EM5109 ENVIRONMENTAL ISSUES AND SUSTAINABILITY

Academic Year	2023-24	Semester	2
Course Coordinator	Associate Prof Zhou Yan		
Course Type	Broadening and Deepening Elective		
Pre-requisites	Nil		
AU	3		
Grading	Letter Grading		
Contact Hours	39 (39 hours Lecture)		
Proposal Date	28 Jun 23		

Course Aims

The aim of this course is to provide you with an opportunity to understand current environmental issues and practices, to appreciate the importance of developing sustainable environmental practices, and eventually build your own overall picture of environmental engineering and science with a better understanding of the contemporary environmental issues and gain an in-depth insight in making a sustainable world.

Intended Learning Outcomes (ILO)

By the end of this course, student will be able to:

1. Identify, describe and explain major environmental issues and challenges.

2. Identify and discuss current environmental problems and practices of pollution abatement for water, land and air.

3. Discuss basic concepts in energy source, consumption and efficiency as well as pros and cons of various sustainable energy options.

4. Describe emerging contaminants, impact, and adaptation/mitigation solutions

5. List main sources of marine pollution (e.g., plastic debris, ballast water etc.) and describe their impacts on the marine environment.

6. Describe basic concepts and principles in environmental engineering system design and life cycle analysis.

7. Interpret correctly sustainability concepts and give examples of sustainability practices.

8. Provide integrated case studies as examples.

Course Content

No	Topic	Lecture (Hour)
1.	Overview of environmental issues	3
2.	Current environmental problems and practices of pollution abatement, including : • Water quality and supply • Wastewater treatment and reuse • Land contamination and remediation • Resource conservation and recovery • Air quality and control • Energy consumption and efficiency • Emerging contaminants, impact, and adaptation/mitigation solutions • Marine pollution – sources and control	24
3.	Green engineering (e.g. systems thinking) and tool (e.g. LCA)	3
4.	Sustainable concepts, technologies, and practices	6
5.	Group project and presentation	3
	Total	**39**

Assessment (Includes both continuous and summative assessment)

Component	ILO Tested	EAB Graduate Attributes	Weightage	Team / Individual	Rubrics
1. CA1: Quiz 1	1,2,4	a, b, c, d, g	10%	Individual	N.A.
2. CA2: Quiz 2	2,3	a, b, c, d, g	10%	Individual	N.A.
3. CA3: Quiz 3	5,6	a, b, c, d, g	10%	Individual	N.A.
4. CA4: Group Project	7,8	a, b, c, d, g, i, j, l	20%	Team	Appendix 1
5. Final Examination	1, 2, 3, 4, 5, 6, 7	a, b, c, d, g	50%	Individual	N.A.
Total			**100%**		

EAB Graduate Attributes[1]	
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

[1] *Reference: EAB Accreditation Manual*

	sciences, and engineering sciences.
c)	**Design / Development of Solutions** Design solutions for complex engineering problems and design systems, 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 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

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 and group-based consultation initiated by you on your learning needs.

Learning & Teaching Approach

Approach	How does this approach support students in achieving the learning outcomes?
Lectures	Class meets once a week in lecture (3 hours) format, with in-class discussions.
Group presentation	This helps you to achieve one or more of the outcomes as you need to do self-study and research. (You are organized into 4-5 students per group)

Readings & References

Beyond uploaded lecture slides, textbooks and reference materials as recommended/provided/uploaded by lecturers

Course Policy & Student Responsibility

(1) General

Students are expected to attend all classes punctually and take all scheduled assignments. Students are expected to take responsibility to follow up with course notes, assignments, and course-related announcements. For student group projects, students are grouped into 4-5 students per group with each group doing a different topic. Group project reports are due typically 1 days before the last class during which each group make an oral presentation of 10 min duration. The project reports are required to be run through NTU's iThenticate originality checking software and corrected if needed, before submission. Both the written report and oral presentation are graded.

(2) Absenteeism

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 in-class activities.

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 recognise 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 about the definitions of

any of these terms, you should refer to the Academic Integrity at NTU (sharepoint.com) 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	Phone	Email
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Asst/P Fei Xunchang	N1-01c-70	67905249	xcfei@ntu.edu.sg

Planned Weekly Schedule

Week	Topic	Course ILO	Readings /Activities
1	Overview of environmental issues	1	Lectures
2-9	Current environmental problems and practices of pollution abatement, including : • Water quality and supply • Wastewater treatment and reuse • Land contamination and remediation • Resource conservation and recovery • Air quality and control • Energy consumption and efficiency • Emerging contaminants, impact, and adaptation/mitigation solutions • Marine pollution – sources and control	2, 3, 4, 5	Lectures
10	Green engineering (e.g. systems thinking) and tool (e.g. LCA)	6	Lectures
11-12	Sustainable concepts, technologies and practices	7	Lectures
13	Group project and presentation	8	Lectures

Appendix 1: Assessment Criteria for Group Project and Presentation

Criteria	Good (16-20)	Ave (11-15)	Fair (6-10)	Poor (0-5)	Remarks
Report – Introduction on Background (15%)					Brief background; well defined problem; clear objectives
Report – Approaches or Mitigation Measures (20%)					A balanced summary of approaches or measures to tackle the problem
Report - Conclusions and References (15%)					Clear and concise; proper and well-formatted in-text citations and the list of references
Presentation – PPT Slide Content (20%)					Clear and concise; minimal language mistakes with appropriate Tables//Figures
Presentation – Teamwork (15%)					Good coordination between the team members. Good transitions and connections between slides. Well pace and finish on time
Presentation - Individual Contribution (15%)					Able to present and answer questions clearly and correctly
TOTAL					