SEE5114: ENERGY, ENVIRONMENT AND SUSTAINABLE DEVELOPMENT

Effective Term
Semester B 2024/25

Part I Course Overview

Course Title
Energy, Environment and Sustainable Development

Subject Code
SEE - School of Energy and Environment
Course Number
5114

Academic Unit
School of Energy and Environment (E2)

College/School
School of Energy and Environment (E2)

Course Duration
One Semester

Credit Units
3

Level
P5, P6 - Postgraduate Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
Nil

Equivalent Courses
SEE8114 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 (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 energy-environment nexus	1, 2, 3, 4	20	

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	
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	
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	

Continuous Assessment (%)

75

Examination (%)

25

Examination Duration (Hours)

2

Additional Information for ATs

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 Assessment Rubrics.

Assessment Rubrics (AR)

Assessment Task

Case study and oral presentation (for 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
(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
In-class exercises (for 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
(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
Assignments (for 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
(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
Reading exercises (for 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
(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
Quizzes (for 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
(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
Final examination (for 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
(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
Case study and oral presentation (for 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
(A+, A, A-) High

Good
(B+, B) Significant

Marginal
(B-, C+, C) Moderate

Failure
(F) Low

Assessment Task
In-class exercises (for 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
(A+, A, A-) High

Good
(B+, B) Significant

Marginal

(B-, C+, C) Moderate

Failure
(F) Low

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

Criterion
Ability to analyse and calculate practical problems in sustainable processes

Excellent
(A+, A, A-) High

Good
(B+, B) Significant

Marginal
(B-, C+, C) Moderate

Failure
(F) Low

Assessment Task
Reading exercises (for 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
(A+, A, A-) High

Good
(B+, B) Significant

Marginal
(B-, C+, C) Moderate

Failure
(F) Low

Assessment Task
Quizzes (for 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
(A+, A, A-) High

Good
(B+, B) Significant

Marginal
(B-, C+, C) Moderate

Failure
(F) Low

Assessment Task
Final examination (for 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
(A+, A, A-) High

Good
(B+, B) Significant

Marginal
(B-, C+, C) Moderate

Failure
(F) Low

Assessment Task
Homework (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion
Ability to apply the concepts learned in class to solve real-world problems

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
Quizzes (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion
Ability to explain key concepts

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
Term paper (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion
Ability to apply lecture material to explain solutions of real-world issues and problems

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
Homework (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion
Ability to apply the concepts learned in class to solve real-world problems

Excellent
(A+, A, A-) High

Good
(B+, B) Significant

Marginal
(B-, C+, C) Basic

Failure
(F) Not even reaching marginal levels

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

Criterion
Ability to explain key concepts

Excellent
(A+, A, A-) High

Good
(B+, B) Significant

Marginal
(B-, C+, C) Basic

Failure
(F) Not even reaching marginal levels

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

Criterion
Ability to apply lecture material to explain solutions of real-world issues and problems

Excellent
(A+, A, A-) High

Good
(B+, B) Significant

Marginal
(B-, C+, C) Basic

Failure
(F) Not even reaching marginal levels

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.