BOT -121 GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY II B.Sc., – Botany -4 / IV Semester End (w.e.f. 2018-19)

Plant Physiology and Metabolism

Total Hrs. of Teaching-Learning: 60 @ 4 h / Week

Unit - 1 Plant - Water relations

- 1. Importance of water to plant life, physical properties of water, diffusion, imbibition and Osmosis.
- 2. Absorption and lateral transport of water; Ascent of sap –Various Theories
- 3. Transpiration : Definition, types of transpiration
- 4. Stomata structure; opening and closing mechanism of stomata.

Unit - 2 Mineral nutrition and Enzymes

- 1. Essential macro and micro mineral nutrients and their role in plants; symptoms of mineral deficiency.
- 2. Uptake of mineral ions passive and active transport.
- 3. Nitrogen fixation- Types, biological nitrogen fixation in *Rhizobium*.
- 4. Enzymes: General characteristics, mechanism of enzyme action and factors regulating enzyme action.

Unit - 3 Plant metabolism - I

- 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 assimilation pathways (C₃, C₄ and CAM).
- 4. Photorespiration and its significance.

Unit - 4 Plant metabolism – II

- 1. Respiration: Aerobic and Anaerobic processes; Glycolysis, Krebs cycle.
- 2. Electron Transport System, mechanism of oxidative phosphorylation,
- 3. Lipid metabolism : Introduction, classification of lipids.

Unit - 5 Plant growth and Development

- 1. Growth and Development: Definition, phases and kinetics of growth.
- 2. Physiological effects of phytohormones- Auxins, Gibberellins, Cytokinins, ABA, Ethylene.
- 3. Physiology of Flowering : Photoperiodism, role of Phytochrome in flowering; Vernalization.

Learning outcomes:

- Students can acquire knowledge about the need of water for plant life
- Students can gain knowledge about the process of photosynthesis and Respiration.
- One can gain knowledge about the role of enzymes in plant metabolism.
- Students can know the importance of plant growth hormones in plant growth and development.

(12 h)

(12 h)

(12 h)

(12 h)

(12 h)

Total Credits : 03

Suggested Readings :

- Subhash Chandra Datta (2007) Plant Physiology, New Age International, New Delhi
- > Pandey, S.M. & B.K. Sinha (2006) Plant Physiology, Vikas Publishing House, New Delhi
- > R.K. Sinha (2014) Modern Plant Physiology, Narosa Publishing House, New Delhi
- S.C. Datta (2007) Plant Physiology, New Age International (P) Ltd., Publishers, New Delhi
- Aravind Kumar & S.S. Purohit (1998) Plant Physiology Fundamentals and Applications, Agro Botanica, Bikaner
- Mukherjee, S. & A.K. Ghosh (1998) Plant Physiolog ,Tata McGraw Hill Publishers(P) Ltd.,New Delhi.

Reference books:

- Salisbury Frank B. & Cleon W. Ross (2007) Plant Physiology, Thomsen & Wadsworth, Austalia & U.S.A
- > Noggle Ray & J. Fritz (2013) Introductory Plant Physiology, Prentice Hall (India), New Delhi
- > Taiz, L. & E. Zeiger (2003) Plant Physiology, Panima Publishers, New Delhi
- > Hans Mohr & P. Schopfer (2006) Plant Physiology, Springer (India) Pvt. Ltd., New Delhi
- > V. Verma (2007) Text Book of Plant Physiology, Ane Books India, New Delhi
- Hopkins, W.G. & N.P.A. Huner (2014) Introduction to Plant Physiology, Wiley India Pvt. Ltd., New Delhi
- > Hans-Walter heldt (2005) Plant Biochemistry, Academic Press, U.S.A.
- Plummer, D.(1989) Biochemistry-the Chemistry of life ,McGraw Hill Book Co., London, N.Y. New Delhi, Paris, Singapore, Tokyo.
- Day, P.M.& Harborne, J.B. (Eds.,) (2000): *Plant Biochemistry*. . Harcourt Asia (P) Ltd., India & Academic Press, Singapore.

BOT - 121 GOVERNMENT COLLEGE (AUTONOMOUS), RAJAHMUNDRY II B.Sc., Botany Practical Paper - IV Practical Syllabus (w.e.f. 2018-19) (Plant Physiology and Metabolism)

Total hours of laboratory Exercises 30hrs @ 2 per week

- 1. Determination of osmotic potential by plasmolytic method using leaf epidermal peels of *Rhoeo* or *Tradescantia*.
- 2. Determination of water potential in potato tuber cylinders by gravimetric method
- 3. Determination of cell membrane permiability using beet root by colorimetric method
- 4. Determination of rate of transpiration using cobalt chloride method
- 5. Determination of rate of transpiration using Ganong's potometer.
- 6. Determination of amylase activity using germination seeds of green gram
- 7. Anatomy of C3, C4 and CAM leaves
- 8. Separation of chloroplast pigments using paper chromatography technique.
- 9. Study of mineral deficiency symptoms using plant material/photographs.
- 10. Minor experiments
 - **a.** Osmosis (Egg membrane/potato osmoscope)
 - **b.** Cytoplasmic streaming
 - c. Ascent of sap through xylem
 - d. Arc-auxonometer,