, especially that of Engler and Prantl.
LO-2	To utilize online botanical resources such as E-Flora and E-Herbarium for research and identification of plant species.
LO-3	To identify and describe key morphological and economic traits of major angiosperm families, and to appreciate the relevance of ethnobotany and traditional medicinal plant use.
LO-4	To describe the mechanisms of apomixis, polyembryony, and sexual incompatibility in plants, and identify the types and roles of endosperm in plant development.

LO-5	To demonstrate understanding of plant tissue systems, including secretory and absorbing tissues, mineral crystals, the process of abscission, and anatomical features such as root–stem transition.
Course OUTCOMES (CO)	
On Completion of this course, the student will be able to	
CO-1	Comprehend the principles and rules of the International Code of Botanical Nomenclature (ICBN) and understand Engler and Prantl's system of classification.
CO-2	Gain knowledge of plant nomenclature, E-Flora, and E-Herbarium resources.
CO-3	Describe the morphology, classification, diagnostic features, and economic importance of selected angiosperm families, and evaluate the history and significance of ethnobotany and ethnomedicinal plants.
CO-4	Understand the concepts of apomixis, polyembryony, and sexual incompatibility, and learn the types and functions of endosperms.
CO-5	Learn about secretory and absorbing tissues, understand the role of mineral crystals in plant cells, and explain the process of leaf fall (abscission).
CO-6	Study applied aspects of plant anatomy and embryology, including root–stem transition.

Unit I: SYSTEMATIC BOTANY & ETHNOBOTANY (15L)

SYSTEMATIC BOTANY:

1. Principles of taxonomy, merits and demerits of systems of classification of Engler and Prantle.
2. Plant nomenclature: ICBN. Principles and Rules. Effective and Valid publication, Rule of Priority, and its typification, author citation, rejection, and retention of names.
3. Plant Identification: characters considered before plant identification; botanical keys: construction of dichotomous keys – Indented and bracketed keys.
4. E-Flora and E-Herbarium.

ETHNOBOTANY:

1. History and development of Ethnobotany.
2. Ethnobotany in India.
3. Plants used by the tribes of Gujarat:
- ***a.*** *Butea monosperma*
- ***b.*** *Calotropis procera*
- ***c.*** *Tamarindus indica*
- ***d.*** *Vitex negundo*

Unit II: ANGIOSPERMS (15L)

Classification as per Bentham and Hooker with economic importance

DICOTYLEDONS:

Polypetalae: Capparidaceae, Sterculiaceae, Rhamnaceae**,** Combretaceae.

Gamopetalae: Asclepiadaceae, Boraginaceae, Bignoniaceae
Apetalae**:** Amaranthaceae
MONOCOTYLEDONS: Commelinaceae, Cyperaceae

Unit III: EMBRYOLOGY (15L)

1. Sexual Incompatibility: Causes, Types and Significance.
2. Endosperm: Types: free nuclear, cellular, helobial, ruminate; functions of the endosperm.
3. Polyembryony: causes, types, and significance.
4. Apomixis: definition, types, and significance.
5. Role of Embryology in Taxonomy.

Unit IV: ANATOMY (15L)

1. Secretory tissue system (excluding Laticiferous)
2. Absorbing tissue system.
3. Waste Material: Mineral crystals-
   a. Calcium oxalate- prismatic raphides, spheraphides
   b. Calcium carbonate- Cystolith.
4. Leaf–fall.
5. Root–stem transition.
6. Applied Plant Anatomy: Anatomy related to Taxonomy.

Reference Books:

- Lawrence, George H.M.; Taxonomy of Vascular Plants; 1st edition; New Delhi: Oxford& IBH Publishing Co., 1967.
- .Naik, V.N. 1984. Taxonomy of Angiosperms; New Delhi: Tata McGraw-Hill Publishing Ltd., 1984.
- Sharma, O.P.; Plant Taxonomy; 1st edition, reprint; New Delhi: Tata McGraw-Hill Publishing Co. Ltd. , 1993(2002)
- Sivarajan, V.V.; Introduction to the principles of plant taxonomy; 2nd edition; Cambridge:
- Cambridge University Press, 1991.
- Singh, V; Taxonomy. Rastogi Publication, Meerut; 2010.
- Singh, G.; Plant Systematics- Theory and Practice; New Delhi: Oxford and IBH Publishing Co. Pvt. Ltd, 1999.
- Subramanian, N.S.; Modern plant taxonomy; New Delhi: 1st edition; Vikas Publishing House Pvt. Ltd., 1995.
- Verma B.K. Introduction to Taxonomy of Angiosperms. New Delhi: PHI Learning Pvt. Ltd., 2011.

