3A5 Soil Mechanics (5 ECTS)

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

Lecturers: Prof. Mark Dyer

Module Organisation

This 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 for submission by the students within a two week period. Students must also deliver classroom presentations on threshold concepts in Soil Mechanics during the semester.

<table>
<thead>
<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>Total</th>
<th>Tutorials Per Week</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>3</td>
<td>12</td>
<td>3</td>
<td>33</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Contact Hours: 36

Module Description

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 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 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 develops methods for applying this knowledge in the analysis of bearing pressure for foundations. Methods of analysis of the consolidation of soils are discussed and analytical methods are developed to estimate ground movements due to the consolidation of the soil. Site investigation techniques are covered.

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 material.
3. To explain the methods of measurement of the permeability of soils.
4. To estimate the total head, pore water 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 amount of settlement to be expected with the consolidation of soil.
7. To estimate the capacity of a soil to support a foundation
8. To estimate the undrained stability of earth slopes
9. To develop a site investigation strategy pertinent to a range of ground engineering works
Module Content

- Description and classification of soils
- Compaction technology
- Seepage
- Effective stress
- Shear strength
- Bearing capacity of soil
- Consolidation of soils
- Ground investigation

Recommended Text

Craig, Soil Mechanics, Chapman & Hall
Foundations of Engineering Geology, Tony Waltham, Spoon Press

Assessment

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

Further information

Web page:
http://www.tcd.ie/Civil_engineering/Staff/Brendan.OKelly/JS%20_3A5_Soil%20Mechanics/