

**PROPOSED COURSE OUTLINE TEMPLATE FOR STUDENTS AT NTU**

<b>Academic Year</b>	2017/18	<b>Semester</b>	1
<b>Course Coordinator</b>	A/P Leong Eng Choon		
<b>Course Code</b>	CV3013		
<b>Course Title</b>	Foundation Engineering		
<b>Pre-requisites</b>	CV2013 Engineering Geology & Soil Mechanics & CV2014 Geotechnical Engineering		
<b>No of AUs</b>	3		
<b>Contact Hours</b>	26 hours <i>Lecture</i> 13 hours <i>Tutorials</i>		
<b>Proposal Date</b>	19 Oct 2015 ( <i>Course syllabus</i> )		

**Course Aims**

*This course aims to provide students with a basic understanding of geotechnical principles in the design and analysis of shallow foundations, deep foundations and retaining structures.*

**Intended Learning Outcomes (ILO)**

By the end of this course, you (as a student) would be able to:

1. Explain the purpose of site investigation and evaluate the design soil parameters
2. Describe the failure modes of retaining walls and foundation supports
3. Describe the design philosophy and sequence the process involved in a foundation project
4. Design simple foundation systems

**Course Content**

S/N	Topic	Lecture Hrs	Tutorial Hrs
1	Site investigation and evaluation of soil parameters	6	3
2	Retaining walls	6	3
3	Braced excavations	2	1
4	Bearing capacity and settlement of shallow foundations	6	3
5	Axial pile capacity, load tests and pile groups	6	3
Total:		26	13

**Assessment (includes both continuous and summative assessment)**

Component	Course LO Tested	Related Programme LO or Graduate Attributes	Weighting	Team / Individual	Assessment rubrics
1. Final Examination	1, 2, 3, 4	EAB SLO* a, c, e	60%	Individual	Appendix 1
2. Continuous Assessment 1 (CA1): Quiz	2, 3, 4	EAB SLO* a, e	20%	Individual	Appendix 2
3. Continuous Assessment 1 (CA2): Quiz	1, 2, 3, 4	EAB SLO* a, c, e	20%	Individual	Appendix 3
Total			100%		

\* CEE SLO = Civil and Environmental Engineering Learning Outcomes (per BEng Civil Engineering Accreditation)

- (a) Competence in mathematics, applied sciences and engineering.
- (c) Possession of essential knowledge in sustainable development and understanding the needs for sustainable infrastructure management and development
- (e) Competent skills in problem analysis and design of sustainable civil engineering facilities.

#### Formative feedback

Describe how you would be giving feedback to students on how they are learning in this course.

*The guideline is for the course to provide formative feedback for students through their CA as well as giving general feedback for students' performance as part of the end of course review*

#### Learning and Teaching approach

Approach	How does this approach support students in achieving the learning outcomes?
Lecture	Provide materials to students and guidance in scope for reading of texts and references
Tutorials	Reinforce materials covered in lectures and further explain concepts, process and design philosophy in foundation design
LAMS	Online learning activities to provide students opportunities to solve more problems over and above the tutorial problems
CA1 & CA2	Provide feedback to students on their understanding of the course

#### Reading and References

##### Text

Knappett, J.A. and Craig, R.F., Craig's Soil Mechanics, 8th edition, Spon Press, 2012.

Coduto, D.P., Kitch, W.A., and Yeung, M.R. Foundation Design, Principles and Practices, 3rd edition, Prentice Hall, New Jersey, 2016.

#### Reference

Bond, A. and Harris, A., Decoding Eurocode 7, 1st edition; New York, Taylor & Francis, 2008

Bowles, J.E., Foundation Analysis and Design, 5th edition, McGraw-Hill, New York, 1996.

