

<b>Course title:</b> Molecular Plant Physiology and Metabolism				
<b>Course code:</b> BBP156	<b>No. of credits:</b> 3	<b>L-T-P:</b> 21-21-0	<b>Learning hours:</b> 42	
<b>Pre-requisite course code and title (if any):</b> None				
<b>Department:</b> Department of Biotechnology				
<b>Course coordinator:</b> Dr Shashi Bhushan Tripathi		<b>Course instructor:</b> Dr Shashi Bhushan Tripathi		
<b>Contact details:</b> shashi.tripathi@terisas.ac.in				
<b>Course type:</b> Core				
<b>Course offered in:</b> Semester 2				
<b>Course description:</b> The principal focus of the existent course is on the molecular aspects of the physiological and metabolic processes in plants. Preliminary knowledge of plant physiology and metabolism would be imparted. Critical knowledge of phyto-hormone biosynthesis, mode and mechanism of action will be highlighted. Students will be oriented into developing a molecular understanding of the principles of photosynthesis and photomorphogenesis, molecular basis of nutrient uptake and utilization with emphasis on plant stress physiology and pathology.				
<b>Course objectives:</b> 1. To illustrate knowledge of stress adaptations in biological systems. 2. To deliver molecular understanding of primary and secondary metabolic process. 3. To present perspectives of the current tools for application in biological system for biotechnological research. Demonstrate the concept using different activities for building capacity.				
<b>Course contents</b>				
<b>S. No</b>	<b>Topic</b>	<b>L</b>	<b>T</b>	<b>P</b>
<b>Part 1</b>	<b>Molecular Plant Physiology</b>			
1	<b>Photo-Morphogenesis:</b> Role of Light in Growth and Development, Establishing Circadian Rhythms, Phytochromes and Cryptochromes.	2	2	0
2	<b>Phytohormones:</b> Biosynthesis, Mode and Mechanism of Action, Biological functions, Perception and Signalling (Auxins, Cytokinins, Gibberellins, Ethylene, Abscic Acid, Brassinosteroids).	3	3	0
3	<b>Plant nutrients:</b> Uptake and utilization, Solute Transport, Plant water relationship.	3	3	0
4	<b>Plant Stress Physiology:</b> Morphological, Physiological and Biochemical Traits in Stress Tolerance Mechanism. Role of Polyamines, Jasmonic Acid and Salicylic acid. Stress adaptations responses.	5	5	0
5	<b>Plant Pathogen Interactions:</b> Introduction to Plant Pathology, Types of biotic stress, Phytohormone signalling in plant defence Molecular Plant Pathogen Interactions.	3	3	0
<b>Part 2</b>	<b>Plant Metabolism and Regulation</b>			0
6	<b>Metabolism and Regulation</b> - An overview, metabolic diversity, catabolism and anabolism, Intermediary metabolism is tightly regulated, integrated processes, Anaplerotic reactions. Respiration (TCA cycle, electron transport chain, alternate respiration), Storing and Transducing Energy. Photosynthesis, Physiological and ecological considerations.	3	3	0
7	<b>Secondary Metabolism:</b> Categories of Secondary Compounds Phenolics, Terpenoids and Alkaloids Amino Acid Metabolism (synthesis) and Urea Cycle (degradation & recyclization):	2	2	0
	<b>Total</b>	<b>21</b>	<b>21</b>	<b>0</b>

<p><b>Evaluation criteria:</b></p> <ol style="list-style-type: none"> <li>1. 2 minor tests : 30% each</li> <li>2. 1 major test (end semester) : 40%</li> </ol>
<p><b>Learning outcomes:</b></p> <ol style="list-style-type: none"> <li>1. A pervasive understanding on the kingdoms of biomolecules, metabolites and pathways that are the prerequisites and consequences of physiological phenomenon for further manipulations.</li> <li>2. Acquaintance with mechanistic view on the plant environment interactions.</li> <li>3. Development of integrative approach for visions in biological problems.</li> </ol>
<p><b>Pedagogical Approach:</b>  Classroom lectures and PowerPoint presentation.  Assignments and tutorial as required.  Emphasis on the detailed discussion of research articles in class.</p>
<p><b>Skill Set:</b></p> <ol style="list-style-type: none"> <li>1. Assessing the role of phytohormones and nutrients in plants.</li> <li>2. Understanding the stress tolerance mechanism adapted by plants.</li> </ol>
<p><b>Employability:</b></p> <ol style="list-style-type: none"> <li>1. Academic and research institutions.</li> <li>2. Seed Industry and Plant tissue culture based Industries.</li> </ol>
<p><b>Materials:</b>  <b>Suggested readings</b></p> <ol style="list-style-type: none"> <li>1. Biochemistry &amp; Molecular Biology of Plants. Authors: Buchanan BB, Grissem W and Jones RL (2000), American Society of Plant Physiologists.</li> <li>2. Lehninger Principles of Biochemistry, Authors: David L. Nelson and Michael M.Cox.</li> <li>3. Plant Physiology. Authors: Taiz L, and Zeizer E, (2006), Sinauer Associates, Inc. Biochemistry. Authors: Berg JM, Tymoczko, JL, and Stryer L (2006). W. H. Freeman.</li> <li>4. Plant Pathology. Authors: Agrios GN 5 ed; 2005, Elsevier Academic Press, 2005.</li> </ol>
<p><b>Additional information (if any):</b></p>
<p><b>Student responsibilities:</b></p> <ol style="list-style-type: none"> <li>1. Class attendance.</li> <li>2. Study of course materials as specified by the instructor.</li> </ol>

**Course reviewers**

Dr. Ajay Arora, IARI

Dr. A Kumar, IARI