

Module Title:	Environmental Management and Modelling
Language of Instruction:	English
Credits:	10
NFQ Level:	8
Module Delivered In	1 programme(s)
Teaching & Learning Strategies:	This module will be taught in four lectures, each of one hour duration per week, over 30 weeks. Tutorial sessions and computer use of Excel and Maple will be integrated into this delivery schedule.
Module Aim:	The aim of this module is to give final year students an overview of legislation, regulation and management of environment-related activities. To introduce the students to the area of mathematical modelling. To study a number of models relevant to environmental studies.

Learning Outcomes	
<i>On successful completion of this module the learner should be able to:</i>	
LO1	Evaluate and discuss current issues in the natural environment in Ireland and globally.
LO2	Survey regulatory bodies and legislation on the environment.
LO3	Identify the necessary elements of an industrial or waste licence to ensure compliance.
LO4	Interpret technical reports and guidance documents.
LO5	Integrate environmental aspects of industrial activity into the overall management system.
LO6	Identify environmental situations that can be modelled mathematically.
LO7	Identify, analyse and solve some environmental problems
LO8	Model some situations using Microsoft Excel and the computer algebra system (CAS) Maple
LO9	Communicate in an effective and professional manner, both in written and oral formats.

Pre-requisite learning
Module Recommendations <i>This is prior learning (or a practical skill) that is recommended before enrolment in this module.</i>
No recommendations listed
Incompatible Modules <i>These are modules which have learning outcomes that are too similar to the learning outcomes of this module.</i>
No incompatible modules listed
Co-requisite Modules
No Co-requisite modules listed
Requirements <i>This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed.</i>
No requirements listed

Module Content & Assessment

Indicative Content

The natural environment

Ecosystems, Ecosystem services/functions, Natural capital, depleting natural resources, Earth equivalence, Environmental degradation, Sustainable development, Circular economy.

Water Quality

Surface water/ground water/aquifers, Water Framework Directive, Drinking water : (public/group/private schemes), production processes, legislation and standards. Industrial and urban waste water: (types, treatment, discharge licences, legislation, river and lake assimilative capacity). Responsibilities of EPA and local authorities.

Pollution

Classes of pollution (chemical: organic -PAHs/PCBs/Dioxins/VOCs/ Biocides/Pharmaceuticals, Inorganic - nutrients (N-P)/heavy metals , biological - bacteria/viruses/protozoa/invasive species, Physical -thermal/radiation/light, Rio de Janeiro Earth Summit 1992. Global warming.

Environmental Liability Directive

Provisions, Polluter Pays and Precautionary principles, the pollution linkage concept.

Industrial Emissions Directive

Provisions, IPPC licences, IPPC application process/information. Best Available Technology (BAT), Bref documents, Emission Limit Values (ELV), Environmental Quality Standards (EQS). Annual Emissions Report (AER), IPPC case studies (food and pharmaceutical industry)

Environmental Impact Assessment

Methodology. EIA Regulations. Case studies. Sustainable development. Public consultation.

Waste Management

Waste production statistics, the waste management hierarchy (prevent, reduce, reuse and recycle). Environmental impacts of landfills, the landfill directive, environmental impacts of incineration (technology/dioxins/GHG), reporting and compliance. Biodegradable waste treatment (composting, anaerobic digestion) Other waste legislation (WEE, Vol.).

Energy

Fossil fuels: Environmental impacts (extraction-processing), effects of combustion - atmosphere, GHG, particulate matter, Carbon footprints, Renewable energy - Targets, environmental impacts of solar, hydroelectric, wind and biofuels) Kyoto, Paris 2015. Energy audits.

Management Systems in Industry

EMS: Complements and implementation, Accreditation schemes: ISO14000:2015, Environmental management and audit scheme (EMAS). Legal and other requirements. Evaluation of compliance. Auditing. Ecolabelling.

Modelling

The modelling concept. Formulation and test. Assumptions. Modelling as an iterative process.

Deterministic models

Formulation of Ordinary Differential Equations for some situations in the Environmental area. Radio-active decay, compartment models of mixing, pollution spread, Solutions to ODEs using Maple V (Computer Algebra System).

Probabilistic models.

Simple, parabolic and multiple regression. Prediction and Assessment of Statistical models. Problem solving using Excel and R Computer language.

Assessment Breakdown

	%
Continuous Assessment	30.00%
End of Module Formal Examination	70.00%

Special Regulation

Students must achieve a minimum grade (35%) in both the practical/CA and final examination.

Continuous Assessment

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Examination	Written Examination	1,2,3,5,9	10.00	n/a
Presentation	Assignment 1	4,9	5.00	Sem 1 End
Written Report	Assignment 2	2,4,5,9	5.00	Sem 2 End
Examination	n/a	6,7,8,9	5.00	n/a
Examination	n/a	6,7,8	5.00	n/a

No Project

No Practical

End of Module Formal Examination				
<i>Assessment Type</i>	<i>Assessment Description</i>	<i>Outcome addressed</i>	<i>% of total</i>	<i>Assessment Date</i>
Formal Exam	Final written exam	1,2,3,4,5,6,7,8	70.00	End-of-Semester

SETU Carlow Campus reserves the right to alter the nature and timings of assessment

Module Workload

Workload: Full Time		
<i>Workload Type</i>	<i>Frequency</i>	<i>Average Weekly Learner Workload</i>
Lecture	30 Weeks per Stage	4.00
Total Hours		120.00

Module Delivered In

Programme Code	Programme	Semester	Delivery
CW_SASES_B	Bachelor of Science (Honours) in Environmental Science	4	Mandatory