

Module Title:	Geotechnical Engineering IV
Language of Instruction:	English
Credits:	5
NFQ Level:	8
Module Delivered In	1 programme(s)
Teaching & Learning Strategies:	Lectures Demonstrations Project work Practicals Presentation Private study
Module Aim:	(a) To be able to determine parameters from soil testing to characterize soil properties, (b) soil strength and soil deformations, (c) to be able to apply the principles of soil mechanics to analyze and design simple geotechnical systems; (d) To develop the skills required to evaluate factual Geotechnical Engineering reports; (e) To develop the skills required to assist in writing an interpretative Geotechnical engineering reports; (f) To recognise when simple geotechnical analysis and design are insufficient to safely or cost effectively evaluate/design a project; (g) To equip the student to operate as a Civil Engineer with a good understanding of Geotechnical Engineering; (h) To equip the student with the skills and information necessary to undertake post-graduated study

Learning Outcomes	
<i>On successful completion of this module the learner should be able to:</i>	
LO1	Assess the information contained in factual geotechnical reports including laboratory test results
LO2	Prepare well presented simple factual and 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	Interpret ground investigation reports for design and analysis
LO5	Scope Site Investigation from Desk Study to Interpretative Report considering economic and stakeholder engagement issues, and relevant communication between relevant parties

Pre-requisite learning		
Module Recommendations <i>This is prior learning (or a practical skill) that is recommended before enrolment in this module.</i>		
6566	ENGR H3503	Geotechnical Engineering I
6801	ENGR H3504	Earthworks Analysis
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>		
Engineering Geology		

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

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/Re-engineering

(a) Lime, cement, pfa, stabilization on mineral soils and peat - chemical reactions within soil mass

Sustainability

Reuse of demolition material in road works, evaluation of excavated material as engineering material

Assessment Breakdown	%
Continuous Assessment	10.00%
Project	30.00%
Practical	20.00%
End of Module Formal Examination	40.00%

Continuous Assessment

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Case Studies	In class eam	1,2,3,4	10.00	n/a

Project

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Project	n/a	1,2,3,4	30.00	n/a

Practical

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Practical/Skills Evaluation	Field work and lab work practicals		20.00	n/a

End of Module Formal Examination

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Formal Exam	End of term Exam	1,2,3,4,5	40.00	End-of-Semester

Module Workload

Workload: Full Time		
<i>Workload Type</i>	<i>Frequency</i>	<i>Average Weekly Learner Workload</i>
Lecture	12 Weeks per Stage	3.00
Estimated Learner Hours	12 Weeks per Stage	8.00
Total Hours		132.00

Module Delivered In

Programme Code	Programme	Semester	Delivery
CW_CMHCE_B	Bachelor of Engineering (Honours) in Civil Engineering	8	Mandatory