St. Xavier's College (Autonomous), Ahmedabad

Syllabus of Semester – II of the following department under Faculty of Sciencebased on Under Graduate Curriculum Framework - 2023 to be implemented from the Academic Year 2023-24.

FACULTY OF SCIENCE

DEPARTMENT OF BOTANY

Course	Title	Content	Hours/ week	Credit
DSC-1 (Theory)	Basics of Botany-II	U-1: Plant Resources, Gardening and Biotechnology U-2: Plant Physiology U-3: Plant Diversity: Study of Higher Plants Gymnosperms U-4: Morphology and Taxonomy of Angiosperms.	4 hrs	4
DSC-1 (Lab)	Basics of Botany Practical-II	Practical based as per Theory syllabus.	8 hrs	4

BSc. (Hons.) Botany

Category – IV

Major Course – 1: Basics of Botany II

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		
Basics of Botany II (BO-2501)	4	0	0	10 + 2 from a recognized board in any stream	Basic Knowledge of Biology

LEARNING OBJECTIVES (LO):

LO 1: To understand the use of plant resources and the basic concepts of Gardening and beacquainted with technology development in Biotechnology and Plant tissue culture.

LO 2: To gain knowledge on environmental and biological ethics.

LO 3: To understand the physiological processes of flowering, respiration and the plant-waterrelated physiological processes.

LO 4: To differentiate between Gymnosperms and Angiosperms.

LO 5: To understand the life cycles of *Cycas*, Sunflower and Maize and gain knowledge on Morphology of Angiosperms.

LO 6: To learn about the types of classifications- artificial, Natural and Phylogenetic and know howto classify plants based on Bentham and Hooker's system of Classification.

.COURSE OUTCOME (CO)

On Completion of this course, the Students will be able to-

CO 1: Explain the use of plant resources and will learn the basic concepts of Gardening.

CO 2: Discuss the technology development in Biotechnology and Plant tissue culture.

CO 3: Explain the physiological processes of flowering plants, respiration and the plant-water related physiological processes.

CO 4: Discuss environmental and biological ethics.

CO 5: Differentiate between Gymnosperms and Angiosperms and describe the life cycles of *Cycas*, Sunflower and Maize.

CO 6: Discuss about the types of classifications- artificial, Natural and Phylogenetic and know howto classify plants based on Bentham and Hooker's system of Classification.

Unit-1 PLANT RESOURCES, GARDENING AND BIOTECHNOLOGY (15L)

1. PLANT RESOURCES:

Botanical name, common name, family, useful part, brief description, important chemical constituents if any, climate and cultivation (only for cereals, pulses and oil seeds) and uses of the following plants:

a. Cereals- Wheat, Rice
b. Pulses- Gram.
c. Oil Seeds- Groundnut
d. Medicinal plants- Ginger, Aloe, Neem and Ashwagandha

2. GARDENING:

a. Types of gardens (Kitchen Garden, water garden, rock garden and terrace garden)

b. Garden Operations- digging, planting.

c. Identification of common plants for different garden location. (Minimum 5 plants for each location): paths, avenue, hedges and flower beds.

3. BIOTECHNOLOGY:
   a. Introduction, Brief History, Scope and Types of Plant Biotechnology.
   b. Plant Tissue Culture – Tools & Technique; Applications
4. BIOETHICS: Introduction to Bioethics.

Unit-2: PLANT PHYSIOLOGY (15L)

1. Plant-Water Relations:
   a. Water Potential
   b. Diffusion,
   c. Imbibition,
   d. Osmosis,
   e. Plasmolysis
2. Physiology of Flowering:
   a. Role of temperature in flowering (Vernalization)
   b. Role of light in flowering (Photoperiodism)
3. Respiration
   a. Outline of Respiratory metabolism.
   b. Glycolytic pathway.
   c. Oxidative Pentose Phosphate Pathway.
   d. Anaerobic respiration.
   e. Tricarboxylic Acid Cycle.
   f. Respiratory Chain/ETS
   g. Significance of ATP.
   h. Chemiosmotic theory.

