ST. JOSEPH’S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM

IV SEMESTER **BOTANY** TIME: 4HRS/WEEK B 4103 (3) **PLANT PHYSIOLOGY AND METABOLISM** MARKS: 100

w.e.f. ‘20AH’ batch **SYLLABUS**

**OBJECTIVES:** To be able to-

* Gain knowledge about the role of water in plant life
* Know the physiology of transpiration, water absorption and importance of essential mineral nutrients and their deficiency symptoms.
* Understand the physical aspects of plant physiology.
* Understand the metabolic processes in plants.
* Get an insight into growth and developmental aspects of plants.

**COURSE OUTCOMES:**

On successful completion of this course, the students will be able to:

CO 1: Comprehend the importance of water and mechanisms for transport of water and solutes in plants.

CO 2: Evaluate the role of minerals in plant nutrition, their deficiency symptoms and interpret the role of enzymes in plant metabolism.

CO 3: Critically understand the light reactions and carbon assimilation processes responsible for synthesis of food in plants.

CO 4: AnalyzethebiochemicalreactionsinrelationtoNitrogenandlipidmetabolisms.

CO5: Evaluatethephysiologicalfactorsthatregulategrowthanddevelopmentinplants.

CO 6: Study the role of light on flowering and explain physiology of plants under stress conditions.

# UNIT–I: PLANT-WATER RELATIONS

* + 1. Importance of water to plant life, physical properties of water,

Diffusion, imbibition,osmosis.waterpotential,osmoticpotential,pressurepotential.

* + 1. Absorption and lateral transport of water; Ascent of sap
    2. Transpiration: stomata structure and mechanism of stomata movements

(K+ ion flux).

* + 1. Mechanism of phloem transport; source-sink relationships.

# UNIT–II: MINERAL NUTRITION, ENZYMES AND RESPIRATION

1. Essentialmacroandmicromineralnutrientsandtheirroleinplants;symptomsofmineral deficiency
2. Absorption of mineral ions; passive and active processes.
3. Characteristics, no menclature and classification of Enzymes. Mechanism of enzyme action, enzyme kinetics.
4. Respiration: Aerobic and Anaerobic; Glycol sis, Krebs cycle; electron transport system, mechanism of oxidative phosphorylation, Pentose Phosphate Pathway (HMP shunt).

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# UNIT–III: PHOTOSYNTHESIS AND PHOTORESPIRATION

1. Photosynthesis: Photosynthetic pigments, absorption and action spectra; Red drop and Emerson enhancement effect
2. Concept of two photosystems; mechanism of photosynthetic electron transport and evolution of oxygen; photophosphorylation
3. Carbon as simulation pathways(C3,C4andCAM);
4. Photorespiration -C2 pathway

# UNIT–IV: NITROGEN AND LIPID METABOLISM

1. Nitrogen metabolism: Biological nitrogen fixation–a symbiotic and symbiotic nitrogen fixing organisms. Nitrogen as enzyme system.
2. Lipid metabolism: Classification of Plant lipids, saturated and unsaturated fatty acids.
3. Anabolismoftriglycerides,β-oxidationoffattyacids,Glyoxylatecycle.

# UNIT–V: PLANT GROWTH – DEVELOPMENT ANDSTRESS PHYSIOLOGY

1. Growth and Development: Definition, phases and kinetics of growth.
2. PhysiologicaleffectsofPlantGrowthRegulators(PGRs)-auxins,gibberellins,cytokinins,ABA, ethylene and brassino steroids.
3. Physiology of flowering: Photoperiodism, role of phytochrome in flowering.
4. Seed germination and senescence; physiological changes.

# TEXTBOOKS:

* Pandey, B.P.(2013)College Botany, Volume-III, S.Chand Publishing, NewDelhi
* Ghosh,A.K.,K.Bhattacharya&G.Hait(2011)ATextBookofBotany,Volume-III,New Central Book Agency Pvt. Ltd., Kolkata

# BOOKSFORREFERENCE:

* + - Aravind Kumar & S.S. Purohit (1998) Plant Physiology – Fundamentals and Applications, Agro Botanica, Bikaner
    - Datta, S.C. (2007) Plant Physiology, New Age International (P) Ltd., Publishers, NewDelhi
    - Hans-Walterheldt(2005) Plant Biochemistry, Academic Press,U.S.A.
    - Hopkins, W.G. & N.P.A. Huner (2014)Introduction to Plant Physiology, Wiley India Pvt. Ltd., New Delhi
    - Noggle Ray & J. Fritz (2013)Introductory Plant Physiology, Prentice Hall (India),New Delhi
    - Pandey, S.M. &B.K.Sinha (2006)Plant Physiology, Vikas Publishing House, New Delhi
    - Salisbury, Frank B. & Cleon W. Ross (2007)Plant Physiology, Thomsen &Wadsworth, Austalia &U.S.A
    - Sinha, R.K. (2014) Modern Plant Physiology, Narosa Publishing House, New Delhi
    - Verma, V.(2007)TextBook of Plant Physiology, Ane Books India, New Delhi

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ST. JOSEPH’S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM

IV SEMESTER **BOTANY** TIME: 2Hrs/WEEK

B 4153(2) **PLANT PHYSIOLOGY AND METABOLISM** MAX.MARKS: 50

w.e.f. 20 AH **PRACTICAL SYLLABUS**

**OBJECTIVES:** To enable the student to

* Perform experiments, record observations, analyze the results and draw logical conclusions of different physiological processes.
* Apply the experimental technique related to plant metabolism, growth & development.

**COURSE OUTCOMES:** On successful completion of this practical course, students shall beable to:

CO 1: Conduct lab and field experiments pertaining to Plant Physiology, that is,biophysical and biochemical processes using related glassware, equipment,chemicalsand plant material.

CO 2: Estimate the quantities and qualitative expressions using experimental results andcalculations

CO 3: Demonstratethefactors responsibleforgrowthanddevelopmentinplants.

# PRACTICALSYLLABUS:

1. Determination of osmotic potential of plant cell sap by plasmolytic method using

Rhoeo/ Tradescantialeaves.

1. Calculation of stomatal index and stomatal frequency of amesophyte and axerophyte.
2. Determination of rate of transpiration using Cobalt chloride method / Ganong’spoto meter(at least for adicot and amonocot).
3. Effect of Temperature on membrane permeability by colorimetric method.
4. Study of mineral deficiency symptoms using plant material/photographs.
5. Demonstration of amylase enzyme activity and study the effect of substrate and Enzyme concentration.
6. Separation of chloroplast pigments using paper chromatography technique.
7. Demonstration of Polyphenoloxidase enzyme activity(Potato tuber or Apple fruit)
8. Anatomy of C3, C4 and CAM leaves
9. Estimation of protein by biuret method/Lowry method
10. Minor experiments – Osmosis, Arc-auxanometer, ascent of sap through xylem, cytoplasmic streaming.

**REFERENCE BOOKS:**

1.Text book of Practical Botany (Vol. II) – Ashok Bendra & Kumar, Rastogi Publications, Meerut – 2001-2002

2. Practical Botany (Vol.II) – H.N. Srivastava, Pradeep Publications, Jallandhar – 200.

3. Modern Practical Botany – B. P. Pandey – S. Chand & Co., New Delhi – 1988.

4. College Botany Practical (Vol.1) – S. C. Santra, T. P. Chatterjee & A. P. Das; New Central Book Agency (P) Ltd, Kolkata, India.

5. Practical Book of Botany, Dr. M. Raghuram, Technical Publishers, Guntur, India; 2010.

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