Course Syllabus

offered by School of Energy and Environment
with effect from Semester B 2021/22

Part I Course Overview

Course Title:	**Energy, Environment and Sustainable Development**
Course Code:	**SEE8114**
Course Duration:	**One semester**
Credit Units:	**3**
Level:	**R8**
Medium of Instruction:	**English**
Medium of Assessment:	**English**
Prerequisites:	**None**
Precursors:	**None**
Equivalent Courses:	**SEE5114 Energy, Environment and Sustainable Development**
Exclusive Courses:	**Nil**

Part II Course Details

1. Abstract

This course aims to develop better understanding of energy and environmental issues with sustainable development. It focuses on raising the awareness of the world's connection to environmental issues, examining the principles and tools for sustainable processes and exploring the methods for reducing the environmental impact. The students will learn about fundamental concepts of sustainability and the methods to evaluate their significance. Sustainable processes in the wider economic, social and environmental contexts will be covered.

The course is designed with an emphasis on interdisciplinary reflection, systems thinking and sharing of students' own experience. The teaching/learning will be supported by video presentations, seminars, web-based resources, site visit and group discussions.

2. Course Intended Learning Outcomes (CILOs)

No.	CILOs[#]	Weighting* (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	*A2*	*A3*
1.	Describe issues relevant to the emergence and ongoing development of sustainable processes in the wider economic, social and environmental contexts	20	√		√
2.	Evaluate the overall techno-economic of sustainable processes	20	√		√
3.	Identify the methodologies available for environmental impacts assessment of a process design	20	√	√	√
4.	Recognise the context of the drivers, challenges and indicators to measure social sustainability	20		√	√
5.	Describe the basic principles of green energy and electrochemical energy process. Explain the important issues and factors affecting the practices of sustainable transportation system.	20	√	√	√
		100%			

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to self-life problems.

A3: *Accomplishments*
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

3. Teaching and Learning Activities (TLAs)

TLA	Brief Description	CILO No.					Hours/week (if applicable)
		1	2	3	4	5	
Lecture	**Lectures** on (1) Sustainable process s; (2) Economics of a Process Design; (3) Environmental Assessment of a Process Design; (4) Circular Economy; (5) Electric Vehicle; (6) Case Studies of green energy	√	√	√	√	√	2.5 hours/week
In-class exercises	**In-class exercises** will be given to students to assess students' concepts and grasp of knowledge taught in class	√	√	√	√	√	0.5 hour/week
Reading exercises	**Reading exercises** including reference books, journal papers and related online materials will be provided to students to facilitate self-directed learning.	√	√	√	√	√	
Mid-term	**Mid-term** will be arranged to assess students' understanding and ability to apply subject-related knowledge learned in class, textbooks and required reading materials.	√	√	√	√	√	
Examination	**Examination** will be arranged to assess students' understanding and ability to apply subject-related knowledge learned in class, textbooks and required reading materials.	√	√	√	√	√	

4. Assessment Tasks/Activities (ATs)

Assessment Tasks/Activities	CILO No.					Weighting*	Remarks
	1	2	3	4	5		
Continuous Assessment: _60_%							
In-class exercises Students need to complete in-class exercises and participate actively in discussing these exercises to facilitate their understanding of knowledge taught in class.	√	√	√	√	√	10%	
Case study and oral presentation Students will work in groups, prepare and deliver oral presentation on 'Green energy conversion and storage'	√	√	√	√		20%	
Assignments One assignment on Technoeconomic Study and Life Cycle Assessment to demonstrate their understanding of concepts One assignment on Integrated Bioprocess Design to demonstrate their understanding of concepts	√	√	√	√	√	30%	
Examination: 40% (duration: 2 hours, if applicable)							
Examination Students will be assessed via the examination their understanding of concepts learned in class, textbooks, reading materials, and their ability to apply subject-related knowledge.	√	√	√	√	√	40%	
						100%	

Examination duration: 2 hrs

Percentage of coursework, examination, etc.: 60% by coursework; 40% by exam

To pass a course, a student must do ALL of the following:

1) obtain at least 30% of the total marks allocated towards coursework (combination of in-class exercises, case study, oral presentation, if applicable);
2) obtain at least 30% of the total marks allocated towards final examination (if applicable); and
3) meet the criteria listed in the section on Grading of Student Achievement.