Braja M. Das, Principles of Foundation Engineering, 7th edition, Thomson, 2010 (TA775.D229 2010)

Tomlinson, M.J., Foundation Design and Construction, 7th edition, Prentice Hall, 2001

### **Course Policies and Student Responsibilities**

#### **(1) General**

*Students are expected to attempt all assigned tutorials before the tutorial classes. Students are expected to take responsibility to follow up with lectures, course notes, and online materials. Students are expected to participate in all lectures, tutorials, quizzes and online exercises.*

#### **(2) Absenteeism**

*The quizzes make up a significant portion of your course grade. Absence from quizzes without a valid reason will affect your overall course grade. Valid reasons include falling sick supported by a medical certificate and participation in NTU's approved activities supported by an excuse letter from the relevant bodies. There will be no make-up opportunities for quizzes.*

*If you miss a quiz, you must inform your course lecturer and me via email. Students who miss quizzes with valid reasons will have to provide the CEE Undergraduate Office with medical certificates or excuse letter from the relevant bodies.*

### **Academic Integrity**

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values.

As a student, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the [academic integrity website](#) for more information. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

### **Course Instructors**

Instructor	Office Location	Phone	Email
A/P Leong Eng Choon	Rm N1-1c-80	6790 4774	<a href="mailto:cecleong@ntu.edu.sg">cecleong@ntu.edu.sg</a>
A/P Anthony Goh	Rm N1-1b-41	6790 5271	<a href="mailto:ctcgoh@ntu.edu.sg">ctcgoh@ntu.edu.sg</a>

### Planned Weekly Schedule

Week	Topic	Course LO	Readings/ Activities
1	Overview of shallow and deep foundations	2, 3, 4	Reading texts and references, Tutorial 1
2	Bearing capacity of shallow foundations	2, 3, 4	Reading texts and references, Tutorial 2
3	Settlement of shallow foundations	2, 3, 4	Reading texts and references, Tutorial 3
4	Pile types and axial capacity	2, 3, 4	Reading texts and references, Tutorial 4
5	Pile under tensile load and load tests	2, 3	Reading texts and references, Tutorial 5
6	Pile groups and negative skin friction	2, 3	Reading texts and references, Tutorial 6
7	Earth retaining structures – overview	2, 3	Reading texts and references, Tutorial 7
8	Lateral earth pressure – limiting states	2, 3	Reading texts and references, Tutorial 8
9	Gravity retaining walls	4	Reading texts and references, Tutorial 9
10	Embedded walls	4	Reading texts and references, Tutorial 10
11	Braced excavations	4	Reading texts and references, Tutorial 10
12	Ground investigation	1	Reading texts and references, Tutorial 11
13	Design soil parameters	1	Reading texts and references, Tutorial 11

### Appendix 1: Assessment Criteria for Final Examination

Performance Indicators	Weightage	Performance Level			
		Outstanding: 4	Good: 3	Average, meet expectation : 2	Below expectations: 1
<b>Understanding the purpose of foundation design</b>	5%	<ul style="list-style-type: none"> <li>Able to fully explain the purpose of foundation design</li> </ul>	<ul style="list-style-type: none"> <li>Able to adequately explain the purpose of foundation design</li> </ul>	<ul style="list-style-type: none"> <li>Able to recall the purpose of foundation design</li> </ul>	<ul style="list-style-type: none"> <li>Unable to recall the purpose of foundation design</li> </ul>

