

FACULTY OF AGRICULTURAL SCIENCES
UNIVERSITY OF THE PUNJAB, LAHORE

Programme	BS-Agribusiness	Course Code	AB-103	Credit Hours	3(2-1)
Course Title	SOIL SCIENCE AND CROP PRODUCTION				
Course Introduction					
<p>This course provides an in-depth understanding of the practical techniques used in soil and water analysis. Students will learn various methods for sampling soil and water, determining soil properties such as saturation percentage, pH, and electrical conductivity, and analyzing soil texture using the feel method. Additionally, the course covers the identification and composition of commercial fertilizers and the calculation of total soluble salts in irrigation water. Through hands-on laboratory work, students will develop practical skills essential for effective soil and water management in agricultural and environmental contexts.</p>					
Learning Outcomes					
<p>By the end of this course, students will be able to:</p> <ul style="list-style-type: none"> ○ Demonstrate proficiency in soil and water sampling methods. ○ Utilize appropriate equipment and techniques for accurate sample collection. ○ Accurately measure soil saturation percentage and understand its importance. ○ Measure and interpret soil pH and its impact on nutrient availability. ○ Determine electrical conductivity (EC) and its relevance to soil health. ○ Calculate total soluble salts (TSS) in irrigation water and understand their impact. ○ Perform soil textural analysis using the feel method and classify soil texture. ○ Identify and analyze the composition of commercial fertilizers. ○ Build a solid foundation for advanced studies in soil science, agronomy, environmental science, or related fields. ○ Gain practical experience and skills applicable to careers in agriculture, environmental consulting, and natural resource management. 					
Course Content (Theory)				Assignments/Readings	
Week 1	<p>Unit 1 1.1. Introduction; Disciplines of Soil Science 1.1.1. Overview of Soil Science 1.1.2. Branches and Disciplines within Soil Science</p>			<p>Prepare a presentation or poster summarizing the various disciplines within soil science (e.g., soil physics, soil chemistry, soil biology). Include their importance and real-world applications.</p>	
Week 2	<p>Unit 2 2.1. Soil formation and development: factors and processes 2.1.1. Factors Influencing Soil Formation 2.1.2. Soil Formation Processes</p>				

Week 3	2.1.3. Weathering and Soil Profile Development 2.1.4. Soil Horizons and Soil Profile Analysis	
Week 4	Unit 3 3.1. Soil Orders found in Pakistan and land use pattern 3.1.2. Major Soil Orders in Pakistan Characteristics of Soil Orders	Conduct a field survey to identify different soil orders in a local area and assess current land use patterns. Prepare a report that includes soil order classifications and their suitability for various land uses.
Week 5	3.1.3. Land Use Patterns in Pakistan 3.1.4. Impact of Soil Orders on Land Use	
Week 6	Unit 4 4.1. Physical and chemical properties of soil 4.1.1. Soil Texture and Structure 4.1.2. Soil Density and Porosity 4.1.3. Soil Water and Air 4.1.4. Soil Chemical Properties (pH, CEC, EC)	
Week 7	Unit 5 5.1. Soil Resources of Pakistan and factors affecting soil productivity 5.1.1. Overview of Soil Resources in Pakistan 5.1.2. Factors Affecting Soil Productivity in Pakistan	Analyze soil samples for physical properties (texture, structure) and chemical properties (pH, nutrient content). Write a detailed report on your findings and their implications for soil management.
Week 8	Unit 6 6.1. Soil organic matter and environmental factors 6.1.1. Importance of Soil Organic Matter 6.1.2. Sources and Composition of Soil Organic Matter 6.1.3. Decomposition and Humification Processes 6.1.4. Environmental Factors Affecting Soil Organic Matter	
Week 9	Unit 7 7.1. Essential plant nutrients and their sources; Soil textural classes and nutrient behavior 7.1.1. Macronutrients in Soil 7.1.2. Micronutrients in Soil 7.1.3. Soil Textural Classes	Choose a region in Pakistan and conduct a case study on its soil resources. Analyze factors affecting soil productivity and suggest strategies for improving soil management in that region.

Week 10	Unit 8 8.1. Soil Problems: Salt-affected and waterlogged soils; Bio-saline agriculture for crop production on degraded soils 8.1.1. Identification of Salt-Affected Soils 8.1.2. Management of Salt-Affected Soils 8.1.3. Identification and Management of Waterlogged Soils 8.1.4. Bio-saline Agriculture Practices	
Week 11	Unit 9 9.1. Environmental impact of agricultural, industrial and municipal wastes 9.1.1. Types of Agricultural Wastes	Develop a nutrient management plan for a specific crop or soil type. Include information on essential nutrients, their sources, and how soil texture influences nutrient availability.
Week 12	9.1.2. Impact of Industrial Wastes on Soil 9.1.3. Municipal Waste and Soil Health 9.1.4. Role of Microbes in Waste Conversion	
Week 13	Unit 10 10.1. Integrated soil fertility management for value added crop production 10.1.1. Principles of Soil Fertility Management	
Week 14	10.1.2. Fertilizer Types and Their Application 10.1.3. Organic Amendments and Soil Health	Prepare a presentation or poster summarizing the various disciplines within soil science (e.g., soil physics, soil chemistry, soil biology). Include their importance and real-world applications.
Week 15	Unit 11 11.1. Conservation of soil, water and environment 11.1.2. Soil Conservation Techniques 11.1.3. Water Conservation Practices	
Week 16	11.1.4. Environmental Conservation Strategies 11.1.5. Integrated Approaches to Soil, Water, and Environmental Conservation	
Course Content (Practical)		Assignments/Readings

