

SEE3104: SUSTAINABLE AND RENEWABLE ENERGY

Effective Term

Semester B 2024/25

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	Master the methodologies and tools available for sustainable and renewable energy application	15	x	x	x
4	Understand 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.

Learning and Teaching Activities (LTAs)

LTAs		Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Students will engage in lectures with facilitated discussion to gain key concepts, such as principles related to various renewable and sustainable energy forms.	1, 2, 3, 4, 5	2.5

2	In-class exercises	Students will have in-class exercises to assess concepts and grasp of knowledge taught in class.	1, 2, 3, 4, 5	0.5
3	Readings	Student will be given reading materials including reference books, journal papers and related online articles to facilitate self-directed learning.	1, 2, 3, 4, 5	
4	Mid-term exam	Students will have a mid-term exam to assess understanding and ability to apply subject-related knowledge learned in class, textbooks and required reading materials.	1, 2, 3, 4, 5	
5	Examination	Students will have a final exam 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	5	

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	15	
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	20	
4	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	20	Duration: 2 hours, if applicable

Continuous Assessment (%)

60

Examination (%)

40

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 continuous assessment, examination, etc.: 60% by continuous assessment; 40% by exam

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

- a. obtain at least 30% of the total marks allocated towards continuous assessment (combination of assignments, pop quizzes, term paper, lab reports and/ or quiz, if applicable);
- b. obtain at least 30% of the total marks allocated towards final examination (if applicable); and
- c. 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. 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

5. 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/