ENGR H5502: Geotechnical Engineering II

Module Title:	Geotechnical Engineering II
Language of Instruction:	English

Credits:	10

NFQ Level:	8

Module Delivered In	2 programme(s)

Teaching & Learning Strategies:	Lectures Demonstrations Project work Practicals Presentation Private study

Module Aim:	(a) To understand the physical and mechanical properties of soils; (b) To develop a general appreciation of environmental issues and their vulnerability to engineering development projects; (c) To develop a general appreciation of sustainable construction principles as it relates to Civil & Geotechnical Engineering; (d) To be able to determine parameters from soil testing to characterize soil properties, (d) soil strength and soil deformations, (e) to be able to apply the principles of soil mechanics to analyze and design simple geotechnical systems; (f) To increase the understanding of the effects of construction on groundwater and the effects of groundwater on construction; (g) To develop the skills required to evaluate factual Geotechnical Engineering reports; (h) To develop the skills required to assist in writing an interpretative Geotechnical engineering reports; (i) To recognise when simple geotechnical analysis and design are insufficient to safely or cost effectively evaluate/design a project; (j) To equip the student to operate as a Civil Engineer with a good understanding of Geotechnical Engineering; (k) To equip the student with the skills and information necessary to undertake post-graduated study

Learning Outcomes	
On successful completion of this module the learner should be able to:	
LO1	Assess the information contained in factual geotechnical reports including laboratory test results
LO2	Prepare well presented interpretative geotechnical calculations and carry out simple geotechnical design and analysis
LO3	Assess ground conditions to evaluate SI requirements for field work, sampling and testing
LO4	Understand the value of desk study information and its role in preparation of factual and interpretative reports

Pre-requisite learning		
Module Recommendations *This is prior learning (or a practical skill) that is recommended before enrolment in this module.*		
6566	ENGR H3503	Geotechnical Engineering I
6801	ENGR H3504	Earthworks Analysis
Incompatible Modules *These are modules which have learning outcomes that are too similar to the learning outcomes of this module.*		
No incompatible modules listed		
Co-requisite Modules		
No Co-requisite modules listed		
Requirements *This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed.*		
Engineering Geology		

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Module Content & Assessment

Indicative Content
Site Investigation (a) Contents of GI report, (b) Determination of appropriate site investigation techniques, (c) Sample selection,in-situ testing,(d) laboratory testing on a site specific basis,
Groundwaterflow through soils Flow through soils; (a) Permeability, (b) Head and head tests, (c) Flow nets, (d) Hydraulic gradient, (e) Uplift, seepage and piping forces (f) Filter design and geotextiles
Stresses, Strains and Elastic Deformation of Soils (a) Stress-strain, (b) Stresses from surface loads, (c) Settlements,
One-dimensional consolidation settlement of fine-grained soils Primary and secondary consolidation, (a) Drainage path, (b) Rate of consolidation, (c) Over-consolidation ratio (d) Field vs. laboratory consolidation (e) Surcharging (f) Use of vertical drains, (f) Derivation, use and understanding of Continuity and Effective Stress equations
Shear strength of Soils (a) Undrained and drained shear strength, (b) Laboratory determination of shear strength using shear box, Triaxial (drained and undrained), (b) In-situ determination, (c) Introduction to Piezocone and pressure meter
Bearing capacity of soils and settlement of shallow foundations (a) Collapse and failure loads - Ultimate and service loads, (b) Settlement, (c) In-situ testing (d) Design to EC 7, (e) Comparison of European vs other International Design Principles
Pile Foundations (a) Piling - types, (b) Effects of installation, (c) Design parameters and pile design, (d) Pile settlement analysis, ULS vs SLS - Load capacity, (e) Testing and Specification; (f) Allowable settlement; (g) Negative skin friction, (H) Single piles vs. pile groups, (i) EC 7 vs other International Codes
Stability of earth retaining structures (a) Types, (b) Lateral earth pressure theory (b) Analyses and design, (c) Introduction to computer based analysis
Slope stability (a) Types of slopes, (b) Types of failures, (c) Methods of analysis; (d) Computer analysis, (e) Probabilistic vs deterministic analysis (f) Slope remediation and stability
Soil stabilization (a) Lime,cement, pfa, stabilization on mineral soils and peat - chemical reactions within soil mass

Assessment Breakdown	%
Continuous Assessment	10.00%
Project	20.00%
Practical	10.00%
End of Module Formal Examination	60.00%

Continuous Assessment

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Examination	Term 1 Exam	1,3	10.00	n/a

Project

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Project	Project	1,2,3,4	20.00	Sem 1 End

Practical

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Practical/Skills Evaluation	Practical	1,2,3,4	10.00	Sem 1 End

End of Module Formal Examination

Assessment Type	*Assessment Description*	*Outcome addressed*	*% of total*	*Assessment Date*
Formal Exam	Exam	1,2,3,4	60.00	End-of-Semester

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

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Module Workload

Workload: Full Time		
Workload Type	*Frequency*	*Average Weekly Learner Workload*
Lecture	30 Weeks per Stage	3.00
Estimated Learner Hours	30 Weeks per Stage	3.00
	Total Hours	180.00

Module Delivered In

Programme Code	Programme	Semester	Delivery
CW_CMHCE_B	Bachelor of Engineering (Honours) in Civil Engineering - Ab Initio	7	Mandatory
CW_CMCEN_B	Bachelor of Engineering (Honours) in Civil Engineering - Add On	3	Mandatory