- Trivedi, P.C; *Ethnobotany*; Jaipur: Aavishkar Publishers.
- Jain, S.K; *Manual of Ethnobotany;* Jodhpur: Scientific Publication.
- Bhojwani, S.S.; Bhatnagar, S.P.; The embryology of angiosperms; revised edition; Delhi: Vikas Publishing House Pvt. Ltd., 1996.
- Maheshwari, P.; Introduction to the embryology of angiosperms; 2nd edition, reprint; New Delhi: Tata McGraw-Hill Publishing Company Limited, 1971.
- Eames, Arthur J.; MacDaniels, Laurence H.; An introduction to plant anatomy; 2nd edition. Reprint; New Delhi: Tata McGraw-Hill Publishing Company Limited, (1978, 2004).
- Esau, Katherine; Anatomy of seed plants; 2nd edition; New York : John Wiley & Sons,1977.
- Fahn, A; Plant anatomy; 4th edition. Indian reprint; New Delhi: Aditya Books (P) Ltd., 1990(1997).
- Gangulee, Das, and Dutta – College Botany Vol I.
- Tayal M.S.; Plant Anatomy; Rastogi publications, 1983.
- Dutta, A.C.; A Class-book of Botany; 15th edition; Calcutta: Oxford University Press,1976.

Suggested Online Links/Readings:

https://swayam.gov.in
https://www.iscnagpur.ac.in/knowledge_learning_files/5.7_General_Open_Access_e-Resources.pdf
https://www.tkdl.res.in/tkdl/langdefault/common/Home.asp?GL=Eng
https://ndl.iitkgp.ac.in
https://nptel.ac.in/course.html
www.ncert.in
https://books.google.co.in

Pedagogy:

1. Lecture method with teaching aids.
2. Audio-Visual Teaching mode with Projector Method.
3. Dialogue and context-based class.
4. Assignments, Learning seminars, Class Tests etc.
5. Open Online Sources and Tutorials.

MODE OF EVALUATION*:*

The evaluation will be divided into two parts.

ASSESSMENT	MARKS
INTERNAL	
Attendance	05
Assignment (Research component)	10
Continuous Internal Assessment I and II	35
TOTAL	**50 marks**
EXTERNAL	
End Semester Exam	50 marks

Students will prepare and present (in pairs) a Submission related to the topic of the Research Assignment on allotted topics. These submissions will be presented in the form of PPT/ Activity/Handwritten notes/ Article/Poster/ etc. Points for evaluation: Presentation (20%) + Content (20%) + Explanation (20%) + Creativity (20%) + Overall impression (20%).

St. Xavier's College (Autonomous), Ahmedabad

Syllabus of Semester – V of the following departments under the Faculty of Science based on Under Graduate Curriculum Framework - 2023 to be implemented from the Academic Year 2025-26.

FACULTY OF SCIENCE

DEPARTMENT OF BOTANY

BSc. (Hons.) Botany

Major Course – III: ADVANCED BOTANY PRACTICALS-I

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title & Code	Credit Distribution of The Course			Eligibility Criteria	Pre-requisite(s) of the Course (if any)
	Lecture	Tutorial	Practical / Practice		
Advanced Botany Practicals - I (BOMC553C)	0	0	04	10 + 2 from a recognized board in any stream	Basic Knowledge of Biology, identification, observation, and analytical skills

LEARNING OBJECTIVES (LO)	
LO-1	To prepare micro-slides of vegetative and reproductive structures of Algae, Fungi, and Bryophytes, and demonstrate laboratory techniques with precision.
LO-2	To identify angiosperm families using diagnostic features and understand their economic and ethnobotanical significance through charts and visual aids.
LO-3	To construct and apply botanical keys for plant identification and classification.
LO-4	To demonstrate the preparation and mounting of various plant tissues (endosperm, secretory, absorbing, waste) and explain the physiological processes like pollen germination and leaf abscission.
LO-5	To analyze genetic data and solve problems using charts, and conduct a botanical field study, including herbarium sheet preparation and specimen documentation.
Course OUTCOMES (CO)	

On Completion of this course, the student will be able to	
CO-1	Make micro preparations of vegetative and reproductive structures of Algae, fungi, and bryophytes (studied in theory).
CO-2	Identify members of the major angiosperm families (from the theory) by observing their diagnostic features and economic importance. Also, understanding ethnobotany through charts.
CO-3	Acquire skills to prepare botanical keys.
CO-4	Demonstrate the exposition and mounting of endosperm, absorbing tissue, secretory tissue, and waste materials in plants.
CO-5	Know the process of pollen germination and the phenomenon of Leaf fall.
CO-6	Apply problem-solving skills to genetics concepts and interpret data through charts.
CO-7	Acquire skills to undertake a field study and present a report along with herbarium sheets andbotanical specimens.

