

Programme	B.Sc. (Hons) Agriculture (Major: Soil Science)	Course Code	SS-407	Credit Hours	3(2-1)
Course Title	SOIL GENESIS AND MORPHOLOGY				
Course Introduction					
Factors and processes of soil formation, interpretative soil morphology and local pedogenic processes and introduction to USDA soil classification system are discussed. The students should be able to understand and describe morphological features and taxonomic relations of different soils.					
Learning Outcomes					
<ol style="list-style-type: none"> 1. Students will learn to describe and analyze soil profiles, understanding the characteristics and significance of various important soil series. 2. Students will gain practical experience in planning and conducting field trips, collecting soil samples, and observing soil properties and conservation measures in different environments. 3. Students will learn to identify and classify soils into different orders based on their physical and chemical properties, using hands-on techniques and laboratory analysis. 4. Students will develop skills in analyzing and interpreting data collected from soil samples and fieldwork, applying scientific methods to understand soil characteristics and environmental impacts. 5. Students will integrate their knowledge of soil profiles, series, and orders to propose and evaluate soil conservation strategies, considering both agronomic and environmental factors. 					
Course Content (Theory)					Assignments/Readings
Week 1	Unit 1 <ul style="list-style-type: none"> • Historical prospective of development of Soil Science discipline 1.1.1. Overview of the course 1.1.2. Introduction and Historical Perspective				Research the key milestones in the development of Soil Science.
Week 2	Unit 2 <p>2.1. Weathering of rocks and minerals; types of parent materials</p>				

	2.1.1. Definition and importance of weathering	
Week 3	2.1.2. Types of weathering processes 2.1.3. Relationship between weathering and soil formation	
Week 4	2.1.4. Types of parent materials 2.1.5. Classification of parent materials	
Week 5	2.1.6. Characteristics of parent materials 2.1.7. Significance in soil formation	
Week 6	Unit 3 3.1. Soil genesis and factors affecting it 3.1.1. Definition and importance of soil genesis 3.1.2. Primary factors affecting soil formation	Conduct laboratory tests to determine key physical and chemical properties of the soils.
Week 7	3.1.3. Factors Affecting Soil Genesis 3.1.4. Detailed study of climatic factors	
Week 8	3.1.5. Biological factors influencing soil formation 3.1.6. Topography and its impact on soil genesis	
Week 9	Unit 4 4.1. Pedogenic processes 4.1.1. Introduction to pedogenesis 4.1.2. Physical processes in soil formation 4.1.3. Chemical processes in soil formation	Research the factors affecting soil genesis (e.g., climate, organisms, relief, parent material, time)
Week 10	4.1.4. Biological processes in soil formation 4.1.5. Interactions between different processes	
Week 11	Unit 5 5.1. Soil morphology	

	<p>5.1.1. Definition and significance of soil morphology</p> <p>5.1.2. Physical properties of soil</p> <p>5.1.3. Soil structure and texture</p>	
Week 12	<p>Unit 6</p> <p>6.1. Description of soil profiles, including special soil features</p> <p>6.1.1. Introduction to soil profiles</p> <p>6.1.2. Methods of describing soil profiles</p>	<p>Conduct a detailed description of the soil profile, noting horizon characteristics, color, texture, structure, and any special features (e.g., mottles, concretions, horizons).</p>
Week 13	<p>6.1.3. Field techniques for profile description</p> <p>6.1.4. Description of Soil Profiles</p> <p>6.1.5. Special soil features</p>	
Week 14	<p>Unit 7</p> <p>7.1. Soil taxonomy: categories and nomenclature</p> <p>7.1.1. Importance of soil classification</p> <p>7.1.2. Application of taxonomy in soil science</p>	
Week 15	<p>Unit 8</p> <p>8.1. Soil orders in Pakistan: extent and their significance</p> <p>8.1.1. Overview of soil orders</p> <p>8.1.2. Extent and significance of different soil orders in Pakistan</p>	<p>Research the different soil orders found in Pakistan, their distribution, and their key characteristics.</p>
Week 16	<p>8.1.3. Detailed study of selected soil orders</p> <p>8.1.4. Case studies and practical examples</p>	
Course Content (Practical)		Assignments/Readings