Unit-3 : PLANT DIVERISTY: Study of higher plants (15L)

GYMNOSPERMS

1. General characters of Gymnosperms: occurrence, morphology and reproduction.
2. *Cycas*: Occurrence, distribution, taxonomic position, morphology, reproduction and life history of the genus (excluding anatomy).

ANGIOSPERMS

1. General characters of Dicotyledons and Monocotyledons.
2. Sunflower and Maize: Occurrence, distribution, taxonomic position, morphology, reproduction and life history of the genus (excluding anatomy).

Unit-4 MORPHOLOGY AND TAXONOMY OF ANGIOSPERMS (15L)

MORPHOLOGY OF ANGIOSPERMS

1. Stipules: types and modifications.
2. Types of placentation.
3. Types of aestivations.

TAXONOMY OF ANGIOSPERMS

1. Introduction to systems of classification—Artificial, Natural and Phylogenetic.
2. Bentham and Hooker's system of classification. **Merits and Demerits.**
3. Study of the following families.
   Dicotyledons- Polypetalae – *Malvaceae*
   Dicotyledons- Gamopetalae- *Convolvulaceae*
   Dicotyledons- Apetalae- *Nyctaginaceae*
   Monocotyledons- *Amaryllidaceae*

Suggestive Reading:

- Verma V.; Text Book of Economic Botany; Delhi: Ane Books, 2009.
- Kochhar S.L., Elbaum L., Einstein E.; Economic Botany in the Tropics; Pan MacMillan,2012.
- Hill A.F.; Economic Botany, 2nd Edition; New York: McGraw -Hill, 1992.
- Samba MurtyA.V.S.S., Subramanyam N.S.; Economic Botany of Crop Plants; Asia techPublishers, 2000.
- Mukherjee D., Bose T.K.; Percy Lancaster's Gardening in India;India Book House PvtLtd., 1997.
- FutehallyLaeeq; Gardens, 2nd Edition; New Delhi: National Book Trust, 1990.
- Satyanarayana U.; Biotechnology; Books and Allied (P) Ltd, 2005.
- Gupta P.K.;Elements of Biotechnology; Rastogi Publications, 2009.
- Narayanaswamy S.; Plant cell and tissue culture; Tata McGraw Hill, 2011.
- Bhojwani, S.S.; Plant Tissue Culture: Theory and Practical (a revised edition). New York,USA: Elsevier Science Publishers, 1990.
- IgnacimuthuS.; Basic Biotechnology; Tata McGraw Hill, 1995.
- Dubey, R.C.; Text Book of Biotechnology; S.Chand Ltd, 2001.
- Noggle, Ray G.; Fritz, George J.; Introductory plant physiology; 2nd edition; New Delhi:Prentice-Hall Of India Private Limited, 1991.
- Sinha, B.K; Pandey, S.N.; Plant Physiology; 1st edition; New Delhi: Vikas PublishingHouse Pvt. Ltd., 1981.
- Verma, V.; Textbook of plant physiology; New Delhi: Ane Books India, 2007.
- Salisbury, Frank B.; Ross, Cleon W.; Plant physiology; 3rd edition, Reprint; New Delhi:CBS Publishers & Distributors, 1986(2001).
- Devlin, Robert M.; Witham, Francis H.; Plant Physiology; 4th edition, Indian reprint;Delhi: CBS Publishers & Distributors, 1986(2001).
- Kochhar, P.L.; A textbook of Plant Physiology; 7th edition; Delhi: Atma Ram & Sons,1964.
- Verma S. K. Textbook of Plant physiology and Biochemistry; 4th editon; S. Chand &Company Ltd, 2003.
- Salisbury, Frank B.;Parke, Robert V.; Vascular plants : form and function; London :Macmillan & Co Ltd , 1964.
- Sinha, R.K.; Modern plant physiology; 2nd edition; New Delhi :Narosa Publishing House 2004.
- Ganguly A.K., Kumar N.C.; General Botany, Vol II, Part II: Introduction to plantphysiology; 7th Edition; Emkay Publications, 1990.
- Chamberlain, Charles Joseph;Coulter, John Merle; Morphology of Gymnosperms; 2ndedition; Allahabad : Central Book Depot , 1964.
- Chamberlain, Charles Joseph; Gymnosperms: structure and evolution; 2nd edition; NewYork : Dover Publications, Inc. , 1966.
- Bhatnagar, S.P.;Moitra, A.; Gymnosperms. ., New Delhi : New Age International Pvt.Ltd., 1996.
- Raghavan, V.;Developmental Biology of Flowering plants; New York:

