Module Descriptor

Title	Ground and Highway Engineering		
Session	2025/26	**Status**	Published
Code	ENGG10014	**SCQF Level**	10
Credit Points	20	**ECTS (European Credit Transfer Scheme)**	10
School	**Computing, Engineering and Physical Sciences**		
Module Co-ordinator	D Boumezerane		

Summary of Module

This module will support students to develop their UWS graduate attributes, namely: Academic (critical and analytical thinking, inquiring, knowledgeable, innovation, and problem solving); Personal (effective communicator, creative, imaginative); Professional (Collaborative, research-minded, and socially responsible).

Ground Engineering

Students will develop design expertise in sheet pile retaining walls, soil and rock slope cuttings, and soil reinforcement. They are required to consider geotechnical risk registers and methods of reducing risk associated with the ground.

The course will also cover topical issues in ground engineering such as slope stability problems. There will be significant discussion of geotechnical risk in both a project and society context. Sustainability is considered as a vital element that should be considered at the design phase.

Highway Engineering

Students are introduced to the basics of highway design. There is a review of horizontal and vertical alignments of roads and the main aspects of pavement design and construction. Roads' drainage together with the drainage of slopes will be considered. Methods of pavement assessment and major techniques of road maintenance will be covered. An overview of the highway design process will be given. The environmental aspects of highway development are considered along with sustainable development. Roundabout and junction design are introduced.

- Design of retaining walls, rock slopes and soil reinforcement are covered.
- Horizontal and vertical alignment of highways based on the recommendations of the Design Manual for Roads and Bridges (DMRB).
- Introduction to soil laboratory testing for pavement design parameters
- Roundabout and junction design in accordance with current practice.
- Ageing and defects of transport infrastructure.
- Integrated Approaches for Highway Rehabilitation & Assessment for Pavement Design Alternatives.

Module Delivery Method	On-Campus[1] ☒	Hybrid[2] ☐	Online[3] ☐	Work -Based Learning[4] ☐
Campuses for Module Delivery	☐ Ayr ☐ Dumfries	☐ Lanarkshire ☐ London ☒ Paisley	☐ Online / Distance Learning ☐ Other (specify)	

Terms for Module Delivery	Term 1	☒	Term 2	☐	Term 3	☐
Long-thin Delivery over more than one Term	Term 1 – Term 2	☐	Term 2 – Term 3	☐	Term 3 – Term 1	☐

Learning Outcomes	
L1	To be able to design rock slopes, reinforced soil slopes and sheet pile retaining walls.
L2	To be able to assess geotechnical risk as it applies to projects and to society.
L3	To be able to do the basic design of highway alignments and pavements and identify suitable techniques of pavement assessment and maintenance.
L4	To be able to understand basic soil laboratory tests for pavement design parameters.
L5	N/A

Employability Skills and Personal Development Planning (PDP) Skills	
SCQF Headings	**During completion of this module, there will be an opportunity to achieve core skills in:**
Knowledge and Understanding (K and U)	**SCQF 10** • Students will be able to integrate knowledge of ground engineering processes and theory with practical design. • Develop a critical K & U of essential facts, concepts, theories, and principles in highway engineering.
Practice: Applied Knowledge and Understanding	**SCQF 10** Students will have developed in depth skills in the design of certain ground engineering and highway engineering works.
Generic Cognitive skills	**SCQF 10** • Students will undertake design where the data is limited and comes from a range of sources.

[1] Where contact hours are synchronous/ live and take place fully on campus. Campus-based learning is focused on providing an interactive learning experience supported by a range of digitally-enabled asynchronous learning opportunities including learning materials, resources, and opportunities provided via the virtual learning environment. On-campus contact hours will be clearly articulated to students.

[2] The module includes a combination of synchronous/ live on-campus and online learning events. These will be supported by a range of digitally-enabled asynchronous learning opportunities including learning materials, resources, and opportunities provided via the virtual learning environment. On-campus and online contact hours will be clearly articulated to students.

[3] Where all learning is solely delivered by web-based or internet-based technologies and the participants can engage in all learning activities through these means. All required contact hours will be clearly articulated to students.

[4] Learning activities where the main location for the learning experience is in the workplace. All required contact hours, whether online or on campus, will be clearly articulated to students

Communication, ICT and Numeracy Skills	**SCQF 10** • Make a formal presentation concerning project risk.
Autonomy, Accountability and Working with Others	**SCQF 10** • Work in a team environment to determine and make and give a presentation

Prerequisites	**Module Code** ENGG09016	**Module Title** Applied Soil Mechanics
	Other	
Co-requisites	**Module Code**	**Module Title**

Learning and Teaching	
In line with current learning and teaching principles, a 20-credit module includes 200 learning hours, normally including a minimum of 36 contact hours and maximum of 48 contact hours. The learning and teaching activity for this module include lectures, laboratories and tutorials.	
Learning Activities During completion of this module, the learning activities undertaken to achieve the module learning outcomes are stated below:	**Student Learning Hours** (Note: Learning hours include both contact hours and hours spent on other learning activities)
Lecture / Core Content Delivery	24
Tutorial / Synchronous Support Activity	12
Laboratory / Practical Demonstration / Workshop	12
Independent Study	152
n/a	0
n/a	0
TOTAL	200

Indicative Resources
The following materials form essential underpinning for the module content and ultimately for the learning outcomes: The following materials form essential underpinning for the module content and ultimately for the learning outcomes: Various handout material for ground engineering and the University's VLE. Design Manual for Roads and Bridges, handout material extracted from CD 116, CD 122, CS 228, CS 459, CS 641, various dates. Extension Resources: Consultation of the undernoted resources is recommended and material from these resources may be of benefit to the student in the assessment process: Environmental Management of Highways. (2001) Institution of Highways and Transportation. Transport in the Urban Environment. (1997) Institution of Highways and Transportation.