<p><b>Apply knowledge to determine bearing capacity and settlement for shallow foundations</b></p>	<p>15%</p>	<ul style="list-style-type: none"> <li>· Able to apply appropriate knowledge in determining bearing capacity and settlement of shallow foundations in a systematic, clear and precise manner.</li> </ul>	<ul style="list-style-type: none"> <li>· Able to apply appropriate knowledge in determining bearing capacity and settlement of shallow foundations in a systematic manner.</li> </ul>	<ul style="list-style-type: none"> <li>· Able to apply basic knowledge in determining bearing capacity and settlement of shallow foundations</li> </ul>	<ul style="list-style-type: none"> <li>· Unable to apply basic knowledge in determining bearing capacity and settlement of shallow foundations</li> </ul>
<p><b>Understand the principles in determining the end bearing and side resistance of deep foundations</b></p>	<p>15%</p>	<ul style="list-style-type: none"> <li>· Able to understand and demonstrate principles in determining end and side resistance of deep foundations in a systematic, clear and precise</li> </ul>	<ul style="list-style-type: none"> <li>· Able to understand principles in determining end and side shear resistance of deep foundations in a systematic manner.</li> </ul>	<ul style="list-style-type: none"> <li>· Able to list principles in determining end and side resistance of deep foundations</li> </ul>	<ul style="list-style-type: none"> <li>· Unable to list principles in determining end and side resistance of deep foundations</li> </ul>
<p><b>Apply knowledge to determine geotechnical capacity of pile foundations</b></p>	<p>10%</p>	<ul style="list-style-type: none"> <li>· Able to apply appropriate knowledge in determining geotechnical capacity of pile foundations in a systematic, clear and precise manner.</li> </ul>	<ul style="list-style-type: none"> <li>· Able to apply appropriate knowledge in determining geotechnical capacity of pile foundations in a systematic manner.</li> </ul>	<ul style="list-style-type: none"> <li>· Able to apply basic knowledge in determining geotechnical capacity of pile foundations</li> </ul>	<ul style="list-style-type: none"> <li>· Unable to apply basic knowledge in determining geotechnical capacity of pile foundations</li> </ul>
<p><b>Understand concept of pile load tests</b></p>	<p>5%</p>	<ul style="list-style-type: none"> <li>· Able to comprehend and apply concept of pile load tests to derive pile resistance</li> </ul>	<ul style="list-style-type: none"> <li>· Able to comprehend concept of static and dynamic pile load test</li> </ul>	<ul style="list-style-type: none"> <li>· Able to recall the basic concept of pile load test</li> </ul>	<ul style="list-style-type: none"> <li>· Unable to recall the basic concept of pile load test</li> </ul>

<b>Apply knowledge to determine lateral earth pressures</b>	20%	· Able to apply appropriate knowledge in determining lateral earth pressures in a systematic, clear and precise manner.	· Able to apply appropriate knowledge in determining lateral earth pressures in a systematic manner.	· Able to apply basic knowledge in determining lateral earth pressures	· Unable to apply basic knowledge in determining lateral earth pressures
<b>Apply knowledge to determine stability of retaining wall systems</b>	20%	· Able to apply appropriate knowledge in determining stability of retaining wall systems in a systematic, clear and precise manner.	· Able to apply appropriate knowledge in determining stability of retaining wall systems in a systematic manner.	· Able to apply basic knowledge in determining stability of retaining wall systems	· Unable to apply basic knowledge in determining stability of retaining wall systems
<b>Apply knowledge to determine soil properties from ground investigations</b>	10%	· Able to apply appropriate knowledge in determining soil properties from ground investigations understanding in a systematic, clear and precise manner.	· Able to apply appropriate knowledge in determining soil properties from ground investigations in a systematic manner.	· Able to apply basic knowledge in determining soil properties from ground investigations	· Unable to apply basic knowledge in determining soil properties from ground investigations

Appendix 2: Assessment Criteria for CA1(20%)

Criteria	Standards		
	Fail standard (< 4 marks)	Pass standard (5-6 marks)	High standard (7-10 marks)
MCQs (LO 2 & 3)	Getting 1 or 2 MCQs correct	Getting 2-3 MCQs correct	Getting 3-5 MCQs correct
Short Calculations (LO 2 & 3)	Unable to show correct formula for question	Able to show use of correct formula for question but unable to obtain correct solution	Able to show use of correct formula and present correct solution for question

Appendix 3: Assessment Criteria for CA2(20%)

Criteria	Standards		
	Fail standard (< 4 marks)	Pass standard (5-6 marks)	High standard (7-10 marks)
MCQs	Getting 1 or 2 MCQs correct	Getting 2-3 MCQs correct	Getting 3-5 MCQs correct

(LO 2, 3 & 4)			
Short Calculations (LO 2, 3 & 4)	Unable to show correct formula for question	Able to show use of correct formula for question but unable to obtain correct solution	Able to show use of correct formula and present correct solution for question