Springer - Verlag,1999.
- Vasishta P.C.,; Botany for degree students- Vol. V, Gymnosperm; Delhi: S. Chand, 1983.
- Chopra G.L., Nagin S.; Gymnosperm; Jullundhar: S. Nagin& Co., 1978.
- Dutta, A.C.; A Class-book of Botany; 15th edition; Calcutta: Oxford University Press,1976.
- Sivarajan, V.V.; Introduction to the principles of plant taxonomy; 2nd edition;Cambridge: Cambridge University Press , 1991.
- Subramanian, N.S.; Modern plant taxonomy; New Delhi : 1st edition; Vikas PublishingHouse Pvt. Ltd. , 1995.
- Lawrence, George H.M.; Taxonomy of Vascular Plants; 1st edition; New Delhi : Oxford& IBH Publishing Co., 1967.
- Sharma, O.P.; Plant Taxonomy; 1st edition, reprint; New Delhi : Tata McGraw-HillPublishing Co. Ltd. , 1993(2002)
- Esau, Katherine; Anatomy of seed plants; 2nd edition; New York : John Wiley & Sons,1977.
- Gangulee, H.C., Das, K.S., Dutta C.T.; College Botany Vol I.; Kolkata: New CentralBook Agency, 2002.
- Naik, V.N. 1984. *Taxonomy of Angiosperms;* New Delhi: Tata McGraw - Hill PublishingCo. Ltd., 1984.

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 seminar, Class Test
5. Open Online Sources and Tutorials.

MODE OF EVALUATION:

Evaluation will be divided in two parts.

ASSESSMENT	MARKS
INTERNAL	
Attendance	05
Research Assignment	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 Research Assignment on allotted topics. These Submission will be presented in form of PPT/ Activity/ Hand written notes etc. Points for evaluation: Presentation (20%) + Content (20%) + explanation (20%) +Creativity (20%) + Overall impression (20%).

BSc. (Hons.) Botany

Category – IV

Major Course – II: Basics of Botany Practicals- II

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		
Basics Of Botany Practicals - II (BO-2502 L)	0	0	4	10 + 2 from a recognized board in any stream	Basic Knowledge of Biology, observation and Analytic skills

LEARNING OBJECTIVES (LO)

LO1: To learn economic botany, garden tools, instrumentation, plant tissue culture, Laboratory design and herbarium technique through cards.
LO2: To demonstrate experimental technique related to plant physiology.
LO3: To perform experimental techniques to analysis selected plants from Gymnosperm andAngiosperm.
LO4: To understand the distinguishing features and classification of selected Angiosperm familiesand learn to appreciate their economic importance.
LO5: To prepare project on the Career opportunities available in any of the branches of Biology.

COURSE OUTCOMES (CO):

On Completion of this course, the student will be able to-

CO1: Identify economical important plant, garden tools, instrumentation and illustrate, plant tissue culture laboratory, garden layout design through charts and cards.

CO2: Demonstrate experimental technique related to plant physiology.

CO3: Perform experimental techniques to analysis selected plants from Gymnosperm andAngiosperm.

CO4: Describe the distinguishing features and classification of selected Angiosperm families andrecognize to appreciate their economic importance.

