

## Module Template for New and Revised Modules<sup>1</sup>

<b>Module Code</b>	CEU33A08
<b>Module Name</b>	3A8 Geology for Engineers
<b>ECTS Weighting<sup>2</sup></b>	5 ECTS
<b>Semester taught</b>	Semester 2
<b>Module Coordinator/s</b>	David O'Connell/ Sean Mc Clenaghan
<b><u>Module Learning Outcomes</u> with reference to the <u>Graduate Attributes</u> and how they are developed in discipline</b>	<p>On successful completion of this module, students should be able to:</p> <p>LO1. Recognise standard terminology, including basic classification systems for geological materials, and terminology applied to important plate tectonic, surface and climatic processes.</p> <p>LO2. Describe the formation and internal structure of planet Earth and describe plate tectonic theory.</p> <p>LO3. Explain how natural hazards such as earthquakes, tsunamis and volcanoes relate to plate tectonic processes, and explain difficulties in predicting natural disasters.</p> <p>LO4. Explain the generation of hydrocarbons within sedimentary basins, use simple exploration techniques, and compare technologies for hydrocarbon exploration and extraction.</p> <p>LO5. Describe the roles of glacial, fluvial, hill slope, coastal and submarine processes in forming the natural environment, and appraise whether engineering solutions are appropriate in managing surface processes.</p> <p>LO6. Explain the major controls on global climate, describe evidence for natural climate change in the geological record, and assess the engineer's role in managing anthropogenic climate change.</p>

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<sup>1</sup> [An Introduction to Module Design](#) from AISHE provides a great deal of information on designing and re-designing modules.

<sup>2</sup> [TEP Glossary](#)

LO7. Explain the sources and distribution of radon in Ireland, describe engineering solutions to alleviate high indoor radon levels.

LO8. Explain the occurrence of groundwater, apply equations of groundwater flow to simple engineering problems, and give examples of the application of hydrogeology to environmental engineering.

**Graduate Attributes: levels of attainment**

To act responsibly - Enhanced

To think independently - Introduced

To develop continuously - Attained

To communicate effectively - Introduced

**Module Content**

Please provide a brief overview of the module of no more than 350 words written so that someone outside of your discipline will understand it.

Geology for Engineers provides an introduction to several areas of Earth Sciences that impact the engineer, including geological materials, earth surface processes, hydrocarbon exploration and production, natural disasters and climate change. Engineers often need to work with geologists. This module will enable the student to operate effectively in such a team by explaining terminology and concepts in the fields stated above. The module also provides the engineer with a natural, regional-scale context in which to place site-specific questions. Financial and time pressures on the engineer necessarily force him/her to concentrate on the site-specific aspects of geology, such as the mechanical properties of the ground and the local risk of natural hazards like flooding, subsidence or earthquakes. This module provides examples of how such local-scale phenomena can be better predicted using knowledge of regional-scale geological processes. The student will learn the kind of questions that geologists can answer, allowing him/her to better assess how much time/money to spend on geological investigations for any given project.

- **Planet Earth [Dr. Sean McClenaghan]**
  - Earth's internal structure: core, mantle, crust
  - Plate tectonics – Deformation of the plates: faulting and folding
  - Earthquake seismology
  - Describing and classifying rocks and minerals
  - Measuring geological time
- **Volcanic Processes [Dr. Sean McClenaghan]**
  - Controls on physical properties of magma

- Principles of multi-phase geophysical flows
- Eruption dynamics
- Important mineral deposits produced by volcanic processes
- **Sedimentary basins and Hydrocarbons [Dr. Sean McClenaghan]**
  - Imaging sedimentary basins using reflection seismology
  - Types of sedimentary basin
  - Generation of hydrocarbons within sedimentary basins
  - Hydrocarbon exploration techniques
- **Geology of Ireland [Dr. Sean McClenaghan]**
  - Tectonic overview
  - Basement structure
  - Examples of igneous rock
  - Main occurrences of metamorphic rock
  - Clastic and carbonate sediments
- **Earth surface processes [Dr. Sean McClenaghan]**
  - Glacial landforms and sediments
  - Weathering, slope and river processes
  - Coastal processes
  - Role of society in controlling surface processes
- **Natural hazards [Dr. Sean McClenaghan]**
  - Earthquakes
  - Tsunamis
  - Volcanic hazards
  - Radon and other radiological hazards
- **Climate [Dr. Sean McClenaghan]**
  - Role of atmosphere, oceans and the solid Earth in controlling climate
  - The Greenhouse Effect
  - Milankovitch cycles
  - Role of society in moderating climate change
- **Geology of Mineral Deposits [Dr. Sean McClenaghan]**
  - Natural Resources and their extraction
  - Mine Engineering
  - Acid Rock Generation
- **Hydrogeology [Dr. David O'Connell]**
  - Hydrogeological terms
  - Occurrence of groundwater
  - Groundwater head and groundwater flow
  - Application of hydrogeology to landfill site selection and design

Groundwater protection

**Teaching and Learning Methods** e.g., lectures, seminars, online learning via VLE, field trips, laboratories, practice-based etc...

<b>Assessment Details<sup>3</sup></b> <b>Please include the following:</b> <ul style="list-style-type: none"> <li>• <b>Assessment Component</b></li> <li>• <b>Assessment description</b></li> <li>• <b>Learning Outcome(s) addressed</b></li> <li>• <b>% of total</b></li> <li>• <b>Assessment due date</b></li> </ul>	Assessment Component	Assessment Description	LO Addressed	% of total	Week due
	Examination	2 hour written examination	LO1-8	100%	

**Reassessment Requirements**

<b>Contact Hours and Indicative Student Workload<sup>3</sup></b>	<b>Contact hours:</b> approx 30 hours
	<b>Independent Study (preparation for course and review of materials):</b> approx 40 hours; Researching journals; reading text books recommended in module booklist; reviewing lecture material and class notes
	<b>Independent Study (preparation for assessment, incl. completion of assessment):</b> ) : approx. 30 hours; literature review, review of lectures and tutorial questions.

**Recommended Reading List**

*Understanding Earth* (second edition), Press & Siever  
*The Solid Earth* (second edition), Fowler  
*Geology Basics for Engineers*, Parriaux  
*Introducing Groundwater* (second edition), Price  
*Water wells and boreholes*, Misstear, Banks & Clark

<sup>3</sup> [TEP Guidelines on Workload and Assessment](#)

<b>Module Pre-requisite</b>	No Pre- or Co requisite
<b>Module Co-requisite</b>	No Pre- or Co requisite
<b>Module Website</b>	
<b>Are other Schools/Departments involved in the delivery of this module? If yes, please provide details.</b>	Geology/Natural Sciences
<b>Module Approval Date</b>	
<b>Approved by</b>	
<b>Academic Start Year</b>	September 2022
<b>Academic Year of Date</b>	2022-23