Week 1	Unit 1 1.1. Soil Sampling 1.1.1. Introduction to Soil Sampling Techniques 1.1.2. Practical Soil Sampling Methods and Equipment	
Week 2	Unit 2 2.1. Water Sampling 2.1.1. Introduction to Water Sampling Techniques 2.1.2. Practical Water Sampling Methods and Equipment	Practical notebook completion
Week 3	Unit 3 3.1. Determination of Soil Saturation Percentage 3.1.1. Understanding Soil Saturation and its Importance 3.1.2. Laboratory Methods for Determining Soil Saturation Percentage	
Week 4	3.1.3. Determination of Soil Saturation Percentage- Practical Demonstration	Practical notebook completion
Week 5	Unit 4 4.1. Measurement of Soil pH and its Effect on Nutrient Availability 4.1.1. Principles of Soil pH and Nutrient Availability 4.1.2. Practical Measurement of Soil pH and Interpretation of Results	
Week 6	Unit 5 5.1. Determination of Electrical Conductivity (EC) 5.1.1. Importance of Electrical Conductivity in Soil Science	Practical notebook completion
Week 7	5.1.2. Laboratory Methods for Measuring Electrical Conductivity	
Week 8	Unit 6 6.1. Calculation of Total Soluble Salts (TSS) in Irrigation Water 6.1.1. Understanding Total Soluble Salts and their Impact on Soil	Practical notebook completion
Week 9	6.1.2. Laboratory Methods for Calculating TSS in Irrigation Water	

Week 10	Unit 7 7.1. Soil Textural Analysis: Feel Method 7.1.2. Introduction to Soil Texture and Classification	Practical completion	notebook
Week 11	7.1.3. Practical Application of the Feel Method for Soil Textural Analysis		
Week 12	Unit 8 8.1. Identification and Composition of Commercial Fertilizer 8.1.1. Types and Composition of Commercial Fertilizers	Practical completion	notebook
Week 13	8.1.2. Methods for Identifying Fertilizer Components		
Week 14	Unit 9 9.1. Integration and Practical Application 9.1.1. Integration of Soil and Water Sampling Techniques	Practical completion	notebook
Week 15	9.1.2. Practical Application of Laboratory Methods for Water Analysis		
Week 16	9.1.2. Practical Application of Laboratory Methods for Soil Analysis	Practical completion	notebook

Textbooks and Reading Material

1. Verheye, W. H. (Ed.). (2010). Soils, Plant Growth and Crop Production-Volume III. EOLSS Publications.
2. Gregory, P. J., & Nortcliff, S. (Eds.). (2013). Soil conditions and plant growth (Vol. 472). New York: Wiley-Blackwell.
3. Ahmad, N. and M. Rashid. 2003. Fertilizers and Their Use in Pakistan: An Extension Guide. Planning Commission, NFDC, Islamabad, Pakistan.
4. Ashman, M. and G. Puri. 2013. Essential Soil Science: A Clear and Concise Introduction to Soil Science. Wiley-Blackwell, Trenton, NJ, USA.
5. Brady, N.C. and R.R. Weil. 2010. The Nature and Properties of Soils. 13th Ed., Prentice-Hall, Inc., Upper Saddle River, Trenton, NJ, USA.
6. Gupta, P.K. 2006. Soil, Plant, Water and Fertilizer Analysis. Agrobios Publishers, New Delhi, India.
7. Russell, E.J. 2013. The Fertility of the Soil. 1st Ed. Cambridge University Press, London, UK.

Teaching Learning Strategies

1. Multimedia
2. White Board

3. Group discussion
4. Quiz/Assignments
5. Demonstration/Activity

Assignments: Types and Number with Calendar

1. Prepare a presentation or poster summarizing the various disciplines within soil science (e.g., soil physics, soil chemistry, soil biology). Include their importance and real-world applications.
2. Conduct a field survey to identify different soil orders in a local area and assess current land use patterns. Prepare a report that includes soil order classifications and their suitability for various land uses.
3. Analyze soil samples for physical properties (texture, structure) and chemical properties (pH, nutrient content). Write a detailed report on your findings and their implications for soil management.
4. Choose a region in Pakistan and conduct a case study on its soil resources. Analyze factors affecting soil productivity and suggest strategies for improving soil management in that region.
5. Develop a nutrient management plan for a specific crop or soil type. Include information on essential nutrients, their sources, and how soil texture influences nutrient availability.
6. Prepare a presentation or poster summarizing the various disciplines within soil science (e.g., soil physics, soil chemistry, soil biology). Include their importance and real-world applications.
7. Practical notebook completion

Assessment

Sr. No.	Elements	Weightage	Details
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.