CO5: Prepare project on the Career opportunities available in any of the branches of Biology.

Unit-1 PLANT RESOURCES, GARDENING AND BIOTECHNOLOGY

Plant Resources

1. Economic Botany- Study of plants as per theory syllabus.

Gardening:

2. Study of Garden tools as per theory syllabus through charts-

i. Scissors,
ii. Hoe,
iii. Hose,
iv. Clippers,
v. Watering can,
vi. Sprinkler.

3. Study of common plants for different garden location (5 plants each) of your area through fresh specimens and herbaria **and designing of garden layout through outline map.**

i. Avenue
ii. Hedge
iii. Paths
iv. flower beds.

Biotechnology:

4. Study of Plant Tissue Culture tools through charts

i. Laminar- Air Flow,
ii. Autoclave,
iii. pH meter,
iv. Oven,
v. Digital balance

5**. Designing of Plant Tissue Culture laboratory using outline map.**

Unit-2: PLANT PHYSIOLOGY

Experiments (to be individually performed) for-

1. To study diffusion in liquid and gaseous phase.
2. To study Endosmosis and exosmosis in grapes.
3. To study Osmosis using Potato Osmometer.
4. To study Plasmolysis using Tradescantia leaf.

Demonstration Experiments:

5. Anaerobic respiration.
6. Kuhne's tube.
7. Release of CO_2 in anaerobic respiration.

Unit-3: PLANT DIVERIST DIVERISTY: Study of higher plants

I] Study of Gymnosperms:

1. Study of Gymnosperms- Life-History of *Cycas*
   i. Specimen- Cycas whole plant, coralloid roots, compound leaf, male cone, Megasporophyll and ovules
   ii. Mounting – Cycas microspores
   iii. Permanent slides- T.S Microsporophyll, L.S Ovule

II] Study of Angiosperms:

2. Study of internal & external Leaf characteristics of Dicotyledon and Monocotyledon plants.

3. Study of Pollen grain characteristics of Dicotyledon *Hibiscus* and Monocotyledon *Crinum* plants.

4. Study of Primary structure of typical Dicot and Monocot stem. Sunflower and Maize.

5. Study of Angiosperms:
a. Life-History of Sunflower
   i. Specimens – Whole plant, Inflorescence, Ray floret and Disc floret.

b. Life-History of Maize
   i. Specimen – Whole plant, Inflorescence, Seed.
   ii. Slides – LS of Seed.

Unit-4 MORPHOLOGY AND TAXONOMY OF ANGIOSPERMS

I] Study of Plant Morphology through charts and fresh specimens.

1. Study of Plant Morphology -I: Types of Placentation.
2. Study of Plant Morphology -II: Types of Aestivation.
3. Study of Plant Morphology -II: Types of Stipules.

II] Study of Plant families: Classification with reasons, identifying characters (general and distinguishing) , floral formula and floral diagrams, habit, sketch, androecium, gynoecium and T.S of ovary; 3-4 botanical and common names of examples.

4. Study of Plant families- Dicotyledonae: *Polypetalae*: *Malvaceae,*

5. Study of Plant families- Dicotyledonae*: Gamopetalae: Convolvulaceae,*

6. Study of Plant families- Dicotyledonae*: Apetalae: Nyctaginaceae*

7. Study of Plant families- Monocotyledon*: Amaryllidaceae*

PROJECTS:

Project 1: PRACTICAL I: SESSION I

The PROJECT will be on the **Career opportunities** available in any of the branches of Biology which the student chooses to go ahead after graduation. Student will be presenting it as an individual project mentioning the opportunities at Local, State, National and International level for the chosen career. These particulars are to be submitted in form of Hand-written reports with photographs/ drawing etc in creative manner.

Project 2: PRACTICAL I: SESSION II

The PROJECT will be on Study of **Campus flora/Visit to Serenity Botanical Garden/Riverfront Flower show etc**. Students will study the basic plant taxonomy and learn

to identify basic families of plant kingdom. These are to be presented as individual projects in form of Reports/ PPT etc in creative manner.