PRACTICAL PART A

UNIT I: ALGAE:

Identify and classify the following types:
ALGAE: Scytonema, **Spirulina**.
Chlamydomonas, Chara, Sargasum, Polysiphonia, Diatoms
Structure and Reproductive Organs through Fresh material/Permanent slides:
ALGAE: Scytonema, **Spirulina**, Chlamydomonas, Chara, Sargasum, Polysiphonia, Diatoms.

UNIT II: FUNGI

1. Study of types through fresh, preserved material and permanent slides.
Identify and classify the following types:
FUNGI: Phytophthora, Aspergillus, Agaricus.
Structure and Reproductive Organs through Fresh material/Permanent slides:
FUNGI: Phytophthora, Aspergillus, Agaricus.
2. Study of the Myxomycetes life cycle through a chart

UNIT III: BRYOPHYTA

Study of types through fresh, preserved material and permanent slides.

Identify and classify the following types:
BRYOPHYTA: Marchantia, **Notothylas,** Sphagnum
Sex organs & Capsule: (Fresh material/Permanent Slides)
BRYOPHYTA: Marchantia, **Notothylas,** Sphagnum

UNIT IV: CELL BIOLOGY AND GENETICS

CELL BIOLOGY:

1. To study mitosis in onion root tips by the squash method
2. Histochemical localization of DNA, RNA, and total protein
3. Electron microphotographs of the following cell organelles:

a. Ultrastructure of Chromatin

4. Cell measurement by Stage Micrometre.

5. Spectrometric estimation of DNA/RNA from the given Plant material.

GENETICS:

1. Study of Gene mutations through charts.
2. DNA Fingerprinting.
3. Study of DNA sequencing by the Maxam and Gilbert Methods.
4. Study of DNA sequencing by Sanger's Method.
5. Genetic problems.

a. Linkage: Complete and Incomplete

b. Crossing over: 3-point test cross.

PRACTICAL PART B

UNIT 1: Systematic Botany & Ethnobotany:

1. **Construction of Dichotomous Keys.**
2. **Ethnobotany study through charts as per the syllabus.**

UNIT II: ANGIOSPERM

ANGIOSPERMS: Study of families as per the theory syllabus, including floral formula and floral diagram. A minimum of ten herbarium sheets should be submitted.
Students must be taken on a Botanical excursion to study vegetation in its natural state.
The excursion report and submission of specimens during the practical examination will be given due weightage

UNIT III: EMBRYOLOGY:

1. Exposition and mountings of
a. Endosperm haustoria: *Cucumis*.
b. Developing embryo: *Cyamopsis tetragonoloba* (Guvar)

UNIT IV: ANATOMY:

1. To study the secretory tissue system through fresh material or permanent slides:
(1) Orange rind
(2) Lemon leaf
(3) Fern leaf (Hydathodes).
(4) Cycas rachis (Mucilage Duct)

2. Study of leaf fall (Abscission layer) through the permanent slide.

3. Study of Waste Materials:
(a) Calcium oxalate
Raphides [*Colocasia*].
Spheraphides [*Opuntia*].
(b) Calcium carbonate
Cystolith [Banyan leaf].

4. Study of the Absorbing tissue system through fresh / preserved material or permanent slides. (1) Absorbing tissue: Orchid root
(2) Haustorial organ: Scutellum maize grain.
(3) Haustoria in Cuscuta.

PROJECT:

Students must submit ***Cryptogamic specimens, Herbarium (family and Ethnobotany), and a Tour report.*** *The evaluation will include a Viva.*

Suggested Readings:

1. Bendre Ashok M.; Ashok Kumar: A Text Book of Practical Botany; Vol 1; Meerut: Rastogi Publications, 2010
2. Practical Botany vol. I & II by Bendre and Kumar, Rastogi Publication
3. Practical Botany by S. C. Santra, Chatterjee and Das, New Central Book Agency.
4. Experimental Plant Ecology by Pratima Kapur and Sudha Rani, CBS Publication

MODE OF EVALUATION:

SR. NO.	EXAM PATTERN	INTERNAL EXAM		EXTERNAL EXAM	
		SESSION I	**SESSION II**	**SESSION I**	**SESSION II**
1	Practical/Performance	25	20	25	25
2	Attendance	0	05	00	00
	Total	**25**	**25**	**25**	**25**
	Grand Total	**25+25= 50 marks**		**25+25= 50 marks**	

St. Xavier's College (Autonomous), Ahmedabad

Syllabus of Semester – V of the following departments under the Faculty of Science, based on Under Undergraduate Curriculum Framework - 2023, to be implemented from the Academic Year 2025-26.

