



Module Definition Form (MDF)

Module code: MOD010253	Version: 1 Date Amended: 17/Apr/2024
1. Module Title	
Geotechnics and Nature-based Solutions Project	
2a. Module Leader	
Maryam Imani	
2b. School	
School of Engineering and the Built Environment	
2c. Faculty	
Faculty of Science and Engineering	
3a. Level	
6	
3b. Module Type	
Standard (fine graded)	
4a. Credits	
30	
4b. Study Hours	
300	

5. Restrictions			
Type	Module Code	Module Name	Condition
Pre-requisite:	MOD010256	Sustainable Conceptual Design for Civil Engineering	Compulsory
Pre-requisite:	MOD002281	Hydraulics	Compulsory
Co-requisites:	None		
Exclusions:	None		
Courses to which this module is restricted:	None		

LEARNING, TEACHING AND ASSESSMENT INFORMATION

6a. Module Description
<p>This module provides students with comprehensive knowledge and practical skills in geotechnical engineering analysis and design, coupled with sustainable drainage system integration as a nature-based solution approach within civil engineering projects. Core topics encompass strategic project definition spanning feasibility appraisal, concept design evaluation, and outline design development. Students will gain in-depth expertise in geotechnical modelling, including lateral soil stress calculations, retaining wall design, slope stability assessments, shallow and deep foundation design, and the application of empirical, analytical, and numerical methods adhering to relevant codes of practice. The module also covers site characterisation, sustainable drainage system (SuDS) component analysis, and SuDS design criteria integration. Emphasis is placed on developing essential professional competencies such as effective teamwork, technical communication through report writing, engineering concept application, software utilisation for design analysis, project planning/organization, adaptability, and proficiency in data interpretation.</p>

6b. Outline Content

Knowledge

Strategic definition of a project:

- Project appraisal
- Concept design options
- Outline Design

Geotechnics:

- Calculation of lateral soil stresses. Design of retaining walls.
- Slope stability analysis.
- Design of shallow and deep foundations.
- Application of empirical, closed-form, finite element methods in analysis and design of geotechnical engineering structures.
- Application of Codes of Practice in Geotechnical Engineering.

Nature-based solutions (specifically Sustainable Drainage System (SuDS)):

- Site assessment and characterisation
- SuDS components analysis
- SuDS design based on the defined design criteria.

Skills

- Effective team work. Effective oral communication.
- Proficient technical report writing.
- Application of engineering concepts to analyse, design and appraise engineering solutions. Usage of software to conduct critical analysis of design problems and proposed solutions.
- Effective planning and organisation as well as an ability to adapt to change. Effective autonomous work.
- Data interpretation.

6c. Key Texts/Literature

The reading list to support this module is available at: <https://readinglists.aru.ac.uk/>

6d. Specialist Learning Resources

- Computer lab: with the following software: CAD drawing, Plaxis geotechnical analysis, Matlab programming, Microsoft Office, SWMM or InfoSWMM, QGIS.
- Laboratories: MAR 018.

7. Learning Outcomes (threshold standards)		
No.	Type	On successful completion of this module the student will be expected to be able to:
1	Knowledge and Understanding	Develop an understanding of fundamental principles in geotechnics, encompassing soil mechanics, foundation engineering, and retaining wall design relevant to civil engineering projects.
2	Knowledge and Understanding	Acquire specialised knowledge of diverse nature-based techniques and their integration into engineering design to mitigate environmental impacts and promote ecosystem health for sustainable and resilient projects.
3	Intellectual, practical, affective and transferrable skills	Apply an integrated approach to geotechnical engineering, incorporating geological considerations, environmental factors, and relevant codes of practice to develop safe, cost-effective, and sustainable solutions while effectively communicating with technical and non-technical stakeholders.
4	Intellectual, practical, affective and transferrable skills	Demonstrate innovation in integrating Nature-based Solutions and particularly Sustainable Drainage Systems (SuDS) into engineering design, addressing societal, environmental, and commercial requirements while enhancing project outcomes.
5	Intellectual, practical, affective and transferrable skills	Evaluate the environmental and societal impact of projects, identifying potential risks and implementing mitigation measures to minimise adverse effects on communities and ecosystems.

8a. Module Occurrence to which this MDF Refers				
Year	Occurrence	Period	Location	Mode of Delivery
2024/5	ZZF	Template For Face To Face Learning Delivery		Face to Face

8b. Learning Activities for the above Module Occurrence			
Learning Activities	Hours	Learning Outcomes	Details of Duration, frequency and other comments
Lectures	36	1-2	Scheduled in accordance with the project requirements.
Other teacher managed learning	36	1-5	Geotechnics lab: 3 hours Computer software tutorials for Geotechnics: 9 hours Workshops for geotechnics and NBS coursework, site visit to relevant projects, and tutorials scheduled in accordance with the project requirements: 24 hours
Student managed learning	228	1-5	Group work, autonomous study and individual learning activities.
TOTAL:	300		

9. Assessment for the above Module Occurrence					
Assessment No.	Assessment Method	Learning Outcomes	Weighting (%)	Fine Grade or Pass/Fail	Qualifying Mark (%)
010	Coursework	1,3,5	30 (%)	Fine Grade	30 (%)
1500-word equivalent Geotechnics Report This element is aligned with Engineering Council AHEP4 Learning Outcomes: C5, C17. This element is aligned with JBM threads: Design, Health and Safety, Geotechnics					
Assessment No.	Assessment Method	Learning Outcomes	Weighting (%)	Fine Grade or Pass/Fail	Qualifying Mark (%)
011	Examination Chelmsford	1	30 (%)	Fine Grade	30 (%)
Geotechnics exam – 2 hours This element is aligned with Engineering Council AHEP4 Learning Outcomes: C2. This element is aligned with JBM threads: Geotechnics					
Assessment No.	Assessment Method	Learning Outcomes	Weighting (%)	Fine Grade or Pass/Fail	Qualifying Mark (%)
012	Coursework	2,4,5	40 (%)	Fine Grade	30 (%)
2500-word equivalent Nature-based Solutions Design report This element is aligned with Engineering Council AHEP4 Learning Outcomes: C6, C7. This element is aligned with JBM threads: Design, Sustainability, Fluid Mechanics, Environmental Engineering, Public health					

In order to pass this module, students are required to achieve an overall mark of 40% (for modules at levels 3, 4, 5 and 6) or 50% (for modules at level 7*).

In addition, students are required to:

- (a) achieve the qualifying mark for each element of fine graded assessment as specified above**
- (b) pass any pass/fail elements**

[* the pass mark of 50% applies for all module occurrences from the academic year 2024/25 – see Section 3a of this MDF to check the level of the module and Section 8a of this MDF to check the academic year]