Suggested Reading:

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

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

BASICS OF BOTANY PRACTICALS - II (BO-2502 L)
BOTANY INTERNAL PRACTICAL PAPER
SEMESTER II
(Effective from June-2023)
PRACTICAL I: SESSION I

Date:_____ Total Marks: 25 Time: 2 hours

Q.1. Perform the physiological experiment as per the chit. (04)

Q.2. Prepare the designing of Garden layout using outline map and mention suitable five plants as per mentioned garden location. (03)

Q.3. Prepare the designing of PTC Laboratory using outline map and place appropriate tools as per syllabus. (03)

Q.4. Identify and describe the specimens: (10)
Specimen A: Physiology
Specimen B: Physiology
Specimen C: Economic Botany
Specimen D: Gardening
Specimen E: PTC

Q.5. Project Viva (02)

Q.6. Journal (03)

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ST. XAVIER'S COLLEGE, (Autonomous) AHMEDABAD

BASICS OF BOTANY PRACTICALS - I (BO-2502 L)
BOTANY INTERNAL PRACTICAL PAPER
SEMESTER II
(Effective from June-2023)
PRACTICAL I: SESSION II

Date:_____ Total Marks: 20 Time: 2 hours

Q.1 Identify whether **Specimen A** is an Gymnosperm/Angiosperm, giving general characters. (03)

Q.2 Mount the _____from the **Specimen B.** Draw a labeled diagram of the peculiarities observed and show it to the Examiner. (03)

Q.3 Identify, classify giving reasons and describe family **Specimen C.** Draw a labelled diagram of L.S of flower and Floral diagram. (04)

Q.4 Identify and describe the specimens: (06)
Specimen D: Gymnosperm/Angiosperm
Specimen E: Morphology
Specimen F: Morphology

Q.5 Project and Viva (02)

Q.6 Journal (02)

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ST. XAVIER'S COLLEGE, (Autonomous) AHMEDABAD

BASICS OF BOTANY PRACTICALS - II (BO-2502 L)

BOTANY EXTERNAL PRACTICAL PAPER
SEMESTER II
(Effective from June-2023)
PRACTICAL I: SESSION I

Date:_____ **Total Marks: 25** **Time: 3 hours**

Q.1. Perform the physiological experiment as per the chit. (04)

Q.2. Prepare the designing of Garden layout using outline map and mention suitable five plants as per mentioned garden location. (03)

Q.3. Prepare the designing of PTC Laboratory using outline map and place appropriate tools as per the syllabus. (03)

Q.4. Identify and describe the specimens: (10)
Specimen A: Physiology
Specimen B: Physiology
Specimen C: Economic Botany
Specimen D: Gardening
Specimen E: PTC

Q.5. Project Viva (02)

Q.6. Journal (03)

ST. XAVIER'S COLLEGE, (Autonomous) AHMEDABAD

BASICS OF BOTANY PRACTICALS - I (BO-2502 L)

BOTANY EXTERNAL PRACTICAL PAPER
SEMESTER II
(Effective from June-2023)
PRACTICAL I: SESSION II

Date:_____ **Total Marks: 25** **Time: 3 hours**

Q.1 Identify whether **Specimen A** is an Gymnosperm/Angiosperm, giving general characters. (04)

Q.2 Mount the **_____** from the **Specimen B.** Draw a labeled diagram of the peculiarities observed and show it to the Examiner. (03)

Q.3 Identify, classify giving reasons and describe family **Specimen C.** Draw a labelled diagram of L.S of flower and Floral diagram. (05)

Q.4 Identify and describe the specimens: (08)
Specimen D: Gymnosperm
Specimen E: Angiosperm
Specimen F: Morphology
Specimen G: Morphology

Q.5 Project and Viva (02)

Q.6 Journal (03)

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