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 **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: Analyze the biochemical reactions in relation to Nitrogen and lipid metabolisms.

CO 5: Evaluate the physiological factors that regulate growth and development in plants.

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,pressure potential.
    2. Absorption and lateral transport of water; Ascent of sap
    3. Transpiration: stomata structure and mechanism of stomata movements (K+ ion flux).
    4. 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).

# UNIT–III: PHOTOSYNTHESIS AND PHOTORESPIRATION

1. Photosynthesis: Photosynthetic pigments, absorption and action spectra; Red drop and Emerson enhancement effect
2. Concept of two photo systems; mechanism of photosynthetic electron transport and evolution of oxygen; photo phosphorylation
3. Carbon assimilation path ways(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. Anabolism of triglycerides, β-oxidation of fatty acids, Glyoxy late cycle.

# UNIT–V: PLANT GROWTH – DEVELOPMENT ANDSTRESS PHYSIOLOGY

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

# TEXTBOOKS:

* Pandey, B.P.(2013)College Botany, Volume-III, S.Chand Publishing, New Delhi
* 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) Text Book of Plant Physiology, Ane Books India, New Delhi

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