NANYANG TECHNOLOGICAL UNIVERSITY

Teaching, Learning and Pedagogy Division

Reg. No. 200604393R

COURSE OUTLINE

Academic Year	AY 2018/19	**Semester**	2
Course Coordinator	Dr Cise Unluer (CEE)		
Course Code	CV0001		
Course Title	Civil Engineering and Sustainable Built Environment		
Pre-requisites	Nil		
No of AUs	3		
Contact Hours	Lecture: 39 hrs; Tutorial: 0 hr; Lab: 0 hr		
Proposal Date	8 August 2018		

Course Aims

This course aims to equip you with up-to-date knowledge on the current and emerging environmental issues concerning civil engineers. During this course, you will attain an understanding of the environmental challenges facing the construction industry, and discuss building, urban planning, geotechnical, and water resources concepts from a sustainability perspective. You will also learn how to identify crucial environmental problems and develop potential suggestions to alleviate their adverse effects on the environment, which will be useful for future engineering courses and careers.

Intended Learning Outcomes (ILO)

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

1. Explain different sustainability concepts concerning civil engineers
2. Identify key environmental issues in the areas of building, urban planning, geotechnical, and water resources
3. Evaluate the impact of human actions by using various sustainability tools
4. Assess the viability of potential solutions proposed for a broad range of global environmental issues
5. Develop technical solutions to reduce the impacts of different environmental problems

Course Content

S/N	Topic	Lecture Hrs
1.	Civil engineering, built environment and sustainability	9
2.	Urban planning and sustainable development	9
3.	Geotechnical engineering and sustainability	5
4.	Environmental and water resources and sustainability	6
5.	Engineers in society	1
6.	Integrated civil and environmental engineering	9

	projects	

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, 5	CEE SLOs (a), (c), (e), (g), (h) EAB SLOs: (a), (b), (g)	50%	Individual	See Appendix 1
2. Continuous Assessment 1 (CA1): Team project	2, 3, 4, 5	CEE SLOs (a), (b), (c), (d), (e), (f), (g), (h), (i,) (j) EAB SLOs: (a), (b), (c), (d), (g), (i), (j)	30%	Team	See Appendix 2
3. CA2: Participation	1, 2, 3. 4, 5	CEE SLOs (a), (b), (c), (d), (e), (f), (g), (h), (i,) (j) EAB SLOs: (a), (b), (c), (d), (g), (i), (j)	20%	Team and individual	See Appendix 3
Total			100%		

Note:
Proposed new Civil Engineering Programme SLOs (2017):

Knowledge
(a) Competence in mathematics, science, information technology and modern engineering tools for the solution of civil engineering and sustainable infrastructure development problems;

Skills
(b) Ability to design and conduct experiments, analyse and interpret data, and synthesise valid conclusions for problems related to civil engineering and sustainable infrastructure development;
(c) Ability to design a system, component, or process, and synthesise solutions for complex problems in civil engineering and sustainable infrastructure development to achieve desired needs and understand the solutions' limitations;
(d) Ability to identify, formulate, research through relevant literature review, and solve civil engineering and sustainable infrastructure development problems reaching substantiated conclusions;
(e) Ability to use state-of-the-art techniques, skills, and modern engineering tools necessary for civil engineering and sustainable infrastructure development practices with appropriate considerations for public health and safety, cultural, societal, and environmental constraints;
(f) Ability to communicate effectively;

Professional awareness and insight
(g) Ability to acquire knowledge for continual professional development in civil engineering through lifelong learning or pursue graduate study and recognize its importance;
(h) Awareness of the impact of civil engineering solutions in a societal context and to be able to respond effectively to the needs for sustainable development;
(i) Ability to function effectively within multi-disciplinary teams and understand the fundamental precepts of effective civil engineering and sustainable infrastructure project management;
(j) Ability to recognize the importance of ethics, and the need to uphold high moral standards in relation to professional conduct and apply appropriate ethical principles in practices

EAB's generic graduate attributes (SLOs)

(a) **Engineering knowledge**: Apply the knowledge of mathematics, natural science, engineering fundamentals, and an engineering specialisation to the solution of complex engineering problems.
(b) **Problem Analysis**: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
(c) **Design/development of Solution**s: 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.
(d) **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.
(e) **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.
(f) **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.
(g) **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.
(h) **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
(i) **Individual and Team Work**: Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.
(j) **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.
(k) **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.
(l) **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

You will be receiving feedback on your progress via the in-class activities, during which we will solve sample problems together. You will also get the chance to hear others' opinions on different environmental issues throughout the in-class discussions.

Learning and Teaching approach

Approach	**How does this approach support students in achieving the learning outcomes?**
Lectures	Weekly lectures to provide you with the necessary knowledge to achieve the intended learning outcomes. (ILO 1-5)

Team project	Team project to enable you to collaborate in the development of sustainable solutions to pressing environmental issues. (ILO 2-5)
Participation	Several activities arranged in class and online for you to understand the key issues, hear other students' opinions and provide a review of the material covered in class. (ILO 1-5)

Reading and References

1. Christensen, N. The Environment and You. Pearson, 2012
2. Allenby, B.R. The Theory and Practice of Sustainable Engineering. Pearson, 2012
3. Graedel, T.E. and Allenby, B.R. Industrial Ecology and Sustainable Engineering. Pearson, 2010
4. Mihelcic, J.R. and Zimmerman, J.B. Environmental Engineering: Fundamentals, Sustainability, Design. Wiley, 2009

Course Policies and Student Responsibilities

1. Final Exam (50%): The final is a closed book exam; all materials are covered from week 1 to 13.

2. Team Project (30%): The team project will relate to the subject. Each team will submit one final report at the end of the project. Each team shall give a presentation on the group's work at the end of term. The grading of the team project is based on the final report (10%), presentation (10%), and peer review (10%).