Barnes G.E., (2000) Soil Mechanics: Principles and Practice. 2nd edition: Palgrave Macmillan Publishing.

Low B.K., (2022) Reliability-Based Design in Soil and Rock Engineering: CRC Press.

Daiheng N.I. (2016) Traffic Flow Theory. Characteristics, Experimental Methods, and Numerical Techniques : Butterworth Heinemann.

Dallas M.F. (2006) Value and Risk Management: A Guide to Best Practice: Blackwell Publishing.

Clayton C.R.I. (2001) Managing Geotechnical Risk: Improving Productivity in UK Building and Construction: Thomas Telford Publishing.

Simons N. & B. Menzies (2001)A Short Course in Soil and Rock Slope Engineering: Thomas Telford Publishing.

Frank et al. (2004) Designer's Guide to En 1997-1 Eurocode 7: Geotechnical design – General Rules.

Smith I.M. (2014) Smith's elements of soil mechanics. 1st edition: John Wiley & Sons Ltd.

(N.B. Although reading lists should include current publications, students are advised (particularly for material marked with an asterisk*) to wait until the start of session for confirmation of the most up-to-date material)

Attendance and Engagement Requirements

In line with the Student Attendance and Engagement Procedure, Students are academically engaged if they are regularly attending and participating in timetabled on-campus and online teaching sessions, asynchronous online learning activities, course-related learning resources, and complete assessments and submit these on time.

For the purposes of this module, academic engagement equates to the following:

The School of Computing, Engineering and Physical Sciences considers attendance and engagement to mean a commitment to attending, and engaging in, timetabled sessions. You will scan your attendance via the scanners each time you are on-campus and you will login to the VLE several times per week. Where you are unable to attend a timetabled learning session due to illness or other circumstance, you should notify the Programme Leader that you cannot attend. Across the School an 80% attendance threshold is set. If you fall below this, you will be referred to the Student Success Team to see how we can best support your studies.

Equality and Diversity

The University's Equality, Diversity and Human Rights Procedure can be accessed at the following link: UWS Equality, Diversity and Human Rights Code.

Aligned with the University's commitment to equality and diversity, this module supports equality of opportunity for students from all backgrounds and learning needs. Using the VLE, material will be presented electronically in formats that allow flexible access and manipulation of content. This module complies with University regulations and guidance on inclusive learning and teaching practice. This module has lab-based teaching and as such you are advised to speak to the Module Co-ordinator to ensure that specialist assistive equipment, support provision and adjustment to assessment practice can be put in place, in accordance with the University's policies and regulations.

(N.B. Every effort will be made by the University to accommodate any equality and diversity issues brought to the attention of the School)

Supplemental Information

Divisional Programme Board	**Engineering Physical Sciences**
Overall Assessment Results	☐ **Pass / Fail** ☒ **Graded**
Module Eligible for Compensation	☐ **Yes** ☒ **No** **If this module is eligible for compensation, there may be cases where compensation is not permitted due to programme accreditation requirements. Please check the associated programme specification for details.**
School Assessment Board	Civil Engineering and Quality Management
Moderator	S Paudel
External Examiner	M Bock
Accreditation Details	This module is accredited by the Joint Board of Moderators as part of BEng (Hons) Civil Engineering and GA-BEng (Hons) Civil Engineering.
Module Appears in CPD catalogue	☐ **Yes** ☒ **No**
Changes / Version Number	v 4.2 (March 2025) Module Descriptor copied to 2025/26 template and Assessment 2 changed to "Unseen Closed Book Class Test" from Examination v4.1 April 2024: - "Transportation" coursework component added to Assessment 1 as suggested by JBM. - "Laboratory" coursework component added to Assessment 1. - Summary of module updated. - List of essential resources updated. - Added L4: Learning Outcome 4. - Added learning activity: Laboratory. - Added learning hours for Laboratory. - Assessment outcome grid updated.

Assessment (also refer to Assessment Outcomes Grids below)
Assessment 1
Coursework - 40%
Assessment 2
Unseen Closed Book Class Test - 60%.
Assessment 3
N/A
(N.B. (i) Assessment Outcomes Grids for the module (one for each component) can be found below which clearly demonstrate how the learning outcomes of the module will be assessed. (ii) An indicative schedule listing approximate times within the academic calendar when assessment is likely to feature will be provided within the Student Module Handbook.)

Component 1							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Design/ Diagram/ Drawing/ Photograph/ Sketch/Presentation/ Transportation/Laboratory	☒	☒	☒	☒	☐	40	12

Component 2							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
Unseen Closed Book Class Test.	☒	☒	☒	☒	☒	60	2

Component 3							
Assessment Type	**LO1**	**LO2**	**LO3**	**LO4**	**LO5**	**Weighting of Assessment Element (%)**	**Timetabled Contact Hours**
N/A	☐	☐	☐	☐	☐		
Combined total for all components						100%	14 hours

Change Control

What	When	Who
Module Descriptor copied to 2025/26 template and Assessment 2 changed to "Unseen Closed Book Class Test" from Examination	20/03/2025	D Boumezerane