UNIVERSITY OF MADRAS

M.Sc. DEGREE PROGRAMME IN BOTANY

SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Course	**LABORATORY COURSE- IV** Covering Core Papers XII & XIII						
Paper Number	**CORE XIV**						
Category	Core	**Year**	II	**Credits**	4	**Course Code**	523C4C
		Semester	IV				

Instructional Hours per week	**Lecture**	**Tutorial**	**Lab Practice**	**Total**
	4	-	4	8

Pre-requisite	Practicals pertaining to the above subjects is important to gain knowledge on various physiological functions of plants.
Learning Objectives:	
C1	Extract bimolecule of diverse nature from different sources so thatthey will be able to assess the metabolic profile of their source material.
C2	Recognize the role that water plays in several physiological processes in plants.
C3	Recognize the importance of respiration and photosynthesis.
C4	Learn about chromatographic techniques.
C5	The students will graduate with practical knowledge of the physiological processes that occur in plants.

UNIT	**EXPERIMENTS**
I	**PLANT PHYSIOLOGY** 1. Determination of water potential by plasmolytic method. 2. Deficit (DPD) by weighing method. 3. Determination of effect of chemicals on membrane permeability (Colorimetric). 4. Effect of varying wavelengths of light (Or) Quality of light on the rate of photosynthesis of an aquatic plant by using Wilmot's Bubble Counter. 5. Effect of varying concentrations of CO_2 on the rate of photosynthesis of an aquatic plant by using Wilmot's Bubble Counter. 6. Extraction and separation of photosynthetic pigments of C3 and C4 plants by thin layer chromatographic (TLC) method. 7. Estimation of carotenoids by using colorimeter. 8. Determination of rate of respiration of different respiratory substrates by using titration method. 9. Estimation of proline content of leaves from plants under drought stress. 10. Estimation flavonoids in plant tissues under different environmental and physiological conditions.

II	**PLANT PHYSIOLOGY** **(DEMONSTRATION EXPERIMENTS PLANT PHYSIOLOGY)** 1. Calculation of stomatal index of upper and lower epidermal peelings of *Moringa*. 2. Dye reduction test (Hill's Reaction) 3. Polyacrylamide Gel Electrophoresis (PAGE and SDS-PAGE) 4. Estimation of Nitrate reductase (NR) activity 5. Bioassay for 2, 4-D. 6. Bioassay for cytokinin. 7. Isolation of chloroplast protein from leaves.
III	**BIOCHEMISTRY** 1. Basic Biochemistry - Preparation of different types of solutions. 2. Principles of photometry-Colorimeter and Spectrophotometer- principles and applications. 3. Preparation of standard graph for potassium dichromate ($K_2Cr_2O_7$) using colorimeter (Or) Verification of Beer- Lambert Law using colorimeter. 4. Principles of pH meter and application. 5. Determination of neutralization point of acid-base mixture by titration method using pH meter.
IV	**BIOCHEMISTRY** 1. Colorimetric Estimation of glucose by anthrone reagent method. 2. Colorimetric Estimation of amino acids by ninhydrin method. 3. Estimation of proteins (Lowry's method). 4. Extraction and separation of known and unknown amino acids using paper chromatographic method. 5. Estimation of fatty acid using the titration method (oil/fat). 6. Assay for the enzyme catalase.
V	**(DEMONSTRATION EXPERIMENTS PLANT BIOCHEMISTRY AND BIOPHYSICS)** 1. Preparation of buffers. 2. Estimation of starch from plant tissue. 3. Estimation of glucose from plant tissue. 4. Estimation of protein from plant tissue. 5. Simple problems based on theory syllabus.