3. Participation (20%): There will be several activities organized in and out of class to encourage student participation. One is video creation, during which students are asked to come up with a specific product/consumption related issue and highlight their own perspectives by reflecting on the environmental aspects of this product. Students are expected to suggest potential solutions to reduce the overall impact on the environment. The work shall be presented as a short video clip of 4-5 minutes prepared by the students. Another participation opportunity involves in-class discussion, followed by a short write-up submitted at the end of the activity. Furthermore, you can participate in small activities arranged in class during the first 3 weeks. There will be several opportunities for class participation, based on material presented in class, assigned readings and related media material.

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	Phone	Email
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Planned Weekly Schedule

Week	Topic	Course LO	Readings/ Activities
1	Civil engineering, built environment and sustainability	1, 2	Lectures and in-class activities
2	Civil engineering, built environment and sustainability	1, 2, 3	Lectures and in-class activities
3	Civil engineering, built environment and sustainability	1, 2, 3, 4, 5	Lectures and in-class activities
4	Urban planning and sustainable development	1, 2	Lectures and in-class activities
5	Urban planning and sustainable development	1, 2, 3	Lectures and in-class activities
6	Geotechnical engineering and sustainability	1, 2	Lectures and in-class activities
7	Geotechnical engineering and sustainability; Engineers in society	1, 2, 3, 4, 5	Lectures and in-class activities
8	Urban planning and sustainable development	1, 2, 3, 4, 5	Lectures and in-class activities
9	Environmental and water resources and sustainability	1, 2	Lectures and in-class activities
10	Environmental and water resources and sustainability	1, 2, 3, 4, 5	Lectures and in-class activities
11	Integrated civil and environmental engineering projects	2, 3, 4, 5	Lectures and in-class activities
12	Integrated civil and environmental engineering projects	2, 3, 4, 5	Lectures and in-class activities
13	Integrated civil and environmental engineering projects	2, 3, 4, 5	Lectures and in-class activities

Appendix 1: Assessment Rubrics for Final Examination

	Performance Level/Criteria			
Performance Indicators/Course LO Tested	**Outstanding: 4**	**Good: 3**	**Average/meet expectations: 2**	**Below expectations: 1**
Explain sustainability concepts and identify key environmental issues (ILO 1 and 2)	Excellent ability in understanding and identifying key environmental issues	Good ability in understanding and identifying key environmental issues	Ability in understanding and identifying key environmental issues	Unable to understand and identify key environmental issues
Evaluate the impact of human actions and assess the viability of potential solutions (ILO 3 and 4)	Excellent ability in using various sustainability tools to evaluate human impact and identify solution viability	Good ability in using various sustainability tools to evaluate human impact and identify solution viability	Ability in using various sustainability tools to evaluate human impact and identify solution viability	Unable to use various sustainability tools to evaluate human impact and identify solution viability
Develop technical sustainability solutions (ILO 5)	Excellent ability in proposing technical ideas and proving their effectiveness in improving sustainability	Good ability in proposing technical ideas and proving their effectiveness in improving sustainability	Ability in proposing technical ideas and proving their effectiveness in improving sustainability	Unable to propose technical ideas and prove their effectiveness in improving sustainability

Appendix 2: Assessment Rubrics for CA1 – Team Project

	Performance Level/Criteria			
Performance Indicators/Course LO Tested	**Outstanding: 4**	**Good: 3**	**Average/meet expectations: 2**	**Below expectations: 1**
Identify key environmental issues (ILO 2)	Excellent ability in identifying key environmental issues	Good ability in identifying key environmental issues	Ability in identifying key environmental issues	Unable to identify key environmental issues
Evaluate the impact of human actions and assess the viability of potential solutions (ILO 3 and 4)	Excellent ability in using various sustainability tools to evaluate human impact and identify solution viability	Good ability in using various sustainability tools to evaluate human impact and identify solution viability	Ability in using various sustainability tools to evaluate human impact and identify solution viability	Unable to use various sustainability tools to evaluate human impact and identify solution viability
Develop technical sustainability	Excellent ability in proposing technical ideas and proving	Good ability in proposing technical ideas	Ability in proposing technical ideas	Unable to propose technical

solutions (ILO 5)	their effectiveness in improving sustainability	and proving their effectiveness in improving sustainability	and proving their effectiveness in improving sustainability	ideas and prove their effectiveness in improving sustainability

Appendix 3: Assessment Rubrics for CA2 – Participation

	Performance Level/Criteria			
Performance Indicators/Course LO Tested	**Outstanding: 4**	**Good: 3**	**Average/meet expectations: 2**	**Below expectations: 1**
Explain sustainability concepts and identify key environmental issues (ILO 1 and 2)	Excellent ability in understanding and identifying key environmental issues	Good ability in understanding and identifying key environmental issues	Ability in understanding and identifying key environmental issues	Unable to understand and identify key environmental issues
Evaluate the impact of human actions and assess the viability of potential solutions (ILO 3 and 4)	Excellent ability in using various sustainability tools to evaluate human impact and identify solution viability	Good ability in using various sustainability tools to evaluate human impact and identify solution viability	Ability in using various sustainability tools to evaluate human impact and identify solution viability	Unable to use various sustainability tools to evaluate human impact and identify solution viability
Develop technical sustainability solutions (ILO 5)	Excellent ability in proposing technical ideas and proving their effectiveness in improving sustainability	Good ability in proposing technical ideas and proving their effectiveness in improving sustainability	Ability in proposing technical ideas and proving their effectiveness in improving sustainability	Unable to propose technical ideas and prove their effectiveness in improving sustainability