DEPARTMENT OF AGRONOMY
Faculty of Agricultural Sciences
University of the Punjab, Lahore

Course Outline

Programme	B. Sc. (Hons.) Agriculture (Agronomy)	**Course Code**	**AGR-310**	**Credit Hours**	3 (2-1)
Course Title	**ENVIRONMENT AND CROP PRODUCTION**				

Course Introduction

This course delves into the intricate relationship between the environment and crop production, emphasizing the impacts of climate change and food security. It provides a comprehensive understanding of the various types and classifications of environments and explores the dynamics of aerial and soil environments within a crop canopy at both macro and micro levels. The course covers critical topics including the greenhouse effect, El Niño and La Niña phenomena, and how crops adapt to changing climate conditions.

Learning Outcomes

On the completion of the course, the students will:

18. Develop a comprehensive understanding of how various environmental factors influence crop growth and development, enabling them to make informed decisions in agricultural management.
19. Learn about crop adaptation strategies to changing climate conditions.
20. Be able to manage the dynamics of aerial and soil environments within a crop canopy, improving their ability to optimize conditions for enhanced crop productivity.
21. Acquire practical skills in measuring and estimating key environmental variables.

Course Content		**Assignments/Readings**
Week 1	**Theory** **Unit-I** 1.1 Introduction of Environment **1.1.1** Definition of environment and their biotic and abiotic factors **1.1.2** Difference between climate and weather **Practical** Estimation of radiation interception and its use efficiency in field crops (Radiation use efficiency, leaf area index)	Basics of environmental sciences by Michael Allaby, Pages 64-68
Week 2	**Unit-II** 2.1 Climate change and Food Security	Food security and climate change by Wiley

	2.1.1 Climatic factors that affect crop productivity (temperature, CO_2 level, drought, flooding), 2.1.2 Enhance food security. **Practical** Estimation of radiation interception and its use efficiency in field crops (Radiation use efficiency, leaf area index)	Blackwell, Pages 3-10,14-18
Week 3	**Unit-III** 3.1 Types and classification of Environment 3.1.1 Natural and artificial environment 3.1.2 Characteristics and components of each environment type **Practical** Estimation of radiation interception and its use efficiency in field crops (radiation capture by crop canopies, Radiant energy)	Environmental physiology of plants by Alastair H Fitter and Robert KM Hay, Pages 29-33
Week 4	**Unit-IV** 4.1 Dynamics of aerial environment in a crop canopy at macro level 4.1.1 Interaction between aerial environment and crop canopy 4.2 Dynamics of aerial environment in a crop canopy at micro level 4.2.1 Factors affecting canopy **Practical** Calculation of different drought indices (introduction to drought)	Plant Physiological Ecology by, R.W. Pearcy, J.R. Ehleringer, H.A. Mooney and P.W. Rundal, Pages 118-124
Week 5	**Unit-V** 5.1 Dynamics of soil environment in a crop canopy at macro level 5.1.1 Interaction between soil environment and crop canopy 5.1.2 Physical and chemical factors effecting crop canopy **Practical** Classification of Drought (agriculture, metrological, hydrological, socioeconomic)	Plant Physiological Ecology by, R.W., J.R. Ehleringer, H.A. Mooney and P.W. Rundal, Pages 85-90

Week 6	Unit-VI 5.2 Dynamics of soil environment in a crop canopy at micro level 5.2.1 Soil properties and their influence on crop growth 5.2.2 Effect of external environment **Practical** Drought indices Percent of normal Palmer drought severity index(continue)	Plant Physiological Ecology by, R.W., J.R. Ehleringer, H.A. Mooney and P.W Rundal, Pages 85-90
Week 7	**Unit-VII** 7.1 Environment Factors 7.2 External Factors 7.3 Internal Factors **Practical** Agriculture reference index for drought Crop moisture index Deciles	Environmental physiology of plants by Alastair H Fitter and Robert KM Hay, Internet source
Week 8	**Unit-VIII** 8.1 Influence of radiations on crop growth and development 8.1.1 Effects on different crops production 8.1.2 Effects on photosynthesis and transpiration **Practical** Agriculture reference index for drought Crop moisture index Deciles	Environmental physiology of plants by Alastair H Fitter and Robert KM Hay, Pages 33-66
Week 9	**MID TERM EXAM**	
Week 10	**Unit-VIII** 8.1.3 Leaf area index 8.1.4 Effect of intercepted radiations and leaf area index on growth of crops **Practical** Calculation of potential ET (ET definition, potential ET, actual ET, Formula method to find potential ET)	Environmental physiology of plants by Alastair H Fitter and Robert KM Hay, Pages 33-66

