

Course Title: Soil Conservation and Management				
Course code: UES 205	No. of credits: 3	L-T-P: 35-10-0	Learning hours: 45	
Pre-requisite course code and title (if any): None				
Department: Natural and Applied Sciences				
Course coordinator:		Course instructor:		
Contact details:				
Course type: Major		Course offered in: Semester 3		
Course Description The purpose of this course is to provide students with a comprehensive understanding of soil properties and characteristics. By the end of the course, students will be able to identify different types of soil and understand the causes of erosion in various scenarios. They will learn about erosion control measures and gain an introductory understanding of soil pollution and management of degraded soil.				
Course objectives The course aims to build the following basic understanding among students: <ul style="list-style-type: none"> • To understand the concept of soil formation, soil profile and its importance as a natural resource. • To understand the factors responsible for soil erosion, degraded land systems and their impact on the environment. • To understand the soil erosion models, application of erosion control measures and management 				
Course content				
Module	Topic	L	T	P
1	Soil Formation, Physical and Chemical Properties			
	This module introduces concepts related to soil formation, profile, and distribution: Soil texture, structure, soil classifications, colloidal properties of soil, buffering capacity of soil, mobility of nutrient and trace elements during soil genesis; paedogenic evolution and soil nutrient cycle. Fundamental biogeochemical processes and role of soil as carbon source and sink.	6	2	
2	Land use change and agroecology			
	This module focuses on agro-ecological zones of India including crop planning and study of soil maps. It covers following topics: Role of land capability and suitability classification and factors affecting soil health. Impact of land use changes due to changing cropping patterns and on the onset of erosion in different topography.	6	2	
3	Soil Erosion			
	This module describes the mechanism and various factors that affect the erosion of soil. Following topics are covered under this module: Soil resistance and resilience properties; soil types, vegetation, water, wind, topography, soil moisture loss and nutrient depletion; significance of land degradation due to erosion and sediment losses; reflection on forest ecosystems. Assessment of soil erosion, modelling using Universal Soil Loss Equation (USLE) and its modifications, and discussion using case study approach	8	4	
4	Soil Conservation Practices			
	This module focuses on the control and management measures adopted for soil conservation. It covers the following topics: Soil conservation practices adopted for rill and gully erosion and wind erosion,	8	2	

	including vegetative and mechanical measures, control of accelerated erosion, traditional and modern practices of soil conservation.			
5	Land degradation management			
	This module discusses causes of land degradation, management, and its remediation: Wasteland reclamation, application of decision support systems including simulation of physical processes using the soil and water assessment tool (SWAT). Case study discussion	7		
		35	10	
Evaluation criteria				
<ul style="list-style-type: none"> • Minor Test 1: Written test [at the end of teaching of modules 1 and 2] -- 20% • Minor Test 2: Written test [at the end of teaching of module 3] -- 20% • Major Test: Written test [at the end of the semester, full syllabus] -- 40% • Assignment/Field trip: 20% 				
Learning outcomes				
Upon completion of the course, the students will be able to:				
<ul style="list-style-type: none"> • understand different kinds of soil, impact of cropping pattern on land capability and types of erosion. [Modules 1, 2 and 3; Minor Tests 1 and 2] • understand and assess potential solutions related to soil erosion and soil pollution. [Module 4 and 5; Major Test] 				
Pedagogical approach				
<ul style="list-style-type: none"> • The course will be delivered through lectures and a case study approach shall be used for analyses of challenges for soil conservation and management. • The course will focus on classroom discussions and assignments/field trip assessment which help them to make this course more robust and fruitful. 				
Reading resources				
<ul style="list-style-type: none"> • Brady, N. C., Weil, R. R., & Weil, R. R. (2008). <i>The nature and properties of soils</i> (Vol. 13, pp. 662-710). Upper Saddle River, NJ: Prentice Hall. • Singh, J. S., Singh, S. P., & Gupta, S. R. (2014). <i>Ecology, environmental science & conservation</i>. S. Chand Publishing. • Foth, H. D. (1978). Fundamentals of soil science. <i>Soil Science</i>, 125(4), 272. • Fundamentals of Soil Science. (2012). <i>Indian Society of Soil Science</i>. • Tan, K. H. (2009). <i>Environmental Soil Science</i>. United Kingdom: CRC Press. • Blanco, H., & Lal, R. (2023). <i>Soil Conservation and Management</i>. Springer Nature Switzerland. 				
Student Responsibilities				
The students are required to come prepared with readings that are suggested during the class and ensure timely submission of assignments. They are also expected to participate and further strengthen their understanding of concepts through classroom discussions field trip exposure.				

Course Designed by:

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- Dr Chandrashekhara Azad Vishwakarma, Assistant Professor, Department of Natural and Applied Sciences, TERI School of Advanced Studies, New Delhi

Course Reviewers:

The course is reviewed by following reviewers:

- Dr Anshumali, Professor, Indian Institute of Technology (ISM), Dhanbad
- Dr Sudip Mitra, Professor, School of Agro & Rural Technology, Indian Institute of Technology Guwahati (IITG), Guwahati