**Generic Elective**

**IV. Plant Physiology and Metabolism**

**(Credits: Theory-4, Practical-2)**

**THEORY**

**Lectures: 60**

**Unit 1: Plant-water relations**  **(8 lectures)**

Importance of water, water potential and its components; Transpiration and its significance; Factors affecting transpiration; Root pressure and guttation.

**Unit 2: Mineral nutrition** **(8 lectures)**

Essential elements, macro and micronutrients; Criteria of essentiality of elements; Role of essential elements; Transport of ions across cell membrane, active and passive transport, carriers, channels and pumps.

**Unit 3: Translocation in phloem** **(6 lectures)**

Composition of phloem sap, girdling experiment; Pressure flow model; Phloem loading and unloading

**Unit 4: Photosynthesis** **(12 lectures)**

Photosynthetic Pigments (Chl a, b, xanthophylls, carotene); Photosystem I and II, reaction center, antenna molecules; Electron transport and mechanism of ATP synthesis; C3, C4 and CAM pathways of carbon fixation; Photorespiration.

**Unit 5: Respiration (6 lectures)**

Glycolysis, anaerobic respiration, TCA cycle; Oxidative phosphorylation, Glyoxylate, Oxidative Pentose Phosphate Pathway.

**Unit 6: Enzymes (4 lectures)**

Structure and properties; Mechanism of enzyme catalysis and enzyme inhibition.

**Unit 7: Nitrogen metabolism**

Biological nitrogen fixation; Nitrate and ammonia assimilation.

**(4 lectures)**

**Unit 8: Plant growth regulators**

**(6 lectures)**

Discovery and physiological roles of auxins, gibberellins, cytokinins, ABA, ethylene.

**Unit 9: Plant response to light and temperature** **(6 lectures)**

Photoperiodism (SDP, LDP, Day neutral plants); Phytochrome (discovery and structure), red and far red light responses on photomorphogenesis; Vernalization.

**Practical**

1. Determination of osmotic potential of plant cell sap by plasmolytic method.
2. To study the effect of two environmental factors (light and wind) on transpiration by excised twig.
3. Calculation of stomatal index and stomatal frequency of a mesophyte and a xerophyte.
4. Demonstration of Hill reaction.
5. Demonstrate the activity of catalase and study the effect of pH and enzyme concentration.
6. To study the effect of light intensity and bicarbonate concentration on O2 evolution in photosynthesis.
7. Comparison of the rate of respiration in any two parts of a plant.
8. Separation of amino acids by paper chromatography.

**Demonstration experiments (any four)**

1. Bolting.
2. Effect of auxins on rooting.
3. Suction due to transpiration.
4. R.Q.
5. Respiration in roots.

**Suggested Readings**

1. Hopkins, W.G., Huner, N.P., (2009). Introduction to Plant Physiology. John Wiley & Sons, U.S.A. 4th Edition.
2. Bajracharya, D., (1999). Experiments in Plant Physiology- A Laboratory Manual. Narosa Publishing House, New Delhi.
3. Taiz, L., Zeiger, E., MØller, I.M. and Murphy, A (2015). Plant Physiology and