

GENERIC ELECTIVES (BOT-GE-9)

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical/ Practice		
Intelligent Systems in Plants BOT-GE-9	4	2	0	2	Nil	Nil

Learning Objectives

- The course aims to lay the foundations on plant intelligence and develops understanding of the intelligent adaptively variable behaviour of plants.

Learning outcomes

- The students will be learning the concepts of intelligence, distinction between development and intelligent behaviour and morphological /adaptive strategies employed by plants to survive.

SYLLABUS OF BOT-GE-9

Unit 1: Introduction

Weeks: 02

An Introduction to Plant Structure (Morphological and Anatomical details); compartmentalization

Unit 2: Plants and Intelligence

Weeks: 1.5

Introduction to Plant Intelligence and Memory - Historical Perspective

Unit 3: Sensory Biology

Weeks: 02

Cell to cell communication, Self-recognition, Recognition of Neighbours and Relatives.

Unit 4: Learning in Plants

Weeks: 03

Habituation learning; Learning by association (Rhizosphere and Mycorrhizae); Adaptive Intelligence (Hydrophytes, Xerophytes, Parasites, Carnivorous plants, Thermogenic plants); Response to water, heat, salt and cold stress; Mechanical and chemical defence against predators with special reference to secondary metabolites.

Unit 5: Intelligent Behaviour of Plants

Weeks: 6.5

A Guided tour to Plant Movements (Tropic Movements, Movement towards gravity, light, tracking sun movements, prey driven movements, liberation movements); Intelligent response to minerals and light (Seed germination, root cap, response of shoot, leaf morphology and anatomy); Unique pollination and seed dispersal mechanisms; Osmosis; Short and long-distance transport of water and food; Metabolic redundancy; Life Cycle Signaling in response to external stimuli (Reactive Oxygen Species, peptides, receptors, hormones).

Practicals:

1. Study the structure of plant cell using temporary mount. **(Week: 01)**
2. Study of the cell as an osmotic system (Plasmolysis and Deplasmolysis). **(Week: 01)**
3. Demonstration of the phenomenon of protoplasmic streaming in *Hydrilla* leaf. **(Week: 01)**
4. Extraction and qualitative analysis of alkaloids, flavonoids, tannins and phenols. **(Weeks: 02)**
5. To study the phenomenon of seed germination (effect of light). **(Week: 02)**
6. To study light sensitivity and etiolation vs. de-etiolation. **(Week: 01)**
7. Morphology and orientation of chloroplasts in leaves growing in light and dark, plasmodesmata connections and plasma membrane receptors. (through photographs or other digital resources). **(Week: 01)**
8. Estimation of total photosynthetic pigments. **(Week: 01)**
9. Study of (a) Root cap (b) Trichomes: non-glandular and glandular (c) Leaf Morphology and Anatomy (d) pulvinus anatomy in *Mimosa pudica* (e) Specialised motor tissue at the base of monocot leaves. **(Weeks: 02)**
10. (a) Study of morphological and anatomical adaptations of hydrophytes, xerophytes.
(b). Study of biotic interactions of the following: Stem parasite (*Cuscuta*), Root parasite (*Orobancha*), Epiphytes, Predation (Insectivorous plants). **(Weeks: 02)**
11. Pollination types (selected) and associated seed dispersal mechanisms. **(Week: 01)**

Suggested Readings:

1. Mauseth, J.D. (1988). Plant Anatomy. The Benjamin/Cummings Publisher, USA.
2. Evert, R.F., Eichhorn, S.E. (2012). Raven Biology of Plants, 8th edition, New York, NY: W.H. Freeman and Company.
3. Koller, D. (2011). The Restless Plant. Edited by Elizabeth Van Volkenburgh, Harvard University Press, Cambridge, Massachusetts, and London, England.
4. Crang, R., Lyons-Sobaski, S., Wise, R. (2018) Plant Anatomy- A Concept based approach to the structure of seed plants, Springer Nature, Switzerland.

Additional Resources:

Trewavas A. (2017). The foundations of plant intelligence. Interface Focus 7: 20160098.
<http://dx.doi.org/10.1098/rsfs.2016.0098>