

## SCIA S8002: Soil and Water Management

Module Details	
Module Code:	SCIA S8002
Full Title:	Soil and Water Management <b>APPROVED</b>
Valid From::	Semester 1 - 2019/20 ( June 2019 )
Language of Instruction:	
Duration:	1 Semester
Credits::	7.5
Module Owner::	Joseph Lynch
Departments:	Unknown
Module Description:	In this module, students will acquire a knowledge and understanding of the factors that affect various soil types under different management regimes and the associated effects on surface and groundwater. This module offers a combination of interactive practical classes, field trips and lectures that will cater for a wide range of cognitive abilities on topics that are highly relevant today, in particular due to the on-going implementation of the Water Framework Directive (2000/60/EC), Water Pollution Act, Nitrates Directive (91/676/EEC), Waste Directive (75/442/EEC) and associated Landfill Directive (99/31/EC) and will be relevant to the future soil focused legislation and directives.

Module Learning Outcome	
On successful completion of this module the learner will be able to:	
#	Module Learning Outcome Description
MLO1	Evaluate the principles of soil science, including soil genesis, classification and land use and relate aspects of soil biology and biochemistry to soil structure and fertility.
MLO2	Evaluate the fundamental factors that affect soil hydrology, nutrient storage and the movement of nutrients through a soil profile with a strong emphasis on a catchment management approach.
MLO3	Critically synthesise various catchment pressures that lead to ground and surface water contamination and formulate innovative solutions in terms of remediation and pollution control.
Pre-requisite learning	
<b>Module Recommendations</b> <i>This is prior learning (or a practical skill) that is strongly recommended before enrolment in this module. You may enrol in this module if you have not acquired the recommended learning but you will have considerable difficulty in passing (i.e. achieving the learning outcomes of) the module. While the prior learning is expressed as named DkIT module(s) it also allows for learning (in another module or modules) which is equivalent to the learning specified in the named module(s).</i>	
No recommendations listed	

Module Indicative Content
<b>Lectures</b> This course builds on previous material given in plant science and aquatic sciences. It will apply the principles of soil science to the management of soil and water resources, with a focus on pollution prevention through source protection which is of utmost importance in light of the current stringent legislation implemented both by the European Union and at national level. Such legislation includes the Water Framework Directive, the Nitrates Directive, the Groundwater Directive, the Waste Management Act and the Landfill Directive and the future soil focused legislation and directives, all of which form an integral part of this module.
<b>Earth's systems and integrated catchment management</b> A study on the major cycling systems in soil and water resources. Earth system components including the atmosphere, hydrosphere, biosphere and lithosphere. Major energy, moisture, carbon, sulphur cycling systems, residence times of soil, surface and ground waters. An Integrated Catchment Management approach to achieve the Water Framework Directive objectives both Nationally and Internationally.
<b>The variability and value of soil resources</b> Soil properties and its management; soil as a filtering/buffering system in aquifer protection. Soil as a vital hydrologic routing system; Soil-water interactions in the management of river basins; physical, chemical and biological characteristics of surface and ground waters. Soil Microbiome; The role of micro-organisms in agricultural production and the interactions of these organisms with soil and water quality.
<b>Water Resource Management</b> Context and principles of water management from catchment to consumer; Sources of drinking water in Ireland; issues including contamination with pathogens, nitrate, THMs. Overview of constructed wetlands, bioswales, turloughs and other groundwater dependent ecosystems. Potential impacts of climate change and other large-scale drivers on water and soil resources.
<b>Pollution prevention and control</b> Soil quality and runoff risk assessment from various sources; Surface and groundwater contamination and protection including pollution from septic tanks, nutrient enrichment from agricultural practices and other industries. The role of animal manures and other organic wastes on the BOD and nutrient loads within aquatic systems; safe landspreading of organic wastes; agriculture and soil erosion. Statutory and voluntary regulations on waste, soil and water management and protection.
<b>Practicals</b> Physical and chemical properties of soils; Analysis of soil for bulk density, porosity, organic content, particle size, pH, available phosphorus, and carbon and nitrogen contents. Soil-water interactions; Analysis of groundwater and soil, prior to and after a contaminant plume such as an on-site wastewater treatment system. Analysis of a range of water contaminants, such as wastes from the wastewater treatment systems, the agri-food industry, the mining industry and other industrial pollutants.
<b>Field visits</b> 1. A field excursion to examine different soil types, their management, associated land use and profiles. Soil samples will be taken and analysed in subsequent laboratory sessions. 2. A field excursion on catchment management; This will involve visiting various impacted freshwater sites where monitoring stations are in place. A list of possible pollution risks will be assembled and these data will be compiled in a report format.

