UNIVERSITY of BRADFORD

Module Descriptor

Module Details	
Module Title	Advanced Geotechnics
Module Code	CSE7009-B
Academic Year	2023/4
Credits	20
School	Department of Civil and Structural Engineering
FHEQ Level	FHEQ Level 7

Contact Hours	
Type	Hours
Lectures	20
Tutorials	10
Seminars	10
Directed Study	160

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

Module Aims

Near surface soil layers that are characterized by the incusion of soft soil and/or high groundwater may pose a serious problem 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 designs, and ensure long-term stability of structures. This module aims to extent 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.

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 grouting, vertical drains, dynamic compaction, vibro-compaction and vibro-replacement. Design and construction of soil reinforcement: Bearing capacity of reinforced earth, Reinforced earth walls and slopes.

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 quantitive 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

Utilizing current research and cutting edge knowledge on the topic of geotechnical design, the students will participate in lectures, workshops, tutorials and independant study to explore concepts and solve real-world geotechnical design problems. The teaching and learning methods have been selceted to engage students in developing their knowledge and understanding of advanced geotechnical design through formal learning opportunities such as lectures and tutorials, experimental learning through practical classes and informal and social learning through team-working in projects.The essential concepts and principles are the basis for further in-depth discussion, application, critical analysis and design of geotechnical systems. The formal on campus tutorial sessions include several worked examples in which students 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. In addition, students practice the application of concepts and theories to solve systematically advanced geotechnical design problems. Directed time is for students to consolidate and enhance their learning through further reading and practice of a range of practical problems from the recommended reading list. It is also for students to work in groups to address advanced problems in their preferred area of geotechnics. Embedding the strategic aims of the Universities Learning, Teaching and Student Experience Strategy (LTSES), case studies and practical problems provide lots of opportunities for students to design their own solutions. In addition to the modules, academic skills workshops will be organized during the year to provide further support in self-regulation, persistence, and the development of essential skills such as digital literacy.

To support accessability, clarity and comprehension all teaching material is provided online in advance of the teaching sessions and practical problems will be sent a week in advance allowing students to endeavour developing creative and innovative solutions and customise the display of their learning experience as a whole. Thorughout the programme, lots of opportunities are provided for students to design their ow solutions and express their own ideas, choosing from a variety of tools and methodologies. An emphasis is also placed on the importance of planning and goal setting, allowing students to forge a learning pathway that is suitable for their needs, while respecting the requirements of programme, and the needs of others, when working within a team.

The University recognises the importance of providing pastoral support, taking into consideration all aspects of our students' journeys and development. All students are allocated a personal academic tutor, with whom they meet regularly to discuss and receive guidance on their learnign and development. Module leader organises a weekly office hour where students discuss their creative solutions and receive tailored feedback for deepening their knowledge.

To prepare the students ready for the world of work, assessments are designed to measure industry ready skills such as presentation skills, rerport writing skills team-working skills using group coursework to strenghten 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 from this formative assessment will support students develop the skills and knowledge required for the summative assessment. The formal closed-book examination will assess Learnign 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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