

AUXILIUM COLLEGE (AUTONOMOUS)

VELLORE – 632 006

Department of Botany



Botany

SYLLABUS AND REGULATIONS

(Based on TANSICHE Model Syllabus)

Under

OUTCOME BASED EDUCATION PATTERN

With

CHOICE BASED CREDIT SYSTEM

For the Candidates Admitted from 2024-2025 Onwards

AUXILIUM COLLEGE (Autonomous)
(Accredited by NAAC with A⁺ Grade with a CGPA of 3.55 out of 4 in the 3rd Cycle)
Gandhi Nagar, Vellore – 632006
Department of Botany
(Effective from the academic year 2024 - 2025)

The Department of Botany offers Allied and Optional Allied Course in Botany to the students of Zoology and Chemistry Department.

Objectives

- Understanding the basics of Botany
- Acquire knowledge of the diversity of the Plant kingdom
- Utilize the knowledge to understand the metabolism of Plants
- Apply the knowledge to develop a sustainable environment
- Acquire skills for self-employment as Agripreneurs
- Affirm the opportunities to become an entrepreneur

STRUCTURE OF THE COURSE

Year/ Sem	Course Code	Title of the Course	Course Type	Course Category	H/W	Credits	Marks
I Year I Sem	UGEBTA24	Generic Elective : Botany - I	Theory	Allied	4	3	40+60=100
I Year I Sem	UGEBTB24	Generic Elective Practical: Botany I	Practical	Allied	2	2	40+60=100
I Year II Sem	UGEBTC24	Generic Elective : Botany -II	Theory	Allied	4	3	40+60=100
I Year II Sem	UGEBTD24	Generic Elective Practical: Botany II	Practical	Allied	2	2	40+60=100
II Year III Sem	UGEBTA324	Generic Elective : Botany - I	Theory	Allied	4	3	40+60=100
II Year III Sem	UGEBTB324	Generic Elective Practical: Botany I	Practical	Allied	2	2	40+60=100
II Year IV Sem	UGEBTC424	Generic Elective : Botany -II	Theory	Allied	4	3	40+60=100
II Year IV Sem	UGEBTD424	Generic Elective Practical: Botany II	Practical	Allied	2	2	40+60=100
II Year IV Sem	UNEVS24	Environmental Studies	Theory	General	2	2	25+25+50=100

Pattern of Question Paper for Semester

Theory-Total Marks 100

Section A (Answer All) - $10 \times 2 = 20$

Section B (either or) - $5 \times 7 = 35$

Section C (3 out of 5) - $3 \times 15 = 45$

Practical - Total Marks 60

Practical: 50 Marks

Record: 10 Marks

Generic Elective : Botany -I

Title of the Course	Generic Elective : Botany -I						
Category	Elective	Year	I/II	Credits	3	Course Code	UGEBTA24 / UGEBTA3 24
		Semester	I/III				
Instructional Hours per week	Lecture		Tutorial	Lab Practice	Total		
	3		1	-	4		
Pre-requisite	To study the basics of botany.						
Objectives of the Course	<ul style="list-style-type: none"> • To study the life cycle of lower plants. • To study the structure and importance of microbes. • To study the detailed study of the structure of Plant cell and its organelles. • To study the fundamentals of Genetics. • To demonstrate techniques of Plant tissue culture. 						
Course Outline	<p>UNIT-I (12 hours) (K1, K2, K3 & K4) Algae: 1.1 Vegetative characters of Algae 1.2 Reproductive characters of Algae 1.3 Structure, reproduction and life cycle of <i>Nostoc</i> 1.4 Structure, reproduction and life cycle of <i>Sargassum</i> 1.5 Economic importance of Algae.</p>						
	<p>UNIT-II (12 hours) (K1, K2, K3 & K4) Fungi, Bacteria and Virus: 2.1 General characters of Fungi 2.2 Structure, reproduction and life cycle of <i>Yeast</i> 2.3 Structure, reproduction and life cycle of <i>Agaricus</i> 2.4 Economic importance of fungi. 2.5 Bacteria - general characters, structure and reproduction of <i>Escherichia coli</i> and economic importance of bacteria. 2.6 Virus - general characters, structure of TMV, Structure of Bacteriophage.</p>						
	<p>UNIT-III (12 hours) (K1, K2, K3 & K4) Bryophytes, Pteridophytes and Gymnosperms: 3.1 General characters of Bryophytes, 3.2 Structure and life cycle of <i>Funaria</i>. 3.3 General characters of Pteridophytes, 3.4 Structure and life cycle of <i>Lycopodium</i>. 3.5 General characters of Gymnosperms, 3.6 Structure and life cycle of <i>Cycas</i>.</p>						
	<p>UNIT-IV (12 hours) (K1, K2, K3 & K4) Cell Biology: 4.1 Prokaryotic and Eukaryotic cell- structure /organization. 4.2 Cell organelles - ultra structure and function of Chloroplast, 4.3 Mitochondria 4.4 Nucleus. 4.5 Cell division - Mitosis 4.6 Meiosis.</p>						