FACULTY OF SCIENCE

DEPARTMENT OF BOTANY

BSc. (Hons.) Botany

Subject Specific Minor: ADVANCED BOTANY-III (Theory)

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title & Code	Credit Distribution of The Course			Eligibility Criteria	Pre-requisite(s) of the Course (if any)
	Lecture	Tutorial	Practical / Practice		
Advanced Botany -III (BOMC553C)	2	0	2	10 + 2 from a recognized board in any stream	Basic Knowledge of Biology, identification, observation, and analytical skills

LEARNING OBJECTIVES (LO)	
LO-1	To understand the fundamental processes of plant growth and development, including hormonal regulation and environmental influences.
LO-2	To explain the concept of Respiratory Quotient (R.Q.), interpret growth correlations, and describe the physiological basis and stages of plant senescence.
LO-3	To assess mechanisms of seed dormancy and germination, and understand the physiological and biochemical changes during fruit ripening.
LO-4	To classify amino acids, vitamins, and proteins, and understand their synthesis, structural features, and functional roles in plant systems.
LO-5	To explain the biochemical pathways of nitrogen metabolism and nitrogen fixation, along with the structure, function, and metabolism of lipids in plants.
LO-6	To understand the fundamental processes of plant growth and development, including hormonal regulation and environmental influences.

LO-7	To explain the concept of Respiratory Quotient (R.Q.), interpret growth correlations, and describe the physiological basis and stages of plant senescence.

Course OUTCOMES (CO)	
On Completion of this course, the student will be able to	
CO-1	Understand the physiological processes involved in the growth and development of plants.
CO-2	Explain the concept of Respiratory Quotient (R.Q.), growth correlations, and the physiological basis of senescence.
CO-3	Assess the mechanisms of seed dormancy and germination, and describe the physiological changes during fruit ripening.
CO-4	Classify amino acids, vitamins, and proteins, and understand their synthesis, structure, and functional types.
CO-5	Describe the pathways and regulation of nitrogen metabolism and nitrogen fixation, and understand the biochemical processes of lipid metabolism.

UNIT I: PLANT PHYSIOLOGY (15L)

1. **Plant Growth and Development: Definition, phases of growth, and factors affecting.**
2. Dormancy: Causes of dormancy. Methods of breaking dormancy
3. Germination: Different phases of germination and Factors affecting germination.
4. Respiration: R.Q. and factors affecting respiration.
5. Senescence and aging: Introduction, types of senescence, mechanisms, factors affecting senescence.
6. Fruit ripening: molecular basis and manipulation.

UNIT II: BIOCHEMISTRY (15L)

1. Amino acids: Classification, structure, protein and non-protein amino acids
2. **Protein: Classification of protein based on structure**
3. Lipids: Synthesis, alpha & Beta–oxidation.
4. A general account of the structure and functions of vitamins.
5. Nitrogen metabolism and Nitrogen fixation.

Suggested Reading:

- Devlin, Robert M.; Witham, Francis H.; Plant Physiology; 4th edition, Indian reprint;Delhi:CBS Publishers & Distributors, 1986(2001).
- Ganguly A.K., Kumar N.C.; General Botany, Vol II, Part II: Introduction to plant physiology; 7th Edition; Emkay Publications, 1990.
- Hans-Walter Heldt*, Plant Biochemistry* – Academic Press. 2004
- Kochhar, P.L.; A textbook of Plant Physiology; 7th edition; Delhi: Atma Ram & Sons,1964.

- Noggle, Ray G.; Fritz, George J.; Introductory plant physiology; 2nd edition; New Delhi: Prentice of India Private Limited, 1991.
- Salisbury, Frank B.; Parke, Robert V.; Vascular plants: form and function; London: Macmillan &Co Ltd, 1964.
- Salisbury, Frank B.; Ross, Cleon W.; Plant physiology; 3rd edition, Reprint; New Delhi: C B S Publishers & Distributors, 1986(2001).
- Sinha, B.K.; Pandey, S.N.; Plant Physiology; 1st edition; New Delhi: Vikas Publishing HousePvt. Ltd., 1981.
- Sinha, R.K.; Modern plant physiology; 2nd edition; New Delhi: Narosa Publishing House,2004.
- Verma S. K. Textbook of Plant physiology and Biochemistry; 4th edition; S. Chand &CompanyLtd, 2003.
- Verma, V.; Textbook of plant physiology; New Delhi: Ane Books India, 2007.
- Alberts, B., Bray, D., Lewis, J., Raff, M., Roberts, K. and Watson, J.D.; Molecular Biology ofthe Cell. New York: Garland Publishing, Inc.