5. Assessment Rubrics

- Applicable to students admitted in Semester A 2022/23 and thereafter

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B)	Marginal (B-, C+, C)	Failure (F)
1. Case study and oral presentation	Ability to analyse green energy system and propose methods to boost energy efficiency	High	Significant	Moderate	Low
2.In-class exercises	Ability to apply concepts and theories to sustainable design of processes in practice	High	Significant	Moderate	Low
3. Assignments	Ability to analyse and calculate practical problems in sustainable processes	High	Significant	Moderate	Low
4.Reading exercises	Ability to evaluate and make sensible comments on reading materials related to the 'Case study' topic.	High	Significant	Moderate	Low
5. Mid-term exam	Ability to analyse and calculate practical problems in energy, environment and sustainability-related issues.	High	Significant	Moderate	Low
6. Final exam	Ability to analyse and calculate practical problems in energy, environment and sustainability-related issues.	High	Significant	Moderate	Low

- Applicable to students admitted before Semester A 2022/23,

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Adequate (C+, C, C-)	Marginal (D)	Failure (F)
1. Case study and oral presentation	Ability to analyse green energy system and propose methods to boost energy efficiency	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. In-class exercises	Ability to apply concepts and theories to sustainable design of processes in practice	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Assignments	Ability to analyse and calculate practical problems in sustainable processes	High	Significant	Moderate	Basic	Not even reaching marginal levels
4. Reading exercises	Ability to evaluate and make sensible comments on reading materials related to the 'Case study' topic.	High	Significant	Moderate	Basic	Not even reaching marginal levels
5. Mid-term exam	Ability to analyse and calculate practical problems in energy, environment and sustainability-related issues.	High	Significant	Moderate	Basic	Not even reaching marginal levels
6. Final exam	Ability to analyse and calculate practical problems in energy, environment and sustainability-related issues.	High	Significant	Moderate	Basic	Not even reaching marginal levels

Part III Other Information

1. Keyword Syllabus

- Unit operation and process flow sheet
- Techno-economic evaluation
- Life cycle assessment of sustainable chemical processes
- Social economic impact
- Social sustainability
- Green Transportation

Electrochemical Energy conversion & storage

2. Reading List

2.1 Compulsory Readings

1.	Technology for Biobased Products Online course by Delft University of Technology (TU Delft) https://www.edx.org/course/technology-biobased-products-delftx-tbp01x#.VJ6LVrAQ
2.	Circular Economy: an introduction Online course by Delft University of Technology (TU Delft) https://www.edx.org/course/circular-economy-an-introduction
3.	Municipal Solid Waste Management in Developing Countries Online course by École Polytechnique Fédérale de Lausanne https://www.coursera.org/learn/solid-waste-management

2.2 Additional Readings

The following are reference books and documents useful for the students in this course. Additional reference sources on the course topics will be provided over the course. Students may also find other information and Internet resources on the course website in Canvas.

1.	Study on Sustainable Development for the 21st Century (SUSDEV21) http://www.pland.gov.hk/pland_en/p_study/comp_s/susdev/ex_summary/final_eng/ch5.htm
2.	Perry RJ and Green JH. (2007) Perry's chemical engineer's handbook, 8th edition, McGraw-Hill, New York.
3.	Sinnott, R.K., Towler, G. (2009) *Chemical Engineering Design 5th ed. Elsevier/Butterworth-Heinemamn.*
4.	Peters MS, Timmerhaus KD and West RE. (2003) Plant design and economics for chemical engineers. 5th edition, McGraw Hill, New York.
5.	Sadhkhan J, Ng, KS and Martinez, E. (2014) Biorefineries and Chemical Processes: Design, Integration and Sustainability Analysis. John Wiley & Sons Inc.
6.	Lin, C.S.K., Kaur, G., Li, C., Yang, X. (2021) Waste Valorisation : Rethinking Waste streams in a Circular Economy. John Wiley & Sons Inc., New York, United States.