	<p>UNIT-V (12 hours) (K1, K2, K3 & K4)</p> <p>Genetics and Plant Biotechnology:</p> <p>5.1 Mendelism - Law of dominance, Law of segregation</p> <p>5.2 Law of Independent Assortment</p> <p>5.3 Incomplete dominance.</p> <p>5.4 Monohybrid and dihybrid cross - Test cross - Back cross.</p> <p>5.5 Plant tissue culture - <i>In vitro</i> culture methods.</p> <p>5.6 Plant tissue culture and its application in biotechnology.</p>
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Texts	<ol style="list-style-type: none"> 1. Singh, V., Pande, P.C and Jain, D.K. 2021. A Text Book of Botany. Rastogi Publications, Meerut. 2. Bhatnagar, S.P and Alok Moitra. 2020. Gymnosperms, New Age International (P) Ltd., Publishers, Bengaluru. 3. Sharma, O.P. 2017. Bryophyta, MacMillan India Ltd. Delhi. 4. Lee, R.E. 2008. Phycology, IV Edition, Cambridge University Press, New Delhi. 5. Rao, K., Krishnamurthy, K.V and Rao, G.S. 1979. Ancillary Botany, S. Viswanathan Pvt. Ltd., Madras.
Reference books:	<ol style="list-style-type: none"> 1. Parihar, N.S. 2012. An introduction to Embryophyta –Pteridophytes - Surjeet Publications, Delhi. 2. Alexopoulos, C.J. 2013. Introduction to Mycology. Willey Eastern Pvt. Ltd. 3. Vashishta, P.C. 2014. Botany for Degree Students Gymnosperms. Chand & Company Ltd, Delhi. 4. Coulter, M. Jhon, 2014. Morphology of Gymnosperms. Surjeet Publications, Delhi. 5. Vashishta, P.C. 2014. Botany for Degree Students Algae. 2014. Chand & Company Ltd, Delhi. 6. Parihar, N.S. 2013. An introduction to Embryophyta –Bryophytes -, Surjeet Publications, Delhi. 7. Pandey B.P. 1986, Text Book of Botany (College Botany) Vol I &II, S.Chand and Co. New Delhi.
Web Resources	<ol style="list-style-type: none"> 1. https://www.kobo.com/us/en/ebook/the-algae-world 2. http://www.freebookcentre.net/biology-books-download/Fungi-(PDF-15P).html 3. http://scitec.uwichill.edu.bb/bcs/bl14apl/bryo1.htm 4. https://www.toppr.com/guides/biology/plant-kingdom/pteridophytes/ 5. https://arboretum.harvard.edu/wp-content/uploads/2013-70-4-beyond-pine-cones-an-introduction-to-gymnosperms.pdf 6. https://www.us.elsevierhealth.com/medicine/cell-biology 7. https://www.us.elsevierhealth.com/medicine/genetics 8. https://www.kobo.com/us/en/ebook/plant-biotechnology-1

Course Outcomes:

On completion of the course, the students should be able to

- CO1:** Increase the awareness and appreciation of human-friendly algae and their economic importance.(K1,K2,K3,K4)
- CO2:** Develop an understanding of microbes and fungi and appreciate their adaptive strategies (K1,K2,K3,K4)
- CO3:** Develop critical understanding on morphology, anatomy and reproduction of Bryophytes, Pteridophytes and Gymnosperms. (K1,K2,K3,K4)
- CO4:** Compare the structure and function of Plant cell and its organelles. (K1,K2,K3,K4)
- CO5:** Understand the core concepts and fundamentals of Plant tissue culture in biotechnology. (K1,K2,K3,K4)

CO/PO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	M	M	H	M	H
CO2	H	H	M	H	M	H
CO3	H	M	M	H	M	H
CO4	H	H	M	H	M	H
CO5	H	H	M	H	M	H

H-High(3), M-Moderate(2), L-Low(1)

