

Module Details	
Module Title	Advanced Geotechnics
Module Code	CSE7009-B
Academic Year	2024/5
Credits	20
School	School of Built Environment, Architecture & Creative Industries
FHEQ Level	FHEQ Level 7

Contact Hours	
Type	Hours
Tutorials	10
Seminars	6
Directed Study	160
Lectures	24

Availability	
Occurrence	Location / Period
BDA	University of Bradford / Semester 1

Module Aims
<p>Near surface soil layers that are characterized by the inclusion of soft soils and/or high groundwater which may pose serious problems to sustainable and resilient development of cities if care is not undertaken. An advanced knowledge is required to ensure safe ground conditions, to develop creative, and cost- effective and environmentally friendly design geotechnical solutions, to reduce the carbon footprint of geotechnical structures and to ensure long-term stability of structures. This module aims to extend the application of the fundamental concepts and principles of soil behaviour introduced in Soil Mechanics and Geotechnical and Civil Engineering modules, with particular emphasis on analysis and design of dewatering schemes, soil improvement techniques and temporary ground support systems. Students will develop solutions to advanced geotechnical engineering problems by a process of analysis and validation using specialist software where appropriate.</p>

Outline Syllabus

Soil modelling approaches. Groundwater flow: design of wells in confined and unconfined aquifers under steady and unsteady state flow, methods, control and design of dewatering systems. Groundwater flow through heterogeneous and anisotropic soils. Ground support techniques during temporary works, design of sheet piling walls and working platforms. Analysis of soil improvement techniques including vertical drains, dynamic compaction, vibro-compaction and vibro-replacement. Design and construction of soil reinforcement: bearing capacity of reinforced grounds, reinforced earth walls and slopes. Throughout the module topics, considerations are given to the principles of sustainability and UN SDGs 9, 11, 12, 13 and 15.

Learning Outcomes

Outcome Number	Description
01	Critically evaluate soil behaviour in the analysis and design of advanced geotechnical problems.
02	Demonstrate systematic application of scientific methods for creative problem solving in the geotechnical context.
03	Apply geotechnical quantitative methods to analyse and design earthworks.
04	Use fundamental soil parameters in design and analysis of ground water flow, soil improvement, reinforced slopes and soils.
05	Interpret data from a variety of sources and present a technical solution to problems.
06	Use where appropriate software to solve and design ground support systems.

Learning, Teaching and Assessment Strategy

The teaching and learning methods have been selected to engage students in developing their knowledge and understanding of advanced geotechnical design problems through lectures, tutorials and seminars. The essential concepts and principles are introduced in the lectures. Furthermore, the lectures are designed to include several worked examples providing opportunities for in-depth discussion, application, critical analysis of the design concepts. In the formal tutorial students are exposed to apply the theory and receive formative feedback. Oral feedback is also given during the seminar sessions to assist and guide students to effectively address the geotechnical coursework challenge. Directed time is for students to consolidate and enhance their learning through further reading and practice of a range of geotechnical problems from the recommended reading list. It is also for students to work in groups to address the advanced challenge in their preferred coursework topic.

To support accessibility, clarity and comprehension all teaching material is provided online in advance of the teaching sessions and practical problems will be sent a week in. Opportunities are provided for students to design their own solutions and express their own ideas, choosing from a variety of tools and methodologies to address the coursework challenge. Module leader organizes a weekly office hour where students discuss their solutions and receive tailored feedback for deepening their knowledge.

Assessments are designed to measure industry ready skills such as presentation skills, report writing skills, team-working skills using group coursework to strengthen students' ability to work effectively in teams and peer evaluation. Throughout the module, students will be set formative assessment activities that will help develop confidence in tackling design problems. The timely constructive feedback will support students develop the skills and knowledge required for the summative assessment. The formal closed-book examination will assess Learning Outcomes 1-4 expressed in the module descriptor. The team-based coursework report will assess the application of practical skills and broadening of knowledge relevant to the selected geotechnical engineering problem as stated by Learning Outcomes 5 and 6.

Mode of Assessment			
Type	Method	Description	Weighting
Summative	Examination - Closed Book	Examination - Closed book (3 Hrs)	60%
Summative	Coursework - Written	Technical report, 1500 words per student and two group presentations	40%

Reading List
To access the reading list for this module, please visit https://bradford.rl.talis.com/index.html

Please note:

This module descriptor has been published in advance of the academic year to which it applies. Every effort has been made to ensure that the information is accurate at the time of publication, but minor changes may occur given the interval between publishing and commencement of teaching. Upon commencement of the module, students will receive a handbook with further detail about the module and any changes will be discussed and/or communicated at this point.

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