

Course title: Molecular Plant Physiology and Metabolism				
Course code: BBP 116	No. of credits: 2	L-T-P: 30-0-0	Learning hours: 30	
Pre-requisite course code and title (if any): Science graduate				
Department: Department of Biotechnology				
Course coordinator: Dr. Shashi Bhushan Tripathi		Course instructor: Dr. Shashi Bhushan Tripathi		
Contact details: shashi.tripathi@terisas.ac.in				
Course type: Elective		Course offered in: Semester 2		
Course description: This course is designed for the students who have opted for Plant Biotechnology as the stream of specialization in the M.Sc. Biotechnology Programme. The course aims to provide a comprehensive knowledge of molecular plant physiology. The main topics include photomorphogenesis, hormones, water relations, photosynthesis and stress physiology.				
Course objectives: 1. To provide a foundational understanding of key plant physiological processes. 2. To provide knowledge of molecular mechanisms of plant metabolism and development. 3. Knowledge of plant stress physiology and tolerance mechanisms. 4. Familiarity with secondary plant metabolites.				
Course contents				
Module	Topic	L	T	P
	Photomorphogenesis: Role of light in growth and development, Circadian rhythms, Phytochrome, Cryptochrome and Phototropins	4	0	0
	Phytohormones: Biosynthesis, mode and mechanism of action, biological functions, perception and signaling (Auxins, Cytokinins, Gibberellins, Ethylene, Abscisic Acid, Brassinosteroids), Polyamine, Salicylic acid and Jasmonic acid	6	0	0
	Physiology of plant development and flowering: Embryogenesis, apical, basal & radial patterning; Developmental control of root and shoot apical meristem; Molecular mechanism of floral induction and development	7	0	0
	Plant nutrients: Uptake and utilization, Solute transport, Plant water relationships, hydroponics	2	0	0
	Physiology of biotic and abiotic stress, Molecular plant-pathogen interactions	3	0	0
	Photosynthesis (C ₃ , C ₄ and CAM), photorespiration	3	0	0
	Metabolism of secondary metabolites in plants, Phenolics, Terpenoids and Alkaloids, biochemical and physiological significance	3	0	0

	Biological N ₂ fixation, Plant growth promoting Rhizobacteria, Amino acid metabolism, Urea cycle	2	0	0
	Total	30	0	0

Evaluation criteria:

1. Minor test 1- (Module 1-3) 30%
2. Minor test 2- (Module 3-5) 30%
3. Major test (end semester) - (Modules 5-9) 40%

Learning outcomes:

1. An understanding of photomorphogenesis and plant hormones (Minor test 1)
2. An understanding of floral induction and water relations and stress tolerance mechanisms (Minor test 1 and Minor test 2)
3. An understanding of electron transport, secondary metabolites, and nitrogen metabolism (Minor test 2 and Major test)
4. An ability of making hypotheses related to plant metabolism and development (Minor test 1, Minor test 2 and Major exam)

Pedagogical Approach:

1. Classroom lectures and discussions.
2. Case studies and examples from original research articles.

Skill Set:

1. Developing and screening mutants with novel traits.
2. Ability to develop strategies for genetic improvement of crops having climate resilience.

Employability:

1. Academic and research organisations
2. Tissue culture facilities and horticulture companies
3. Agri-biotechnology and seed companies
4. Pharmaceutical and drug research companies
- 5.

Materials:

Suggested Readings

1. Plant Physiology, Sixth Edition" by Lincoln Taiz and Eduardo Zeiger
2. Biochemistry & Molecular Biology of Plants by Bob Buchanan, Gruissen W and Jones R L

Additional information (if any):

Student responsibilities:

1. Class attendance.
2. Study of reading materials as specified by course instructor
3. Self-study

Course reviewers:

1. Dr. B. P. Shaw, Scientist G, Institute of Life Sciences, Bhubaneswar, Odisha
2. Dr. Santan Barthwal, Scientist F, Forest Research Institute, Dehradun, Uttarakhand