Course outcomes: CO	**On completion of this course, the students will be able to:**	**Programme outcomes**
CO1	Perform quantitative tests for all major macro molecules and file a report of chemical profile of a plant cell.	K1
CO2	Analyze the structure and properties of various enzymes.	K2

CO3	Understand the fundamentals of water and its relation to plants.	K1 & K3
CO4	Understand the role of pigment in photosynthetic mechanism and related events of plants.	K4
CO5	Evaluate the theory and practical skills gained during the course and create idea to seek for suitable job in relevant industries.	K5

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 Text:

1. Plummer, D. 1988. An introduction to Practical Biochemistry, Tata McGraw–Hill Publishing Company Ltd., New Delhi.
2. Palanivelu, P. 2004. Laboratory Manual for analytical biochemistry and separation techniques, School of Biotechnology, Madurai Kamaraj University, Madurai.
3. Jayaraman.J.1981. Laboratory Manual in Biochemistry. Whiley Eastern Limited, New Delhi.
4. Bendre, A.M. and Ashok Kumar, 2009. A text book of practical Botany. Vol. I & II. Rastogi Publication. Meerut. 9th Edition.
5. Manju Bala, Sunita Gupta, Gupta NK. 2012. Practicals in Plant Physiology and Biochemistry. Scientific Publisher.
6. Joy, P.P., Surya, S and Aswathy, C. 2015. Laboratory Manual of Biochemistry, Agricultural University, Pineapple Research Station, Ernakulam, Kerala.
1. Poonam Sharma – Natu, Vijay Paul and P.S. Deshmukh. 2021. Laboratory manual Experimental Plant Physiology. Division of Plant Physiology, Indian Agricultural Research Institute, New Delhi.

Reference books:

1. Bala, M., Gupta, S., Gupta, N.K and Sangha, M.K. 2013. Practicals in plant physiology and biochemistry. Scientific Publishers (India).
2. Wilson, K and J. Walker (Eds). 1994. Principles and Techniques of Practical Biochemistry (4th Edition) Cambridge University Press, Cambridge.
3. Bendre, A.M and Ashok Kumar. 2009. A text book of practical Botany. Vol. I & II. Rastogi Publication. Meerut. 9th Edition.
4. Manju Bala, Sunita Gupta, Gupta, N.K. 2012. Practicals in Plant Physiology and Biochemistry. Scientific Publisher.
5. Wilson, K and J. Walker. 2005. Principles and Techniques of Practical Biochemistry, 5th Edition. Cambridge University press, New York.
6. Rodney Boyer. 2000. Modern Experimental Biochemistry, 3rd Edition. Published by Addison Wesley Longman. Singapore.

7. Bala, M., Gupta, S., Gupta, N.K and Sangha, M.K. 2013. Practicals in plant physiology and biochemistry. Scientific Publishers (India).
8. Wilson, K and J. Walker. 2005. Principles and Techniques of Practical Biochemistry, 5th Edition. Cambridge University press, New York.
9. Rodney Boyer. 2000. Modern Experimental Biochemistry, 3rd Edition. Published by Addison Wesley Longman. Singapore. Glick, B.R and J.E. Thompson. 1993. Methods in Plant Molecular Biology and Biotechnology. CRC Press, Boca Raton, Florida.

Web resources:

1.file:///C:/Users/User/Downloads/2021%20Botany%20Syllabus%20after%20BoS%20formatted1%20(1).pdf
2. https://kau.in/document/laboratory-manual-biochemistry
3. https://www.amazon.in/Practical-Manual-on-Plant-Biochemistry/dp/6200539790
4.https://www.amazon.in/Laboratory-Manual-Physiology-Mukesh-Amaregouda/dp/6133993502
5.https://www.kopykitab.com/A-Laboratory-Manual-of-Plant-Physiology-Biochemistry-and-Ecology-by-Akhtar-Inam

Mapping with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	1	3	2	1	2	2	3	3
CO2	3	3	2	2	3	3	2	3	2	3
CO3	3	2	3	3	1	2	1	3	1	3
CO4	3	3	3	3	3	2	3	3	3	3
CO5	3	3	2	3	2	3	3	3	3	3

S-Strong (3) M-Medium (2) L-Low(1)