SEE3104: SUSTAINABLE AND RENEWABLE ENERGY

Effective Term
Semester A 2022/23

Part I Course Overview

Course Title
Sustainable and Renewable Energy

Subject Code
SEE - School of Energy and Environment
Course Number
3104

Academic Unit
School of Energy and Environment (E2)

College/School
School of Energy and Environment (E2)

Course Duration
One Semester

Credit Units
3

Level
B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
SEE3101 Engineering Thermofluids II

Precursors
SEE3102 Power Plant Engineering;
SEE3103 Energy Efficiency for Buildings

Equivalent Courses
SEE4104 Sustainable Energy and Development

Exclusive Courses
Nil

Part II Course Details

Abstract

This course will introduce a range of renewable technologies, including biomass, wind, wave, tidal and photovoltaic, and evaluate the potential impact of embracing a major shift to the development and utilisation of renewable energy. The students will learn about fundamental concepts of sustainability, technology, and the methods to evaluate their significance. Sustainable and renewable energy in the wider technology, application, and environmental contexts will be discussed.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe issues relevant to the emergence and ongoing development of sustainable processes in the wider technological, economic, social and environmental contexts	10	x		
2	Evaluate the renewable energy sources to grid connection and utilization	15	x	x	x
3	Identify the methodologies and tools available for sustainable and renewable energy application	15	x	x	x
4	Recognise the context of the drivers, challenges and indicators to measure sustainability and renewable energy	10		x	
5	Analyse the different sources of renewable energy and innovative technologies in harnessing energy from these renewable sources	50	x	x	x

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 real-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.

Teaching and Learning Activities (TLAs)

	TLAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Lectures on (1) The Basics of Energy and Power; (2) Electrical Fundamentals; (3) Solar Energy; (4) Wind Energy; (5) Electric Vehicle; (6) Biomass Energy; (7) Water (Hydro and Ocean) Energy	1, 2, 3, 4, 5	2.5

2	In-class exercises	In-class exercises will be handed out to students to assess students' concepts and grasp of knowledge taught in class.	1, 2, 3, 4, 5	0.5
3	Readings	Reading materials including reference books, journal papers and related online articles will be provided to students to facilitate self-directed learning.	1, 2, 3, 4, 5	
4	Mid-term exam	Mid-term exam will be arranged to assess students' understanding and ability to apply subject-related knowledge learned in class, textbooks and required reading materials.	1, 2, 3, 4, 5	
5	Examination	Examination will be arranged to assess students' understanding and ability to apply subject-related knowledge learned in class, textbooks and required reading materials.	1, 2, 3, 4, 5	

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	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.	1, 2, 3, 4, 5	16	

2	Case study and oral presentation Students will work in groups, prepare and deliver oral presentation on ‘Design a 100% Renewable Energy System’ using different renewable energy sources to meet the expected need in various cases. Students are required to make assumptions on how the seasonal and daily pattern of generation and use will be. Students will present their design and to describe the pros and cons of the solution and the technical challenges.	1, 2, 3, 4, 5	20	
3	Assignments One assignment on solar energy and wind energy to demonstrate their understanding of the concepts One assignment on biomass energy and water energy to demonstrate their understanding of the concepts	1, 2, 3, 4, 5	10	
4	Field Trip Report Students will write a summary of a field trip visit to see the latest electric vehicle demonstration. Students will report their learning during the visit and describe importance of EV on the social and economic development in terms of Sustainable Energy and Environment in Hong Kong.	1, 3	4	
5	Mid-term exam Students will be assessed via the mid-term exam their understanding of concepts learned in class, textbooks, reading materials, and their ability to apply subject-related knowledge.	1, 2, 3, 4, 5	25	Duration: 2 hours, if applicable

Continuous Assessment (%)

75

Examination (%)

25

Examination Duration (Hours)

2

Additional Information for ATs

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.

Examination duration: 2 hrs
Percentage of coursework, examination, etc.: 75% by coursework; 25% 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 assignments, pop quizzes, term paper, lab reports and/ or quiz, 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 Assessment Rubrics.

Assessment Rubrics (AR)

Assessment Task

1. In-class exercises

Criterion

Ability to evaluate and analyse sustainable and renewable energy problems, and to discuss their calculations/findings to others.

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Basic

Failure (F)

Not even reaching marginal levels

Assessment Task

2. Case study and oral presentation

Criterion

Ability to design 100% renewable energy system, and to determine the potential for different renewable energy sources and the expected need.

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
3. Assignments

Criterion
Ability to analyse and calculate practical problems in sustainable and renewable energy

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
4. Field Trip Report

Criterion
Ability to report their learning after field trip

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
5. Mid-term exam

Criterion
Ability to apply renewable energy knowledge to solve problems related to energy issues.

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
6. Examination

Criterion
Ability to apply renewable energy knowledge to solve problems related to energy issues.

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Part III Other Information

Keyword Syllabus

- Economic and social sustainability
- Biomass
- Wind
- Water, wave, tidal
- Solar thermal, Photovoltaic
- Transport; Electric Vehicles
- Renewable energy to grid

Reading List

Compulsory Readings

	Title
1	D. Buchla, T. Kissell, T. Floyd, Renewable Energy Systems, Peason, 2015

Additional Readings

	Title
1	Afgan, N.H., Carvalho, M. da G., New and Renewable Energy Technologies for Sustainable Development, Balkema, 2004.
2	Freris, L.L., Infield, D. Renewable Energy in Power Systems, John Wiley & Sons, Ltd., 2008.
3	Kreith, F., Kreider, J. F., Principles of Sustainable Energy, CRC Press, 2011.
4	Crawley, G.M., The World Scientific Handbook of Energy, World Scientific, 2013
5	Boyle, B., Renewable Energy, Oxford University Press, 2012.
6	Wong, M.H., Lee, F., W. K., Fung, M.K.F., 2006. Environmental Principles and Ethics - Textbooks. World Scientific Publishing Co. Pte. Ltd.
7	Cunningham, W.P., Cunningham, M.A., 2008. Environmental Science - A Global Concern, 10th ed. McGraw-Hill International Edition.
8	Technology for Biobased Products Online course by Delft University of Technology (TU Delft) https://www.edx.org/course/technology-biobased-products-delftx-tbp01x#.VJ6LVrAQ
9	Energy Principles and Renewable Energy, Online course by University of Queensland (UQ) https://courses.edx.org/courses/course-v1:UQx+ENGY0x+3T2018/course/