Generic Elective : Botany –II

Title of the Course	Generic Elective : Botany -II					
Category	Elective	Year	I/II	Credits	3	Course Code UGEBTC24/ UGEBTC424
		Semester	II/IV			
Instructional Hours per week	Lecture		Tutorial		Lab Practice	Total
	3		1		-	4
Pre-requisite	To study basics of Botany.					
Objectives of the Course	<ul style="list-style-type: none"> • To be familiar with the morphology and floral characters of Plants. • To study the internal structure and tissue organization of Plants. • To state the basic structure of Plant embryology. • To learn about the various metabolic pathways in Plants. • To know the energy currency stored in Plants. 					
Course Outline	<p>UNIT-I (12 hours) (K1, K2, K3 & K4) MORPHOLOGY OF FLOWERING PLANTS: 1.1 Plant and its parts. 1.2 Structure and function of root and stem. 1.3 Leaf and its parts. Leaf types- simple and compound, Phyllotaxy and types. 1.4 Inflorescence - Racemose, Cymose and Special types. 1.5 Flower description in technical terms. 1.6 Bentham and Hooker System of Classification</p>					
	<p>UNIT-II (12 hours) (K1, K2, K3 & K4) TAXONOMY: Study of the range of characters and plants of economic importance in the following families: 2.1 Caesalpiniaceae 2.2 Rubiaceae 2.3 Asclepiadaceae, 2.4 Euphorbiaceae and 2.5 Liliaceae 2.6 Indian System of Medicines – AYUSH</p>					
	<p>UNIT-III (12 hours) (K1, K2, K3 & K4) ANATOMY 3.1 Tissue and tissue systems 3.2 Simple and complex tissues. 3.3 Anatomy of monocot and dicot roots 3.4 Anatomy of monocot and dicot stems 3.5 Anatomy of dicot and monocot leaves.</p>					

	<p>UNIT-IV (12 hours) (K1, K2, K3 & K4) EMBRYOLOGY 4.1 Structure of mature anther 4.2 Structure of Ovule 4.3 Types of ovules, 4.4 Structure of embryo sac, 4.5 Pollination and double fertilization, 4.6 Structure of dicotyledonous and monocotyledonous seeds.</p>
	<p>UNIT-V (12 hours) (K1, K2, K3 & K4) PLANT PHYSIOLOGY 5.1 Role of water in Plants. 5.2 Absorption of Water 5.3 Photosynthesis - light reaction, Calvin cycle 5.4 Respiration – Glycolysis, Krebs cycle, Electron Transport System 5.5 Growth hormones – auxins, cytokinins and their applications.</p>
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	<p>Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during the Tutorial hour)</p>
Skills acquired from this course	<p>Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</p>
Recommended Texts	<ol style="list-style-type: none"> 1. Sharma, O.P. 2017. Plant Taxonomy. (II Edition).The McGraw Hill Companies. 2. Bhojwani, S.S. Bhatnagar, S.P and Dantu, P.K. 2015. The Embryology of Angiosperms (6th revised and enlarged edition). Vikas Publishing House, New Delhi. 3. Maheshwari, P. 1963. Recent Advances in Embryology of Angiosperms. Intl. Soc. Plant Morphologists, New Delhi. 4. Salisbury, F. B.C.W. Ross.1991. Plant Physiology. Wassworth Pub. Co. Belmont. 5. Ting, I.P. 1982. Plant Physiology. Addison Wesley Pb. Philippines.
Reference books	<ol style="list-style-type: none"> 1. Lawrence.G.H.M. 1985. An Introduction to Plant Taxonomy, Central Book Depot, Allahabad. 2. Bhojwani, S.S and Bhatnagar, S.P. 2000. The Embryology of Angiosperms (4th revised and enlarged edition). Vikas Publishing House, New Delhi. 3. Pandey, B.P. 2012. Plant Anatomy. S Chand Publishing. 4. Jain, VK. 2006. Fundamentals of Plant Physiology, S. Chand and Company Ltd. 5. Rajni Gupta. 2012. Plant Taxonomy: Past, Present and Future. Vedams (P) Ltd. New Delhi. 6. Jain, V.K. 2006. Fundamentals of Plant Physiology, S.Chand and Company Ltd., New Delhi. 7. Verma, S.K. 2006. A Textbook of Plant Physiology, S.K.Chand & Co., New Delhi.

