SEE8114: ENERGY, ENVIRONMENT AND SUSTAINABLE DEVELOPMENT

Effective Term
Semester A 2025/26

Part I Course Overview

Course Title
Energy, Environment and Sustainable Development

Subject Code
SEE - School of Energy and Environment
Course Number
8114

Academic Unit
School of Energy and Environment (E2)

College/School
School of Energy and Environment (E2)

Course Duration
One Semester

Credit Units
3

Level
R8 - Research Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
Nil

Equivalent Courses
SEE5114 Energy, Environment and Sustainable Development

Exclusive Courses
Nil

Part II Course Details

Abstract

This course aims to develop the ability to examine and appraise the key characteristics, prospects, and challenges associated with contemporary energy choices, their environmental impacts, and comprehend them in relation to global decarbonization efforts and sustainable development goals. It focuses on raising the students' understanding of the basic principles and approaches to assess the technical, economic, environmental, and societal aspects of energy options.

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 team-based learning activities.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe issues relevant to the evolving energy landscapes in the wider economic, social and environmental contexts	20	x		x
2	Evaluate economic viability of the processes	20	x		x
3	Identify and assess environmental impacts of processes	20	x	x	x
4	Recognise the interplays between the water and energy sectors and compute water footprints of products and processes	20		x	x
5	Describe the basic principles of green energy technologies	20	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	Lectures on contemporary and emerging energy systems, energy-environment nexus environmental impact assessment energy economics and case studies	1, 2, 3, 4, 5	2.5 hours/week
2	In-class exercises	In-class exercises will be given to students to assess students' concepts and grasp of knowledge taught in class	1, 2, 3, 4, 5	

3	Reading exercises	Reading exercises including reference books, journal papers and related online materials will be provided to students to facilitate self-directed learning.	1, 2, 3, 4, 5	
4	Quizzes	Quizzes 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	Final Examination	Final 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 ("-" for nil entry)	Allow Use of GenAI?
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	-	Yes
2	Case study and oral presentation Students will work in groups, prepare and deliver oral presentation on energy-environment nexus	1, 2, 3, 4	20	-	Yes

3	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	1, 2, 3, 4, 5	20	-	Yes
4	Reading exercises Reference books, journal papers and online materials related to the 'Case study' will be provided to students via an online platform. Students are required to post sensible questions after reading the materials to demonstrate their understanding of the topics.	1, 2, 3, 4	5	-	Yes
5	Quizzes 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.	1, 2, 3, 4, 5	25	One of the quizzes is formative assessment and students are allowed to use GenAI.	No

Continuous Assessment (%)

75

Examination (%)

25

Examination Duration (Hours)

2

Minimum Continuous Assessment Passing Requirement (%)

30

Minimum Examination Passing Requirement (%)

30

Assessment Rubrics (AR)

Assessment Task

Case study and oral presentation (Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Ability to identify and analyse a problem in an energy system or a process, and propose possible solutions

Excellent

High

Good

Significant

Fair

Moderate

Marginal

Basic

Failure

Not even reaching marginal levels

Assessment Task

In-class exercises (Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

Ability to apply concepts and theories to sustainable design of processes in practice

Excellent

High

Good

Significant

Fair

Moderate

Marginal

Basic

Failure

Not even reaching marginal levels

Assessment Task

Assignments (Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion
Ability to analyse and calculate practical problems in sustainable processes

Excellent
High

Good
Significant

Fair
Moderate

Marginal
Basic

Failure
Not even reaching marginal levels

Assessment Task
Reading exercises (Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion
Ability to evaluate and make sensible comments on reading materials related to the ‘Case study’ topic.

Excellent
High

Good
Significant

Fair
Moderate

Marginal
Basic

Failure
Not even reaching marginal levels

Assessment Task
Quizzes (Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion
Ability to analyse and calculate practical problems in energy, environment and sustainability-related issues.

Excellent
High

Good
Significant

Fair
Moderate

Marginal
Basic

Failure
Not even reaching marginal levels

Assessment Task
Case study and oral presentation (Applicable to students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion
Ability to identify and analyse a problem in an energy system or a process, and propose possible solutions

Excellent
High

Good
Significant

Marginal
Moderate

Failure
Low

Assessment Task
In-class exercises (Applicable to students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion
Ability to apply concepts and theories to sustainable design of processes in practice

Excellent
High

Good
Significant

Marginal
Moderate

Failure
Low

Assessment Task
Assignments (Applicable to students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion
Ability to analyse and calculate practical problems in sustainable processes

Excellent
High

Good
Significant

Marginal
Moderate

Failure
Low

Assessment Task
Reading exercises (Applicable to students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion
Ability to evaluate and make sensible comments on reading materials related to the ‘Case study’ topic.

Excellent
High

Good
Significant

Marginal
Moderate

Failure
Low

Assessment Task
Quizzes (Applicable to students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion
Ability to analyse and calculate practical problems in energy, environment and sustainability-related issues.

Excellent
High

Good
Significant

Marginal
Moderate

Failure
Low

Part III Other Information

Keyword Syllabus

-Global energy outlook
-Physics of energy conversion
-Sustainable energy systems
-Water-energy nexus
-Water footprint accounting
-Life cycle assessment
-Energy economics

Reading List

Compulsory Readings

	Title
1	Richard Wolfson. Energy, environment, and climate. WW Norton & Company, 2017
2	Jefferson Tester et al. Sustainable energy: choosing among options. MIT press, 2012.
3	Charles F Kutscher, Jana B. Milford and Frank Kreith. Principles of sustainable energy systems. CRC Press, 2018.

Additional Readings

	Title
1	Ibrahim Dincer, Marc A Rosen Exergy: Energy, Environment and Sustainable Development, Elsevier 2020 (3rd Edition)
2	John Michael Armstrong, The Future of Energy: The 2021 guide to the energy transition
3	David JC MacKay, Sustainable Energy –without the hot air, 2008.
4	Annual energy reports published by McKinsey, BP, Shell, and IEA
5	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.