

ATMIYA UNIVERSITY
Faculty of Science

CORE- COURSE		
For the students admitted from A.Y. 2023-2024 & onwards		
Offering Department: Department of Biotechnology	Offered to: B.Sc. (M/BT)	
Semester II		
Course Code	Course Title	Course Credit and Hours
23UGBT201	Plant Science	4 Credits and 4 hrs/wk.

Course Description: This course is designed to provide students with a comprehensive understanding of the plant morphology, from the microscopic cells and tissues to the diverse and complex anatomy in which plants play a vital role. This course offers a deep dive into the study of plants, their structure, functions, classification, and physiological significance. Through a combination of lectures, laboratory work, and field studies, students will explore the fascinating world of plants, from their morphological structure to their taxonomic significance.

Course Purpose: This course is designed to provide students with a comprehensive understanding of both fundamental and phases of plant classification define and describe morphology of plant sex organs, flower and process of development and fertilization of male and female gametophyte in plants. Upon completion of this course, students will possess the knowledge and skills required deals with internal anatomy of root and stem of plants. And understanding the role of plant growth regulators in growth and development of plants. Also grow positive approaches and interest towards botany and the relevant practical skills.

Course Outcomes: Upon completion of this course, the learner will be able to

CO No.	CO Statement	Bloom's taxonomy Level (K ₁ to K ₆)
CO ₁	Develop a profound interest in and admiration for the boundless diversity of life on Earth	K1
CO ₂	Accurately interpretation of collected information and use taxonomical information to evaluate and formulate a position of plant in taxonomy with morphology	K3
CO ₃	Recognize the anatomy	K1, K2
CO ₄	Identify types and functions of Plant tissues and hormonal physiology	K3
CO ₅	Understand the mechanism of physiological processes of plants	K2

Course Content	Hours
Unit I: Classification of plants and Reproductive morphology	12 Hrs
<ul style="list-style-type: none"> • Systems of classification – Bentham & Hooker with merits and demerits • Structure and important parts of a typical flower • Inflorescences: Types of inflorescence • Floral formula and Floral diagram • Taxonomic studies of angiosperm's families: Dicotyledon: Apocynaceae, Fabaceae and Euphorbiaceae, Monocotyledon: Commelinaceae 	
Unit II: Basics of plant anatomy	
<ul style="list-style-type: none"> • Organization of meristems, types of meristems: Apical, Intercalary and lateral meristem, Simple and complex plant tissue • Primary structure of monocot root and stem • Primary structure of dicot root and stem • Secondary growth in stem • Secondary growth in root 	
Unit III: Basic of plant embryology	13 Hrs
<ul style="list-style-type: none"> • Structure and development of male and female gametophytes • Pollination, Fertilization, Double fertilization • Development and types of embryo, endosperm • Polyembryony, and Apomixis • Development of seed and fruit 	
Unit IV: Plant growth regulators and Plant response to light	11 Hrs
<ul style="list-style-type: none"> • Discovery and physiological roles of Auxins, Gibberellins, Cytokinins in plant growth • Physiological roles and functions of Abscisic acid (ABA) and Ethylene in metabolism • Photomorphogenesis, phytochrome, cryptochrome • Photoperiodism (SDP, LDP, Day neutral plants) • Vernalization, transmission of stimulus, mechanism of vernalization 	
Unit V: Plant Physiology	12 Hrs

<ul style="list-style-type: none"> • Plant water relation, concept of water potential. • Transpiration, mechanism of stomatal transpiration, factor affecting transpiration, Guttation • Transport of food and water, upward movement of water, mechanism of food translocation. • Photosynthesis-Light and dark reaction • Mineral nutrition of plants-Micro and macronutrients. 	
--	--

Pedagogic tools:

- Chalk and Board
- Power point presentation
- Seminar
- Video

Text books:

- Bhojwani, S.S. and Bhatnagar, S.P. (2011). The Embryology of Angiosperms, Vikas Publishing House. Delhi. 5th edition (For Unit 4)
- Verma, B. K. (2011). Introduction to taxonomy of angiosperms. Phi Learning Pvt. Ltd.
- Sambamurty, A. V. S. S. (2010). Taxonomy of angiosperms. IK International Pvt Ltd.
- Taiz, L., Zeiger, E., Møller, I. M., & Murphy, A. (2015). Plant physiology and development.
- V. Verma. Text book of Plant Physiology Ane book India

Reference books:

- Dickison, W.C. (2000). Integrative Plant Anatomy. Harcourt Academic Press, USA.
- Odum, E.P. (2005). Fundamentals of ecology. Cengage Learning India Pvt. Ltd., New Delhi. 5th edition.
- Hopkins, W.G. and Huner, A. (2008). Introduction to Plant Physiology. John Wiley and Sons. U. S.A. 4th edition.
- Davies, P. J. (Ed.). (2013). Plant hormones: physiology, biochemistry and molecular biology. Springer Science & Business Media.
- Raghavan, V. (2000). Developmental Biology of Flowering plants, Springer, Netherlands
- B. P. Pandey. (2001) A Text book of Botany Angiosperms. S. Chand & Company Ltd.