Web Resources	<ol style="list-style-type: none">1. https://books.google.co.in/books/about/Plant_Taxonomy.html?id=0bYs8F0Mb9gC&redir_esc=y2. https://books.google.co.in/books/about/PLANT_TAXONOMY_2E.html?id=Roi0lwSXFnUC&redir_esc=y3. https://archive.org/EXPERIMENTS/plantanatomy031773mbp4. https://www.amazon.in/Embryology-Angiosperms-6th-S-P-Bhatnagar-ebook/dp/B00UN5KPQG5. https://www.crcpress.com/Plant-Physiology/Stewart-Globig/p/book/9781926692692
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Course Outcomes:

On completion of the course, the students should be able to

CO1: Learn the morphology of Plants and recognize the characters of the Plants in different families. (K1,K2,K3,K4)

CO2: Understand the fundamental concepts of plant anatomy. (K1,K2,K3,K4)

CO3: Analyze and recognize the reproductive structures of Plant embryology. (K1,K2,K3,K4)

CO4: Understand water relation of plants and its absorption mechanism. (K1,K2,K3,K4)

CO5: Study of metabolic pathways in Plants and its growth regulators. (K1,K2,K3,K4)

CO/PO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	M	M	H	H	H
CO2	H	M	H	H	H	H
CO3	H	M	H	H	H	H
CO4	H	M	H	H	M	H
CO5	H	M	H	H	H	H

Generic Elective Practical: Botany I

Title of the Course	Generic Elective Practical: Botany I					
Category	Elective	Year	I/II	Credits	2	Course Code UGEBTB24/ UGEBTB324
		Semester	I/III			
Instructional Hours per week	Lecture		Tutorial		Lab Practice	Total
	-		-		2	2
Pre-requisite	Practicals pertaining to above subjects is important to get knowledge on various aspects of plants.					
Objectives of the Course	<ul style="list-style-type: none"> • To enhance information on the identification of each taxonomical group by developing the skill-based detection of the morphology and microstructure of microorganisms, algae, and fungi. • To identify specimens belonging to Bryophytes, Pteridophytes and Gymnosperms through vegetative and reproductive structures. • Understanding of laws of genetics. • Identification of Plant cell and its organelles through its electron micrographs. • Analyse the process of Plant tissue culture and application. 					
EXPERIMENTS						
<ol style="list-style-type: none"> 1. Make suitable micro preparation of the types prescribed in Algae and Pteridophytes. 2. Micro photographs of the Cell organelles ultra structure. 3. Simple genetic problems. 4. Spotters - Fungi, Bacteria, Virus, Bryophytes, Gymnosperms, Cell Biology Plant Tissue Culture in Biotechnology. 						
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during the Tutorial hour)					
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill					

Recommended	1. Sharma, O.P. 2017. Bryophyta, MacMillan India Ltd, New Delhi.
Texts	2. Sharma, O.P. 2012. Pteridophyta, Tata McGraw-Hills Ltd, New Delhi. 3. Subramaniam, N.S. 1996. Laboratory Manual of Plant Taxonomy. Vikas Publishing House Pvt. Ltd., New Delhi. 4. Benjamin, A. Pierce. 2012. Genetics- A conceptual Approach. W.H. Freeman and Company, New York, England. 5. Oggle G.R and G.J. Fritz. 2002. Introductory Plant Physiology. Prentice Hall of India, New Delhi. 6. Rao, K., Krishnamurthy, K.V and Rao, G.S. 1979. Ancillary Botany, S. Viswanathan Pvt. Ltd., Madras.
Reference Books	1. Strickberger, M.W. 2005. Genetics (III Ed). Prentice Hall, New Delhi, India. 2. Nancy Serediak and M. Huynh. 2011. Algae identification lab Guide. Accompanying manual to algae identification field guide, Ottawa Agriculture and Agri food Canada publisher. 3. Mohammed Gufran Khan, Shite Gatew and Bedilu Bekele. 2012. Practical manual for Bryophytes and Pteridophytes. Lambert Academic Publishing. 4. Aler Gingauz. 2001. Medicinal Chemistry. Oxford University Press & Wiley Publications. 5. Steward, F.C. 2012. Plant Physiology Academic Press, US
Web Resources	1. https://www.amazon.in/Practical-Manual-Pteridophyta-Rajan-Sundara/dp/8126106883 2. https://www.google.co.in/books/edition/Gymnosperms/3YrT5E3Erm8C?hl=en&gbpv=1&dq=gymnosperms&printsec=frontcover 3. https://www.amazon.in/Computational-Phytochemistry-Satyajit-Dey-Sarker-ebook/dp/B07CV96NZJ 4. https://medlineplus.gov/genetocs/understanding/basics/cell/ 5. https://apan.net/meetings/apan45/files/17/17-01-01-01.pdf 6. http://www.cuteri.eu/microbiologia/manuale_microbiologia_pratica.pdf 7. https://www.amazon.in/Manual-Practical-Bryophyta-Suresh-Kumar/dp/B0072GNFX4

