**Module co-ordinator:** Associate Prof. Brendan O’Kelly

**Lectures:**
- Associate Prof. Brendan O’Kelly
- Assistant Prof. David Igoe

**Module organisation**
The module runs for 11 weeks of the academic year and comprises three lectures per week for the entire period. There are three one-hour associated laboratory periods during the semester. Submission of laboratory practical reports by the students is required by the Friday of the week following the scheduled laboratory session. Students must also deliver classroom presentations on threshold concepts in Soil Mechanics during the semester.

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<tr>
<th>Engineering Semester</th>
<th>Start Week</th>
<th>Hours of Associated Practical Sessions</th>
<th>End Week</th>
<th>Lectures Per Week</th>
<th>Tutorials Per Week</th>
<th>Total Contact Hours: 36</th>
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<td>3</td>
<td>12</td>
<td>3</td>
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**Module description, aims and contribution to programme**
Soil Mechanics provides students with a basic knowledge of the fundamental concepts of soil behaviour and gives an introduction into general geotechnical engineering. The module describes the relationship between soils and their geological origins and demonstrates the significance of the particles-size distribution and mineralogy of the soil on its engineering behaviour. Soil description and classification methods are covered. The effects of the compaction process on the engineering properties of soil are discussed and methods are developed to allow students to design earth fills. The module explains the principles involved in the flow of water through soils, including methods of analyses and measurement. The important concept of effective stress is described and examples of its significance in geotechnical engineering are developed. The module discusses the shear strength of soils, its measurement, and presents methods for applying this knowledge in the analysis of the short- and long-term bearing capacity for shallow foundations. The module presents elastic methods of analyses for predicting the in-situ stresses induced by surface loading and the resulting settlements. Methods for analysing the short-term stability of fine-grained slopes are presented. Ground investigation and in-situ testing techniques are described for the development of appropriate ground models and the determination/interpretation of design parameter values.

**Learning outcomes**
On successful completion of the module, students will be able:
1. To explain the significant aspects that must be considered when describing and classifying soils.
2. To analyse the compaction characteristics of a soil in order to assess its suitability as an engineering fill material.
3. To explain the methods of measurement of the permeability of soils.
4. To estimate the total head, porewater pressures and discharges to be expected in a variety of engineering design situations.
5. To explain the concept of effective stress and its relationship with the shear strength of soils.
6. To estimate the capacity of soil deposit to support shallow foundations.
7. To estimate the stresses induced in the ground and resulting settlements based on elastic analysis.
8. To estimate the stability of earth slopes for the undrained condition.
9. To develop a site investigation strategy pertinent to a range of ground engineering works.

**Module content**
- Description and classification of soils
- Seepage
- Compaction technology
- Effective stress
- Shear strength
- Bearing capacity of shallow foundations
- Elastic settlements
- Slope stability (undrained condition)
- Ground investigation and in-situ testing

**Assessment**
Written Exam 80%, 3 Laboratory Experimental Reports (3×5=15%) and Classroom Presentations on Threshold Concepts (5%). The examination questions are designed to test the students’ ability to use the knowledge gained in lectures to solve practical problems. The laboratory experiments are used to develop knowledge of the testing procedures used in geotechnical engineering.

The student reports on the laboratory exercises must be submitted by the Friday of the week following the scheduled laboratory practical session. Late entries will not be accepted unless accompanied by medical certificate or other appropriate document.

**Required textbook**

**Further information**
https://www.tcd.ie/Engineering/