Suggested readings / e-resources:

- <https://nptel.ac.in/courses/122/103/122103039/>
- <https://nptel.ac.in/courses/102/107/102107075/>

Suggested MOOCs:

- <https://www.coursera.org/learn/plantknows>
- <https://www.coursera.org/learn/plant-biology>

Methods of assessing the course outcomes

Components of CIA: 30 marks

Sr. No.	Component	Content	Duration (if any)	Marks	Sub Total
A	Test 1	1st Two Units	1½ hours	5 (Set for 30)	20
	Test 2	All 5 Units	3 hours	15 (Set for 70)	
B	Assignment			05	10
C	Class activity			05	
Grand Total					30
Assignment		Group Activity Poster preparation Student generated handbook Herbarium / Chart / Model preparation			
Class activity		Class test Quiz Scientific games Herbarium preparation Peer teaching Group discussion			

ATMIYA UNIVERSITY
Faculty of Science

CORE- COURSE		
For the students admitted from A.Y. 2023-2024 & onwards		
Offering Department: Department of Biotechnology	Offered to: B.Sc. (M/BT)	
Semester II		
Course Code	Course Title	Course Credit and Hours
23UGBT202	Plant Science Practical	2 Credits 4 (P) Hrs/wk.

Course Description: The Plant Science Practical course is designed to provide students with a comprehensive understanding of the plant morphology, from the microscopic cells and tissues to the diverse and complex anatomy in which plants play a vital role. This course offers a deep dive into the study of plants, their structure, functions, classification, and physiological significance. Through a combination of laboratory work and field studies, students will explore the fascinating world of plants, from their morphological structure to their taxonomic significance.

Course Purpose: This course is designed to provide students with a comprehensive understanding of both fundamental and phases of plant classification, define and describe morphology of plant sex organs, flower and process of development and fertilization of male and female gametophyte in plants. Upon completion of this course, students will possess the knowledge and skills required deals with internal anatomy of root and stem of plants. And understanding the role of plant growth regulators in growth and development of plants. Also grow positive approaches and interest towards plant science and the relevant practical skills.

Course Outcomes: Upon completion of this course, the learner will be able to

CO No.	CO Statement	Bloom's taxonomy Level (K ₁ to K ₆)
CO ₁	Accurately interpretation of collected information and formulate a position of plant morphology	K3
CO ₂	Overtly understanding taxonomical information to evaluate and formulate a position of plant in taxonomy with morphology	K1, K2
CO ₃	Recognize the plant anatomy	K4
CO ₄	Expand types and functions of plant gametophytic structure	K2
CO ₅	Grasp plant physiology – stomatal index and stomatal frequency	K2

List of Experiments

1. Morphological studies of different plants parts – Inflorescences
2. Morphological studies of different plants parts – Flowers (Calyx, Corolla and Perianth)
3. Morphological studies of different plants parts – Flowers (Androecium, and Gynoecium)
4. Taxonomic study of following dicotyledons family by taking flower study of any representing plant: Apocynaceae, Fabaceae and Euphorbiaceae
5. Taxonomic study of Commelinaceae - monocotyledon family by taking flower of any representing plant.
6. To study of xylem components by maceration technique.
7. Study of anatomical details of monocot root and stem through permanent slides/temporary stain mounts/macerations/museum specimens with the help of suitable examples.
8. Study of anatomical details of dicot root and stem through permanent slides/temporary stain mounts/macerations/museum specimens with the help of suitable examples.
9. Study of secondary growth in stem through slide preparation.
10. Study of secondary growth in root through slide preparation.
11. Study of T.S. of anther, mounting of pollen grains and study of pollen tube germination.
12. Study of different types of ovules through slide preparation/permanent slide/photographs
13. Mounting of Embryo: (Dicot/ Monocot).
14. To calculate stomatal index and stomatal frequency from the two surfaces of leaves of mesophytes and xerophytes.

Pedagogic tools:

- Chalk and Board
- Power point presentation
- Video
- Peer Teaching
- Field visit
- Practical skill
- Quiz
- Assignments
- Individual and group projects

Text books:

- Bhojwani, S.S. and Bhatnagar, S.P. (2011). The Embryology of Angiosperms, Vikas Publishing House. Delhi. 5th edition (For Unit 4)
- Verma, B. K. (2011). Introduction to taxonomy of angiosperms. Phi Learning Pvt. Ltd..
- Sambamurty, A. V. S. S. (2010). Taxonomy of angiosperms. IK International Pvt Ltd.
- Taiz, L., Zeiger, E., Møller, I. M., & Murphy, A. (2015). Plant physiology and development.
- V. Verma. Text book of Plant Physiology Ane book India

Reference books:

- Dickison, W.C. (2000). Integrative Plant Anatomy. Harcourt Academic Press, USA.
- Odum, E.P. (2005). Fundamentals of ecology. Cengage Learning India Pvt. Ltd., New Delhi. 5th edition.
- Hopkins, W.G. and Huner, A. (2008). Introduction to Plant Physiology. John Wiley and Sons. U. S.A. 4th edition.
- Davies, P. J. (Ed.). (2013). Plant hormones: physiology, biochemistry and molecular biology. Springer Science & Business Media.
- Raghavan, V. (2000). Developmental Biology of Flowering plants, Springer, Netherlands
- B. P. Pandey. (2001) A Text book of Botany Angiosperms. S. Chand & Company Ltd.

Suggested MOOCs:

- <https://www.coursera.org/learn/plantknows>
- <https://www.coursera.org/learn/plant-biology>

Methods of assessing the course outcomes

Components of CIA: 50 marks

Sr. No.	Component	Content	Duration	Marks	Sub Total
A	Test	All practical	03	30 (Set for 50)	30
B	Assignment			10	20
C	Class Activity			10	
Grand Total					50
Assignment		Student-generated handbook (Practical – 1 to 10) Group Activity Poster Preparation Herbarium / Chart preparation			
Class activity		Class test Herbarium preparation Peer teaching One-minute paper (All practical) Peer assessment (Practical – 11 to 14)			