



**DEPARTMENT OF HORTICULTURE**  
**FACULTY OF AGRICULTURAL SCIENCES**

**University of the Punjab, Lahore**

<b>Programme</b>	<b>B.Sc. (Hons.) Agriculture</b>	<b>Course Code</b>	<b>Agr-000</b>	<b>Credit Hours</b>	3(3-0)
<b>Course Title</b>	<b>INTRODUCTION TO CROP MODELING</b>				
<b>Course Introduction</b>					
Crop modeling is crucial as it provides the foundational knowledge needed to understand and utilize models that simulate crop growth and development under various environmental conditions. Crop modeling plays a significant role in modern agriculture by allowing researchers and farmers to predict the outcomes of different management practices, climate scenarios, and genetic improvements on crop performance.					
<b>Learning Outcomes</b>					
On the completion of the course, the students will be able : 1. To familiarize with the concept and application of crop modeling.					
<b>Course Content</b>			<b>Assignments/Readings</b>		
<b>Week 1</b>	<b>Unit-I</b> 1.1 History and introduction of crop growth modeling				
<b>Week 2</b>	<b>Unit-II</b> 2.1 Fundamental concepts of crop modeling 2.2 Importance and uses				
<b>Week 3</b>	<b>Unit-III</b> 3.1 Introduction to decision support system for agro-technology transfer 3.3 Components of a model				
<b>Week 4</b>	<b>Unit-IV</b> 4.1 Input data set for different model				
<b>Week 5</b>	<b>Unit-V</b> 5.1 Modelling and crop improvement				
<b>Week 6</b>	<b>Unit-VI</b> 6.1 Modelling a tool for future predictions				
<b>Week 7</b>	<b>Unit-VII</b>				

	7.1 Mathematical Foundations	
<b>Week 8</b>	<b>Unit-VIII</b> 8.1 Data Requirements and Sources	
<b>Week 9</b>	<b>Unit-IX</b> 9.1 Parameterization and Calibration	
<b>Week 10</b>	<b>Unit-X</b> 10.1 Validation and Evaluation	
	10.2 Sensitivity Analysis	
<b>Week 11</b>	<b>Unit-XI</b> 11.1 Climate Change and Crop Modeling 11.2 Integration with GIS and Remote Sensing	
<b>Week 12</b>	<b>Unit-XII</b> 12.1 Decision Support Systems	
<b>Week 13</b>	<b>Unit-XIII</b> 13.1 Modeling Crop-Soil Interactions	
<b>Week 14</b>	<b>Unit-XIV</b> 14.1 Concept of genetic manipulation	
<b>Week 15</b>	<b>Unit-XV</b> 15.1 Phenology and Crop Development	
<b>Week 16</b>	<b>Unit-XVI</b> 16.1 Economic and Environmental Impact Assessment	
<b>PRACTICAL</b>		
<b>Week 1</b>	Demonstration and practice of crop growth models	
<b>Week 2</b>	CERES-wheat	
<b>Week 3</b>	DSSAT V. 4, APSIM	
<b>Week 4</b>	Measurement of different environmental variables from observatories	
<b>Week 5</b>	Model Setup and Installation	
<b>Week 6</b>	Data Collection and Preparation	

<b>Week 7</b>	Model Calibration	
<b>Week 8</b>	Model Validation	
<b>Week 9</b>	Scenario Analysis	
<b>Week 10</b>	Integration with GIS	
<b>Week 11</b>	Economic Impact Assessment	
<b>Week 12</b>	Environmental Impact Assessment	
<b>Week 13</b>	Decision Support Systems	
<b>Week 14</b>	Collaborative Modeling Projects	
<b>Week 15</b>	Data Analysis and Statistical Tools	
<b>Week 16</b>	Workshops and Field Trips	

#### **Textbooks and Reading Material**

1. Cao, W., J.W. White and E. Wang. 2009. Crop Modeling and Decision Support. Springer, Heidelberg, Germany.
2. Singh, P. 2008. Modeling Crop Production Systems: Principles and applications. Science publishers. Enfield, New Hampshire 03784.USA
3. Sivakumar, M. V. K. and R. P. Motha. 2007. Managing Weather and Climate: Risks in Agriculture. Springer, Berlin, Heidelberg, New York.
4. Sivakumar, M. V. K. and J. Hansen. 2007. Climate Predictions and Agriculture. Springer, Berlin, Heidelberg, New York.

#### **Teaching Learning Strategies**

1. Lectures
2. Discussions
3. Presentations
4. Quiz
5. Assignments

#### **Assignments: Types and Number with Calendar**

Use a crop model to assess the economic impact of different crop management practices (e.g., fertilization, pest control) on profitability. Provide recommendations based on the model's findings.

#### **Assessment**

<b>Sr. No.</b>	<b>Elements</b>	<b>Weightage</b>	<b>Details</b>
1.	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.

2.	Formative Assessment	25%	Continuous assessment includes: Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.
3.	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.

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