Week 11	**Unit-IX** 9.1 Influence of temperature on crop growth and development 9.1.1 Effects of temperature (high and low temperature) on crops, 9.1.2 Heat stress and adaptation of crops 9.1.3 Global warming **Practical** Instruments used to find potential ET	Environmental physiology of plants by Alastair H Fitter and Robert KM Hay, Pages 193-205 Internet source
Week 12	**Unit-X** 10.1 Influence of relative humidity on crop growth and development. 10.1.1 Humidity and types of humidity 10.1.2 Humidity & plant growth, 10.1.3 Attack of diseases and insect pest **Practical** Calculation of potential ET	Plant Physiological Ecology by, R.W., J.R. Ehleringer, H.A. Mooney and P.W Rundal, Pages 57-66
Week 13	**Unit-XI** 11.1 Influence of wind on crop growth and development 11.1.1 Positive & negative effect of wind 11.1.2 Protection from wind damage 11.1.3 Wind measurement **Practical** Measurements and estimation of different environmental variables Relative humidity	Plant Physiological Ecology by, R.W., J.R. Ehleringer, H.A. Mooney and P.W Rundal, Pages 57-66
Week 14	**Unit-XII** 12.1 Influence of CO_2 on crop growth and development 12.1.1 Role of CO_2 in photosynthesis and respiration. 12.1.2 Effects of CO_2 on water use efficiency 12.1.3 Plants response to different CO_2 concentration 12.1.4 Negative impact of CO_2. **Practical** Measurements and estimation of different environmental variables Air temperature	Environmental physiology of plants by Alastair H Fitter and Robert KM Hay, Pages 63-73

Week 15	**Unit-XIII** 13.1 Greenhouse effect 13.1.1 Greenhouse gases and types of greenhouse 13.1.2 How greenhouse gases interact with earth 13.1.3 Impact of the greenhouse effect on global climate and agriculture **Practical** Measurements and estimation of different environmental variables Rainfall	Basics of Environmental Sciences by Michael Allaby, Pages 44-50 Internet source
Week 16	**Unit-XIV** 14.1 El Nino and La Nino phenomenon 14.1.1 Explanation of El Niño and La Niña events 14.1.2 Effects of these phenomena on global weather patterns and crop production **Practical** Measurements and estimation of different environmental variables Light intensity	Basics of Environmental Sciences by Michael Allaby, Pages 59-60
Week 17	**Unit-XV** 15.1 Crop adaptation to changing climate Introduction to climate change and their relation with agriculture 15.1.1 Factors of climate change (Temp., drought, flooding, CO_2) 15.1.2 Strategies and crop adaptation to climate change **Practical** Measurements and estimation of different environmental variables Wind direction and speed	Food security and climate change by Wiley Blackwell, Pages 51-61,72-80,96-107 Internet source
Week 18	**FINAL EXAM**	
Textbooks and Reading Material		
1. Allaby, M. 2000. Basics of Environmental Science. Rutledge, London. 2. Dris, R., J. Mohan and I.A. Khan. 2002. Environment and Crop Production. Science Pub. Inc., New York. 3. Fitter, A.H. and P.K.M. Hay. 2002. Environmental Physiology of Plants. 3rd Ed. Academic		

Press Inc. London.
4. Hammer, G.L., N. Nicholls and C. Mitchell. 2000 Application of Seasonal Climate Forecasting in Agricultural and Natural Ecosystems. Kluwer Academic Publisher, London.
5. Pearcy, R.W., J.R. Ehleringer, H.A. Mooney and P.W. Rundal. 1989. Plant Physiological Ecology: Field Methods and Instrumentation. Champman and Hall, London, New York.
6. Rowan Sewing, C., T.T. Richer, J.W. Jael. G.Y. Tsuji and Hi Ledyard. 1995 Climate
Change Agriculture: Analysis of potential international impact ASA Special Publication, USA.
7. Hay., R.K.M. and J.R. Porter. 2006. The Physiology of Crop Yield. 2nd Ed. Blackwell
publishing Ltd Oxford, UK.

Teaching Learning Strategies

19. Lectures
20. Class Discussions
21. Presentations
22. Quiz
23. Assignments

Assignments: Types and Number with Calendar

9. Written Assignments
10. Presentations
11. Problem set

Assessment

Sr. No.	Elements	Weightage	Details
16.	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.
17.	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.
18.	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.