Week 1	Unit 1 <ul style="list-style-type: none"> • Introduction to Soil Profiles and Soil Series 1.1.1. Overview of soil profiles 1.1.2. Introduction to important soil series and their characteristics	
Week 2	1.1.3. Detailed Soil Profile Description Techniques 1.1.4. Methods for describing soil profiles 1.1.5. Tools and techniques for soil sampling and analysis	
Week 3	1.1.6. Case Study: Major Soil Series 1.1.7. In-depth study of a specific soil series (e.g., Mollisols, Alfisols) 1.1.8. Fieldwork: Sampling and describing the chosen soil series	Practical completion notebook
Week 4	1.1.9. Case Study: Major Soil Series (continued) 1.1.10. Continuation of soil series study 1.1.11. Lab work: Analyzing soil samples from the field	
Week 5	1.1.12. Comparative Analysis of Soil Series 1.1.13. Comparing characteristics of different soil series	
Week 6	1.1.14. Lab work: Data analysis and interpretation	Practical completion notebook
Week 7	Unit 2 2.1. Preparation for Field Trips 2.1.1. Planning and objectives of field trips 2.1.2. Safety protocols and fieldwork methodologies	

Week 8	<p>2.1.3. Field Trip 1: Local Soil Series</p> <p>2.1.4. Field trip to a site with a notable soil series</p> <p>2.1.5. On-site soil profile description and sampling</p>	
Week 9	<p>2.1.6. Field Trip 2: Diverse Soil Orders</p> <p>2.1.7. Visit to locations with different soil orders</p> <p>2.1.8. Identification and sampling of various soil profiles</p>	
Week 10	<p>2.1.9. Field Trip 3: Erosion and Conservation Sites</p> <p>2.1.10. Field trip to areas experiencing soil erosion</p> <p>2.1.11. Observing and documenting erosion control measures</p>	Practical completion notebook
Week 11	<p>2.1.12. Post-Field Trip Analysis</p> <p>2.1.13. Lab work: Analyzing samples collected during field trips</p> <p>2.1.14. Group presentations on field trip findings</p>	
Week 12	<p>Unit 3</p> <p>3.1. Identification of Soil Orders</p> <p>3.1.1. Introduction to Soil Orders</p> <p>3.1.2. Overview of soil taxonomy and classification</p> <p>3.1.3. Key characteristics of major soil orders</p>	
Week 13	<p>3.1.4. Identification Techniques for Soil Orders</p> <p>3.1.5. Hands-on training in identifying soil orders</p> <p>3.1.6. Lab work: Analyzing soil samples for classification</p>	Practical completion notebook
Week 14	<p>3.1.7. Case Studies of Specific Soil Orders</p> <p>3.1.8. Detailed study of selected soil orders (e.g., Ultisols, Aridisols)</p>	

	3.1.9. Fieldwork: Identifying and describing soil orders in the field	
Week 15	3.1.10. Comparative Analysis of Soil Orders 3.1.11. Comparing and contrasting different soil orders 3.1.12. Lab work: Data analysis and classification exercises	Practical completion notebook
Week 16	3.1.13. Review and Integration 3.1.14. Review of soil series, field trip experiences, and soil orders 3.1.15. Integrating knowledge through group discussions and activities	Practical completion notebook
Textbooks and Reading Material		
<ol style="list-style-type: none"> 1. Buol, S.W., M.P. Walker, R.J. Southard and P.A. McDaniel. 2003. Soil Genesis and Classification. 5thEd. Iowa State University Press, Ames, IA, USA. 2. Rabenhorst, M. C. Bell, J. C. & Mc. Daniel (eds.). 1998. Quantifying Soil Hydromorphology. SSSA Special Publ. No. 54, Madison, WI, USA. 3. Schaetzl, R. and S. Anderson. 2005. Soils: Genesis and Geomorphology. Cambridge University Press, Cambridge, UK. 4. Soil Survey Staff. 2006. Keys to Soil Taxonomy. 10th Ed. USDA, Washington, DC, USA. 5. Wilding, L. P. 1994. Factors of Soil Formation. SSSA Special Publ. No. 33, Madison, WI, USA. 		
Teaching Learning Strategies		
<ul style="list-style-type: none"> • Multimedia • White Board • Group discussion • Quiz/Assignments • Demonstration/Activity 		
Assignments: Types and Number with Calendar		
<ol style="list-style-type: none"> 1. Research the key milestones in the development of Soil Science. 2. Conduct laboratory tests to determine key physical and chemical properties of the soils. 		

3. Research the factors affecting soil genesis (e.g., climate, organisms, relief, parent material, time)
4. Conduct a detailed description of the soil profile, noting horizon characteristics, color, texture, structure, and any special features (e.g., mottles, concretions, horizons).
5. Practical notebook completion

Assessment

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