Module Assessment	
Assessment Breakdown	%
Course Work	10.00%
Practical	30.00%
Final Examination	60.00%
Module Special Regulation	

## Assessments

Full Time On Campus			
Course Work			
Assessment Type	Continuous Assessment	% of Total Mark	10
Marks Out Of	0	Pass Mark	0
Timing	n/a	Learning Outcome	2,3
Duration in minutes	0		
Assessment Description	Desk study review of relevant literature in relation to soil and water intereactions and catchment pressures.		
No Project			
Practical			
Assessment Type	Practical/Skills Evaluation	% of Total Mark	30
Marks Out Of	0	Pass Mark	0
Timing	Every Week	Learning Outcome	2,3
Duration in minutes	0		
Assessment Description	Range of soil / water practicals in the area of the physical and chemical properties of soils; soil-water interactions; ground and surface water analysis and analysis of a range of water contaminants.		
Final Examination			
Assessment Type	Formal Exam	% of Total Mark	60
Marks Out Of	0	Pass Mark	0
Timing	End-of-Semester	Learning Outcome	1,2,3
Duration in minutes	0		
Assessment Description	End-of-Semester Final Examination		
Reassessment Requirement			
A repeat examination			
Reassessment of this module will consist of a repeat examination. It is possible that there will also be a requirement to be reassessed in a coursework element.			

## Module Workload

### Workload: Full Time On Campus

<i>Workload Type</i>	<i>Contact Type</i>	<i>Workload Description</i>	<i>Frequency</i>	<i>Average Weekly Learner Workload</i>	<i>Hours</i>
Practical	Contact	No Description	Every Week	3.00	3
Lecture	Contact	No Description	Every Week	3.00	3
Independent Study	Non Contact	No Description	Every Week	5.00	5
Directed Reading	Non Contact	No Description	Every Week	1.00	1
				Total Weekly Learner Workload	12.00
				Total Weekly Contact Hours	6.00

**This module has no Part Time On Campus workload.**

## Module Resources

### Recommended Book Resources

Abbaspour et al.. (2018), Integrated Soil and Water Management: Selected Papers from 2016 International SWAT Conference.  
Jakeman et al.. (2016), Integrated Groundwater Management Concepts, Approaches and Challenges, [ISBN:9783319235752].

### Supplementary Book Resources

Matsui, T., Hanaki, S., Takizawa, S. and Satoh, H.. Advances in water and wastewater treatment technology., Elsevier, 2001.  
Environmental Protection Agency. Landspreading of organic waste : guidance on groundwater vulnerability assessment of land., EPA, 2004.  
Nash, H. and McCall, G.J.H.. Groundwater quality., Chapman and Hall, 1995.  
Daly, D. Thorn, R. and Henry, H.. Septic tank systems and groundwater in Ireland., Geological Survey of Ireland, 1993.  
Wilson, N.. Soil water and ground water sampling., Lewis Publishers, 1995.  
Teagasc, curriculum development unit. Our soil and its management., Teagasc , 2002..  
Thibodeaux, L. J.. Environmental chemodynamics: movement of chemicals in air, water, and soil., Wiley, 1996..  
EU. Water Framework Directive 2000/60/EC establishing a framework for the community action in the field of water policy, European Commission, 22nd Dec. 2000.  
EU. Council Directive 1999/31/EC on the landfill of waste., European Commission 16th July 1999.  
EU. Council Directive 2006/118/EC on the protection of groundwater against pollution and deterioration., European Commission 27th Dec. 2006.  
EU. Waste Management Act, S.I. No. 10 of 1996, No. 36 of 2001.  
EU. Water Pollution Act, 1977.  
EU. The Bathing Water Directive (76/160/EEC), European Commission 8th December 1975.  
EU. The Drinking Water Directive (80/778/EEC) as amended by Directive (98/83/EC), European Commission 5th December 1998.  
EU. The Sewage Sludge Directive (86/278/EEC), European Commission 12th June 1986.  
EU. The Urban Waste-water Treatment Directive (91/271/EEC), European Commission 21st May 1991.  
EU. The Habitats Directive (92/43/EEC), European Commission 21st May 1992.

*This module does not have any article/paper resources*

*This module does not have any other resources*