

Module Details	
Module Title	Soil Mechanics
Module Code	CSE5009-B
Academic Year	2024/5
Credits	20
School	School of Built Environment, Architecture & Creative Industries
FHEQ Level	FHEQ Level 5

Contact Hours	
Type	Hours
Laboratories	12
Lectures	48
Directed Study	140

Availability	
Occurrence	Location / Period
BDA	University of Bradford / Academic Year

Module Aims
<p>To be able to explain the behaviour of different soils, and the factors influencing their behaviour. To introduce and develop understanding of mechanical properties related to strength, compressibility, and permeability of soils. To be able to quantify these properties to predict how soil will behave under field loading for the safe design of soil structures (e.g., buildings, embankments, dams, waste containment liners, highway base courses, etc.), as well as other structures that will overlie the soil.</p>

## Outline Syllabus

Volume-mass relations, compaction of soils (lab test), sieve analysis (lab test), characterisation and classification of cohesive soils (plastic/liquid limits lab test), Darcy's law of permeability (lab test). Stresses in soil mass, definitions of effective stress, pore water pressure and total stress. Increase in effective stress due to external loading. Shear strength of soils. One-dimensional consolidation (lab test), drained and undrained soil behaviour, lateral earth pressure. Shear box (lab test), Triaxial (lab test).

Specific requirements for geotechnical field course to be included in the laboratory report.

1. Horton Bank County Park

Comment on the how sustainable was to maintain the quarry, stability of rock faces, usage of sandstone and shale as construction materials. Discuss the weathering of different materials. Describe how water can infiltrate within the rock mass and how it is held within the reservoir.

2. Hawbank Quarry (Tarmac)

Observe the regular form of the beds. Is all the rock type limestone.

What is the principal geological structure that can be seen at this location.

3. Coldstone Quarry

Discuss the crushing process, usage of crushed limestone in different engineering projects. Comment on long term sustainability of the quarry and associated cost.

4. Thruscross Reservoir

Make comments on the materials used for the construction of the dam.

Note the topography and geology of the area.

How to mitigate seepage problems.

## Learning Outcomes

Outcome Number	Description
01	Evaluate soil behaviour in terms of its particulate nature.
02	Apply principles of continuum mechanics to soils.
03	Perform in a laboratory context under supervision; compaction, sieve analysis, plastic/liquid limits, permeability, oedometer and shear strength tests.
04	Present, interpret and analyse relevant laboratory data for the behaviour of soil.
05	Solve problems systematically.

## Learning, Teaching and Assessment Strategy

Concepts of soil behaviour alongside with several worked examples are introduced using formal lectures. Students attempt to solve the worked examples prior to having a class discussion on how to solve systematically these questions. Deeper understanding is then developed during classes in which students practice the application of theories in geotechnical problems further enhanced using the laboratory classes and the geotechnical materials field course.

The geotechnical materials field course takes place over a full day in the Yorkshire area, in which a number of locations are visited including two quarries, a sustainable park and a reservoir. The field course is a practical exercise, which includes identification of rocks, geological structures, geomorphology and applied geotechnics. The field trip requires a group approach to ensure that all students gain maximum benefit in the limited time available. In addition, the laboratory classes provide students with several opportunities to enhance their learning through observations and interpretation of relevant data. The laboratory classes will also enable linking theory with practice. Oral formative feedback is given during the laboratory sessions and tutorial classes.

The formative examination will provide students with feedback in order to improve their learning and understanding of the fundamental aspects of soil mechanics. Directed time is for students to consolidate their learning through reading and practice of a range of practical problems from the recommended reading list.

Technical report will assess the application of practical skills to the knowledge base of the module to illustrate the achievement of learning outcomes 3 and 4 whereas the formal examination will assess all other learning outcomes expressed in the descriptor. The supplementary assessment if required will include one compulsory question about the laboratory practicals.

### Mode of Assessment

Type	Method	Description	Weighting
Summative	Laboratory Report	Technical Report on the Laboratory-obtained data and geotechnical materials field course	30%
Summative	Examination - Closed Book	Formal closed book examination (2hrs)	70%
Formative	Examination - Closed Book	Closed book examination (2hr) with feedback	N/A

### 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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