Subject Description Form

Subject Code	CSE30307
Subject Title	Soil Mechanics for Civil Engineering
Credit Value	3
Level	3
Exclusion	CSE307 Soil Mechanics
Objectives	To learn the fundamentals of soil mechanics. To apply theories to solve practical soil mechanics problems.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: i. Able to apply the fundamentals of physics and mathematics to understand the physical properties and behaviour of soils for civil engineering purposes; ii. Able to carry out laboratory tests to measure the properties and behaviour of soils for civil engineering applications; iii. Able to develop analytical skills to solve soil mechanics problems; iv. Able to work in small groups as teams and to build both team and individual responsibility in laboratory tests; v. Able to learn independently. vi. recognize the need for, and to engage in life-long learning
Subject Synopsis/ Indicative Syllabus	1. Basic Soil Characteristics (1 week) Particle size analysis; plasticity and density; phase relationship and soil compaction. 2. Theory of Seepage (2 weeks) Hydraulic conductivity and Darcy's law; seepage theory; flow net method, anisotropic flow. 3. Effective Stress (2 weeks) The principle of effective stress; response of effective stress in sand or clay; influence of seepage on effective stress. Solutions of stress and displacements based on elastic theories. 4. Shear Strength (2.5 weeks) The Mohr-Coulomb failure criterion; shear strength tests; stress-strain behaviour; pore water pressure response. 5. Lateral Earth Pressure (2 weeks) Active and passive states of soils; Rankine's theory of earth pressure; Coulomb's theory of earth pressure; earth pressure on retaining walls; stability of retaining walls against overturning and sliding. 6. Consolidation Theory (2.5 weeks) One-dimensional (1-D) consolidation tests and stress-strain (or void ratio) relationships; consolidation settlement; degree of consolidation; Terzaghi's theory of 1-D consolidation; determination of coefficient of consolidation; construction time correction. 7. Soil Dynamics and Geotechnical Earthquake Engineering (1 week) Seismic ground motions, Wave propagation in half-spaces, Single-degree-of-freedom oscillator, Response spectrum, Nonlinear dynamic characteristics of soil, (shear modulus and damping ratio with shear strain), analysis and design of earth retaining wall for seismic condition. 8. Laboratory Testing Four laboratory sessions, including the following tests: (i) index test

<table>
<tr><td></td><td>for liquid limit and plastic limit, (ii) sieving and permeability tests, (iii) triaxial test, and (iv) 1-D consolidation test.</td></tr>
<tr><td>Teaching/Learning Methodology</td><td>Learning methodology: lectures, tutorials and laboratory. There are self-reading components in the syllabus. Students should attend at least one seminar related to the subject, and submit a seminar report. The assessment methods include lab reports, seminar reports, assignments, tests and final examinations.</td></tr>
<tr><td>Assessment Methods in Alignment with Intended Learning Outcomes</td><td>
<table>
<tr><td rowspan="2">Specific assessment methods/tasks</td><td rowspan="2">% weighting</td><td colspan="6">Intended subject learning outcomes to be assessed (Please tick as appropriate)</td></tr>
<tr><td>i.</td><td>ii.</td><td>iii.</td><td>iv.</td><td>v.</td><td>vi.</td></tr>
<tr><td>1. Lab Reports</td><td>5</td><td></td><td>✓</td><td></td><td>✓</td><td></td><td></td></tr>
<tr><td>2. Seminar report</td><td>5</td><td>✓</td><td></td><td></td><td></td><td>✓</td><td>✓</td></tr>
<tr><td>3. Assignments</td><td>10</td><td>✓</td><td></td><td>✓</td><td></td><td>✓</td><td></td></tr>
<tr><td>4. Tests</td><td>10</td><td>✓</td><td></td><td>✓</td><td></td><td>✓</td><td></td></tr>
<tr><td>5. Final Examination</td><td>70</td><td>✓</td><td></td><td>✓</td><td></td><td>✓</td><td></td></tr>
<tr><td>Total</td><td>100 %</td><td colspan="4"></td><td></td></tr>
</table>
Students must attain at least grade D in both coursework and final examination (whenever applicable) in order to attain a passing grade in the overall result.

The understanding of theories will be assessed through lab report, assignments, tests and final examination.</td></tr>
<tr><td>Student Study Effort Expected</td><td>
<table>
<tr><td>Class contact:</td><td>Average hours per week</td></tr>
<tr><td>▪ Lectures / Tutorials / Laboratory</td><td>3 Hrs.</td></tr>
<tr><td>Other student study effort:</td><td></td></tr>
<tr><td>▪ Reading and studying</td><td>3 Hrs.</td></tr>
<tr><td>▪ Completion of Assignments/Lab Reports</td><td>3 Hrs.</td></tr>
<tr><td>Total student study effort</td><td>9 Hrs.</td></tr>
</table>
</td></tr>
<tr><td>Reading List and References</td><td><u>Essential Texts</u>
Knappett, J. and Craig, R.F. (2012) Criag's Soil Mechanics, 8th edition, CRC press.

<u>Reference Texts</u>
Towhata I. (2008). Geotechnical Earthquake Engineering, Springer-Verlag, Berlin.
BS 1377. (1990) Part 1-9: 1990, British Standards Institution.
Das B.M. (2007). Principles of Foundation Engineering, 6th Edition (adapted international student edition), Thomson.
GEO (1987). Guide to Site Investigation. Geoguide 2, GEO, Geotechnical Engineering Office, Civil Engineering Department.
GEO (1988). Guide to Rock and Soil Descriptions, Geoguide 3, GEO, Civil</td></tr>
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	Engineering Services Department, Hong Kong. GEO (1993). *Guide to Retaining Wall Desig*n. 2nd Edition, Geoguide 1, CED, Hong Kong. Lambe T.W. and Whitman R.V. (1979). *Soil Mechanics*, SI Version, Wiley, New York. Sutton B.H.C. (1993). *Solving Problems in Soil Mechanics*, 2nd Edition, Longman. Terzaghi, Karl, Ralph B., Peck, and Gholamreza Mesri. (1996). *Soil Mechanics in Engineering Practice*, 3rd Edition, Wiley: New York.