Suggested Online Links/Readings:

https://swayam.gov.in
https://www.iscnagpur.ac.in/knowledge_learning_files/5.7_General_Open_Access_e-Resources.pdf
https://www.tkdl.res.in/tkdl/langdefault/common/Home.asp?GL=Eng
https://ndl.iitkgp.ac.in
https://nptel.ac.in/course.html
www.ncert.in
https://books.google.co.in

Pedagogy:

1. Lecture method with teaching aids.
2. Audio-Visual Teaching mode with Projector Method.
3. Dialogue and context-based class.
4. Assignments, Learning seminars, Class Tests etc.
5. Open Online Sources and Tutorials.

MODE OF EVALUATION*:*

The evaluation will be divided into two parts.

MODE OF EVALUATION:

Evaluation will be divided in two parts.

ASSESSMENT	MARKS
INTERNAL	
Attendance	**05**
Assignments	**05**
Continuous Internal Assessment I and II	**15**
TOTAL	**25 marks**
EXTERNAL	
End Semester Exam	**25 marks**

Students will prepare and present (in pairs) a Submission related to the topic of the Assignment on the allotted topics. These submissions will be presented in the form of PPT/ Activity/Handwritten notes etc. Points for evaluation: Presentation (20%) + Content (20%) + Explanation (20%) + Creativity (20%) + Overall impression (20%).

St. Xavier's College (Autonomous), Ahmedabad

Syllabus of Semester – V of the following departments under the Faculty of Science, based on Under Undergraduate Curriculum Framework - 2023, to be implemented from the Academic Year 2025-26.

FACULTY OF SCIENCE

DEPARTMENT OF BOTANY

BSc. (Hons.) Botany

Subject Specific Minor: ADVANCED BOTANY-lll (LAB)

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course Title & Code	Credit Distribution of The Course			Eligibility Criteria	Pre-requisite(s) of the Course (if any)
	Lecture	Tutorial	Practical / Practice		
Advanced Botany -III (BOMC553C)	2	0	2	10 + 2 from a recognized board in any stream	Basic Knowledge of Biology, identification, observation, and analytical skills

LEARNING OBJECTIVES (LO)	
LO-1	To accurately perform fundamental experiments in plant physiology
LO-2	To apply standard biochemical techniques such as chromatography and spectrophotometry
LO-3	To record, analyze, and interpret experimental data effectively
Course OUTCOMES (CO)	
On Completion of this course, the student will be able to	
CO-1	Devise methods to improve basic skills and techniques related to plant physiology and biochemistry. .
CO-2	Acquire foundational skills and techniques in Plant Physiology and Biochemistry

UNIT I: PLANT PHYSIOLOGY:

A. Major experiments:

1. To determine the water potential of a given tissue (Any tuber)
2. **Estimation of Sugar from the given sample.**

B. Minor experiments:

1. To detect the seed viability.
2. Determine R.Q. of the given plant material of bud and or seedling.

UNIT II: BIOCHEMISTRY:

A. Major experiments:

1. **Estimation of Free fatty acids .**
2. **Estimation of Ascorbic Acid by the Iodine Titration Method.**
3. Separation of amino acids in a mixture by paper chromatography & their identification by comparison with the standard Rf value.

B. Minor experiments:

1. **Qualitative tests for proteins from plant material**
2. Test for the presence of fats from oil seeds.

C. Biochemistry charts as per the theory syllabus.

D. **Nitrogen metabolism chart is as per the theory syllabus.**

PROJECT:

The PROJECT will be BASED ON SELECTED TOPICS OF THE SYLLABUS. These are to be presented as an individual project. This will be presented as a handwritten report, or a chart/series of charts, or through a PowerPoint presentation. The evaluation will include a Viva.

Suggested Reading:

- Practical Botany vol. I & II By Bendre and Kumar, Rastogi Publication.
- Practical Botany by S. C. Santra, Chatterjee and Das, New Central Book Agency.

MODE OF EVALUATION:

SR. NO.	EXAM PATTERN	INTERNAL EXAM	EXTERNAL EXAM
1	Practical/Performance	20	25
2	Attendance	5	00
	Total	**25 marks**	**25 marks**