COURSE CONTENT

Academic Year	2021-2022	**Semester**	1
Course Coordinator	Asst P FEI Xunchang		
Course Code	EN2004		
Course Title	Geo-Environment and Soil Mechanics		
Pre-requisites	NIL		
No of AUs	3		
Contact Hours	2 hours of lectures per week; 1 hour of tutorial per week		
Proposal Date	March 2021		

Course Aims

This course aims to provide you with a basic knowledge of 1) the essential concepts of the physical and chemical properties of soils; 2) soil as an important component in the environment; and 3) the fundamental principles of soil mechanics. It is designed for environmental engineering students to understand the fundamental concepts in geoenvironmental and geotechnical engineering and their applications in environmental engineering works.

Course Learning Outcomes (Course LO)

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

1. Identify and explain basic concepts in soil which are pertinent to environmental science and engineering.
2. Explain the factors affecting underground environmental quality.
3. Identify and describe conditions and processes related to ground contamination.
4. Identify and describe the physical and mechanical soil properties that control soil behavior.
5. State the effective stress principle and describe how pore water pressure and seepage affect soil response.
6. Apply basic modelling and analysis techniques used in soil engineering.

Course Content

S/N	Topic	Lecture Hrs	Tutorial Hrs
1	Soil classification, indices, and properties	3	2
2	Phase relationships and soil compaction	2	1
3	Flow of water in soils, flow nets, and effective stress concept	4	2
4	Soil compressibility and consolidation	4	2
5	Soil and the environment	3	1
6	Vadose zone and unsaturated soil	2	1
7	Site investigation and soil characterization	4	2
8	Ground contamination and remediation	4	2
	Total:	26	13

Assessment (includes both continuous and summative assessment)

Component	Course LO Tested	Related Programme SLO or Graduate Attributes	Weighting	Team/ Individual	Assessment rubrics
Final Examination	1, 2, 3, 4, 5, 6	ENE SLOs (a), (b)	60%	Individual	
Continuous Assessment 1 (CA1): Quiz 1	1, 2, 3	ENE SLOs (a), (b)	20%	Individual	
3. CA2: Quiz 2	3, 4, 5	ENE SLOs (a), (b)	20%	Individual	
Total			100%		

* ENE SLOs = Student Learning Outcomes for Environmental Engineering Programme (per BEng Environmental Engineering Accreditation)

Related Programme LO or Graduate Attributes

Engineering knowledge: Apply the knowledge of mathematics, natural science, engineering fundamentals, and an engineering specialisation to the solution of complex engineering problems;
Problem Analysis: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences;
Design/development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
Investigation: Conduct investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
The engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for the sustainable development.
Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.
Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and

write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and economic decision-making, and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

Life-long Learning: Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Formative feedback

1. Feedback will be through the dissemination of the student's performance in quizzes as well as review of the quiz questions in class.
2. Additional channel will be through individual consultation initiated by students on their particular learning needs.

Learning and Teaching approach

Approach	How does this approach support students in achieving the learning outcomes?
Lectures	Formal lectures on topics which cover soil properties, soil mechanics, and soil environment. The lectures will focus on the key concepts on how soil characteristics affect the engineering properties and behaviour of geo-materials. The application of these concepts will be illustrated through analysis and problem solving.
Tutorials	Reinforces concepts of lectures with example problems. To promote peer discussion and group interaction in problem solving.

Reading and References

1. Lecture slides and additional reading materials where needed.
2. Recommended text and reference materials.

Course Policies and Student Responsibilities

The standing university policy governing student responsibilities shall apply.
No special policy for this course.

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 AY2021/22

Instructor	Office Location	Phone	Email
Asst P Fei Xunchang	N1-01c-70	67905249	xcfei@ntu.edu.sg
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Planned Weekly Schedule

Two hours of lecture and one hour of tutorial.
The actual schedule will need to be adjusted to accommodate public holidays and official time off approved by University such as Union Day.

Week	Topic	Course LO	Readings/Activities
1	Soil classification, indices, and properties.	3, 4, 5	Tutorials and Lectures
2	Soil composition. Phase relationships and soil compaction	3, 4	Tutorials and Lectures
3	Seepage. Permeability tests.	4, 5	Tutorials and Lectures
4	Flow nets and effective stress principle.	5, 6	Tutorials and Lectures
5	Compressibility. Consolidation process. Oedometer test.	4, 5	Tutorials and Lectures
6	Settlement calculation.	4, 6	Tutorials and Lectures
7	Terzaghi's consolidation theory. Time-rate consolidation.	4, 5, 6	Tutorials and Lectures
8	Soil and the environment	1, 2, 3	Tutorials and Lectures
9	Vadose zone and unsaturated soil.	3, 4, 5	Tutorials and Lectures
10	Soil and groundwater sampling. Sample characterization.	3, 4, 5	Tutorials and Lectures
11	Site investigation. Geotechnical and geophysical methods.	3, 4, 5	Tutorials and Lectures
12	Sources, detection, and processes of ground contamination.	3, 4	Tutorials and Lectures
13	Prevention and remediation of ground contamination.	3, 4	Tutorials and Lectures