

Paper Code	NAG-120	Cr. Hrs	03 (Class Credits: 02; Lab Credits: 01)
Paper Title	INTRODUCTION TO SOIL SCIENCE		
Domain	Natural Sciences		

Course Introduction	
This course introduces the concepts of soil science for agriculture students at under-graduate level. The students will be able to understand soil properties and their relationship with crop production and environment.	
Learning Outcomes	
On the completion of the course, the students will:	
<ol style="list-style-type: none"> 1. Understand the basic principles and concepts of soil science, including soil formation, classification, and physical, chemical, and biological properties 2. Develop skills in analyzing soil texture, structure, water retention, nutrient content, and organic matter through laboratory and field experiments. 3. Recognize the importance of soils in ecosystems and their role in supporting plant growth, water filtration, and carbon sequestration. 4. Apply soil science knowledge to solve real-world problems related to agriculture, environmental management, and land use planning 	
Course Content (Theory)	Assignments/Readings
Week 1 Unit 1 1.1. Definition of earth, geology and soil science; Disciplines of soil science 1.1.1. Introduction to Soil Science, Definition of earth, geology and soil science 1.1.2. Branches/Disciplines of Soil Science	Visit library or online sources for recommended books
Week 2 Unit 2 2.1. Soil forming rocks and minerals: types and their formation 2.1.1 Soil forming rocks introduction 2.1.2. Types of soil forming rocks	

Week 3	2.1.3. Soil forming minerals, structural concepts 2.1.4. Layer silicate clay minerals	Model preparation of octahedral and tetrahedral sheets
Week 4	2.1.5. Soluble and sesquioxide minerals Unit 3 3.1. Weathering of rocks and minerals: parent materials 3.1.1. Physical weathering	
Week 5	3.1.2. Chemical weathering	
	Unit 4 4.1. Soil formation: processes and factors affecting 4.1.1. Soil formation factors	
Week 6	4.1.2. Soil formation processes	
	Unit 5 5.1. Soil profile and its description 5.1.1. Soil profile master soil horizons	Preparation of soil profile models
Week 7	5.1.2. Diagnostic soil horizons	
	Unit 6 6.1. Physical, chemical and biological properties of soil 6.1.1. Physical properties of soil	
Week 8	6.1.2. Chemical properties of soil	
	6.1.3. Biological properties of soil	
Week 9	Unit 7 7.1. Introduction to soil classification and land use capability classes 7.1.1. Soil classification importance and system 7.1.2. Classification categories	Visit of Soil Survey of Punjab for Monoliths
Week 10	7.1.3. Brief introduction to soil series of Pakistan	
	7.1.4. Land capability classification	
Week 11	Unit 8	

	8.1. Soil organic matter: sources, composition and significance 8.1.1. Soil organic matter introduction and significance 8.1.2. Soil organic matter sources and composition	
Week 12	Unit 9 9.1. Elements essential for plant growth 9.1.1. Primary and secondary macro nutrients 9.1.2. Micronutrients	
Week 13	Unit 10 10.1. Organic and inorganic fertilizers 10.1.1. Introduction to organic and inorganic fertilizers 10.1.2. Difference between organic and inorganic fertilizers	Collection of inorganic fertilizers and their display on charts etc.
Week 14	Unit 11 11.1. Salt-affected and waterlogged soils 11.1.1. Saline, sodic and saline sodic soils 11.1.2. Water logged soils	
Week 15	Unit 12 12.1. Soil and water conservation 12.1.1. Soil conservation introduction and methods 12.1.2. Water conservation introduction and methods	
Week 16	Unit 13 13.1. Soil and water pollution 13.1.1. Soil pollution sources and reclamation 13.1.2. Water pollution sources and reclamation	Presentation on soil and water pollution case studies
Course Content (Practical)		Assignments/Readings
Week 1	Unit 1 1.1. Soil sampling and handling 1.1.1. Soil sampling introduction, importance and illustration	

Week 2	1.1.3. Soil Sampling Demonstration and hand-on training	Practical notebook completion
Week 3	Unit 2 2.1. Preparation of saturated soil paste 2.1.1. Soil sample preparation for soil paste	
Week 4	2.1.2. Soil paste preparation and characteristics	Practical notebook completion
Week 5	Unit 3 3.1. Determination of soil water contents 3.1.1. Determination of soil water contents; introduction to the techniques	
Week 6	3.1.2. Gravimetric method	Practical notebook completion
Week 7	Unit 4 4.1. Analysis of irrigation water, report writing and interpretation 4.1.1. Irrigation water analysis demonstration	
Week 8	4.1.2. Irrigation water analysis hand-on training	Practical notebook completion
Week 9	Unit 5 5.1. Determination of soil texture and bulk density 5.1.1. Soil texture determination by hydrometer	
Week 10	5.1.2. Soil bulk density determination by core method	Practical notebook completion
Week 11	Unit 6 6.1. Fertilizers: Identification, composition and calculation of nutrient percentage 6.1.1. Fertilizer identification and composition	
Week 12	6.1.2. Fertilizer calculation from nutrient recommendation	Practical notebook completion
Week 13	Unit 7 7.1. Determination of soil pH and EC 7.1.1. Determination of pHs	

Week 14	7.1.2. Determination of E _c	Practical completion	notebook
Week 15	Unit 8s 8.1. Determination of soil organic matter 8.1.1. Solution and sample preparation		
Week 16	8..1.2. Soil organic matter procedure	Practical completion	notebook

Textbooks and Reading Material

- 1.. Bashir, E. and R. Bantel. 2001. Soil Science. National Book Foundation, Islamabad, Pakistan.
2. Brady, N.C. and R.R. Weil. 2007. The Nature and Properties of Soils. 14th Ed. Pearson Education, Upper Saddle River, NJ, USA.
3. Brady, N.C. and R.R. Weil. 2009. Elements of the Nature and Properties of Soils. 3rd Ed. Pearson Education, Upper Saddle River, NJ, USA.
4. Das, D.K. 2011. Introductory Soil Science. 3rd ed. Kalyani Publ. New Delhi-110002, India.
5. Hillel, D. 2008. Soil in the Environment: Crucible of Terrestrial Life. Elsevier Inc., Burlington, MA, USA.
6. Singer, M.J. and D.N. Munns. 2002. Soils- An Introduction. 5th Ed. Prentice-Hall, Inc., Upper Saddle River, NJ, USA.

Teaching Learning Strategies

1. Multimedia
2. White Board
3. Group discussion
4. Quiz/Assignments
5. Demonstration/Activity

Assignments: Types and Number with Calendar

1. Visit library or online sources for recommended books
2. Model preparation of octahedral and tetrahedral sheets
3. Preparation of soil profile models
4. Visit of Soil Survey of Punjab for Monoliths
5. Collection of inorganic fertilizers and their display on charts etc.
6. Presentation on soil and water pollution case studies
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.