Course Outcomes:

On completion of the course, the students should be able to

CO1: To study the internal organization of Algae and Pteridophytes. (K1,K2,K3,K4)

CO2: Develop understanding on morphology, anatomy and reproduction of Fungi, Bryophytes, and Gymnosperms. (K1,K2,K3,K4)

CO3: To study the basic structure of microbes (K1,K2,K3,K4)

CO4: Understand the ultrastructure of Plant cell and its organelles. (K1,K2,K3,K4)

CO5: To study the fundamentals of Plant tissue culture and applications in biotechnology. (K1,K2,K3,K4)

CO/PO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	M	M	H	H	H
CO2	H	M	H	H	H	H
CO3	H	M	H	H	H	H
CO4	H	M	H	H	M	H
CO5	H	M	H	H	H	H

Generic Elective Practical: Botany II

Title of the Course	Generic Elective Practical: Botany II					
Category	Elective	Year	I/II	Credits	2	Course Code UGEBTD24/ UGEBTD424
		Semester	II/IV			
Instructional Hours per week	Lecture		Tutorial		Lab Practice	Total
	-		-		2	2
Pre-requisite	Practicals pertaining to above subjects is important to get knowledge on various aspects of plants.					
Objectives of the Course	<ul style="list-style-type: none"> • To be familiar with the morphology and floral characters of Plants. • To study the internal structure and tissue organization of Plants. • To state the basic structure of Plant embryology. • To learn about the various metabolic pathways through experiments. • To know the role of growth hormones and its application. 					
EXPERIMENTS						
<ol style="list-style-type: none"> 1. To identify the family and explain the floral characters. 2. To study the Economic importance of the family. 3. Demonstration experiments <ol style="list-style-type: none"> 1. Osmosis 2. Ganong's Light screen 2. Ganong's Respiroscope 4. To make suitable micro preparations of anatomy materials prescribed in the syllabus. 5. Spotters – Morphology- Root, Stem, Leaf Anatomy – Tissue and Tissue System Embryology Growth Hormone – Auxin/Cytokinin 						
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC /others to be solved (To be discussed during the Tutorial hour)					

Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
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Recommended Texts	<ol style="list-style-type: none"> 1. Gamble, J.S.- The Flora of Presidency of Madras. Vol. I, II and III. Bishen Singh and MahendraPal Singh, Dehra Dun. 1919-1925. 2. Dr. Ashok M. Bendrea and Dr. Ashok Kumar – A text book of Practical Botany –I,II ,Rastogi Publications, New Delhi, 2009-2010.
Reference Books	<ol style="list-style-type: none"> 1. Lawrence.G.H.M. 1985. An Introduction to Plant Taxonomy, Central Book Depot, Allahabad. 2. Bhojwani, S.S and Bhatnagar, S.P. 2000. The Embryology of Angiosperms (4th revised and enlarged edition). Vikas Publishing House, New Delhi. 3. Pandey, B.P. 2012. Plant Anatomy. S Chand Publishing. 4. Jain, VK. 2006. Fundamentals of Plant Physiology, S. Chand and Company Ltd. 5. Rajni Gupta. 2012. Plant Taxonomy: Past, Present and Future. Vedams (P) Ltd. New Delhi. 6. Jain, V.K. 2006. Fundamentals of Plant Physiology, S.Chand and Company Ltd., New Delhi. Verma, S.K. 2006. A Textbook of Plant Physiology, S.K.Chand & Co., New Delhi. 7. Steward, F.C. 2012. Plant Physiology Academic Press, US
Web Resources	<ol style="list-style-type: none"> 1. https://www.amazon.in/Practical-Manual-Pteridophyta-Rajan-Sundara/dp/8126106883 2. https://www.amazon.in/Manual-Practical-Bryophyta-Suresh-Kumar/dp/B0072GNFX4

Course Outcomes:

On completion of the course, the students should be able to

- CO1:** Understanding the morphology of flowering plants.(K1,K2,K3,K4)
CO2: To observe the characters of the families. (K1,K2,K3,K4)
CO3: Analyse the internal structure of Plant parts. (K1,K2,K3,K4)
CO4: Understand the basic structure of Plant embryology. (K1,K2,K3,K4)
CO5: To study the metabolic pathways through experiments.(K1,K2,K3,K4)

CO/PO	PO					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	H	M	M	H	H	H
CO2	H	M	H	H	H	H
CO3	H	M	H	H	H	H
CO4	H	M	H	H	M	H
CO5	H	M	H	H	H	H