Bot-416 & 417 ADVANCES IN PLANT PHYSIOLOGY Credit Hours: 3(2+1)

THEORY:

Introduction of the Course:

The course is organized to provide an adequate knowledge about advances in plant physiology. Physiology studies about these internal processes and their functional aspects. Plant physiology is a study of vital phenomena in plant. It is the science concerned with Processes and functions, the responses of plants to environment and the growth and development that results from the responses.

Course Objectives:

The course is designed:

1. To provide an adequate knowledge about basic concepts of plants according to syllabus.
2. To a give detailed account of water and solute transport, plant growth regulators, phytochromes and control of floral development.

Contents:

1. **Plant Growth Regulators**:
   - 1.1 Major natural hormones (Auxins, Gibberellins, Cytokinins, Abscisic acid, Ethylene)
   - 1.2 Structure, biosynthesis, receptors, signal transduction, mode of action, transport, and physiological effects.
2. **Water Relations**:
   - 2.1 The soil plant atmosphere continuum an overview
   - 2.2 Structure of water
   - 2.3 Physico-chemical properties of water
   - 2.4 Water in the soil and its potentials
   - 2.5 Water in cell components
   - 2.6 Absorption of water in plants
   - 2.7 Pathways and driving forces
   - 2.8 Aquaporins,-their structure and types
   - 2.9 Cell water relations terminology
   - 2.10 Modulus of elasticity coefficient
   - 2.11 Hydraulic conductivity
3. **Solute Transport:**
   - 3.1 The nature of membrane carriers
   - 3.2 channels and electro genic pumps
   - 3.3 Passive and active (primary and secondary) transports and their energetics
   - 3.4 Membrane transport proteins Ion traffic into root
4. **Phytochromes**:
   - 4.1 Discovery of phytochromes
   - 4.2 Physical and chemical properties of phytochromes
   - 4.3 Role of phytochromes in biological processes
   - 4.4 Phytochromes signaling pathways
5. **Control of Flowering**:
   - 5.1 Floral meristem and floral organ development
   - 5.2 Floral organ identity genes and the ABC model
   - 5.3 Circadian rhythms

5.4 Photoperiodism
5.5 Vernalization

Practical:

1. To determine osmotic potential of massive tissue by freezing point depression method or by an osmometer.
2. To investigate water potential of a plant tissue by dye method and water potential apparatus.
3. Measurements of stomata index and conductance, Determination of K uptake by excised roots.
4. To investigate the preferential absorption of ions by corn seedlings and potato slices.

Teaching-learning Strategies:

1. Lectures
2. Group Discussion
3. Laboratory work
4. Seminar/ Workshop

Learning Outcome:

1. Students are expected to get familiarized with the morphological and systematic knowledge about different plant groups.
2. They will be able to describe, apply and integrate the basic concepts of Cell Biology including Genetics and Evolution, Biochemistry, Physiology as well as Structure and Functions of different Organelles.
3. This will enable them qualify for basic to moderate level jobs involving knowledge of plants and their environment.
4. The obtained knowledge shall also enable the students to enter into various entrepreneurial activities involving general introduction to Botany.

Assessment Strategies:

1. Lecture Based Examination (Objective and Subjective)
2. Assignments
3. Class discussion
4. Quiz
5. Tests

Recommended Readings:

1. Taiz, L., Zeiger, E. Møller I.M. and Murphy, A. (2015). *Plant Physiology and Development,* 6th Edition. Sinauer Associates Inc., Sunderland MA. ISBN: 0-87893-8311,700pp
2. Jones, R. L., Ougham, H. H. Thomas, S. and Waaland. (2012). *The Molecular Life of Plants***.** Wiley Blackwell**.** ISBN: 978-0-470-87011-2012 766pp
3. Buchanan, B. B., Gruissem, W., Jones, R. L. (2015). *Biochemistry and Molecular Biology of Plants.* Wiley-Blackwell. 2nd Edition, ISBN: 978-0-470- 71421-8, 1280pp.
4. Grotewold, E., Chappell, J. and Kellogg, E. A. (2015). *Plant Genes, Genomes, and Genetics.* Wiley-Blackwell ISBN: 978-1-119-99888.
5. Plant Physiology and Development (http://6e.plantphys.net/).
6. The Arabidopsis Book (https://aspb.org/publications/other-aspb-publications/thearabidopsis-book/).
7. Plant Physiology (http://www.plantphysiol.org/).

8. Annual Review of Plant Biology (http://www.annualreviews.org/journal/arplant).
9. The Plant Cell (http://www.plantcell.org/site/teachingtools/).
10. Teaching tools in Plant Biology (http://www.plantcell.org/content/teaching-tools-plantbiology).
11. Basic Biology Concepts Khan Academy (http://lej4learning.com.pk/category/basicsciences/biology).
12. Current protocols in Plant Biology (http://www.currentprotocols.com/WileyCDA/Section/id-810246.html).

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