

SEE6125: CARBON CAPTURE USE AND STORAGE

Effective Term

Semester A 2025/26

Part I Course Overview

Course Title

Carbon Capture Use and Storage

Subject Code

SEE - School of Energy and Environment

Course Number

6125

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

Nil

Exclusive Courses

Nil

Part II Course Details

Abstract

This course offers a comprehensive understanding of the role of Carbon Capture, Use, and Storage (CCUS) in mitigating climate change and facilitating energy transition. The curriculum provides an in-depth exploration of CCUS technologies, their integration into various energy and industrial sectors for decarbonization, and the requisite policy and regulatory frameworks for their implementation. Students will gain a thorough understanding of the technological aspects of CCUS, including its potential benefits, risks, and challenges towards large-scale deployment. The course underscores the critical importance of CCUS in achieving global climate goals, particularly in maintaining the global carbon budget to limit global warming to 1.5 and 2 °C.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if DEC-A1 DEC-A2 DEC-A3 app.)			
1	Articulate CCUS in decarbonization across various energy and industrial sectors, and its crucial role in meeting global climate goals.	20	x		
2	Delineate the key concepts, principles, advantages, and limitations of each technological aspect of CCUS.	40		x	
3	Apply the principles and concepts of CCUS technologies in devising solutions to mitigate and eradicate carbon emissions in vital sectors.	40		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	Lectures	Explain key concepts and principles of CCUS technologies	1, 2, 3
2	Tutorials	Solidify students' understanding of key concepts and principles via practice and tackling confusions or difficulties encountered in the lectures and exercises	1, 2, 3

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	Assignments Several assignments will be given throughout the semester. Through the assignments, students will demonstrate their understanding of the underlying concepts and principles of CCUS technologies.	1, 2, 3	30	-	Yes
2	Test Students will complete a mid-term test to demonstrate their ability to apply their knowledge to analyze and solve problems related to CCUS technologies.	1, 2, 3	20	-	No

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Minimum Continuous Assessment Passing Requirement (%)

30

Minimum Examination Passing Requirement (%)

30

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 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**

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

Criterion

Ability to explain concepts, analyze and solve problems related to CCUS technologies

Excellent

(A+, A, A-) Excellent understanding of concepts and ability to analyze and solve problems related to CCUS technologies

Good

(B+, B, B-) Good understanding of concepts and ability to analyze and solve problems related to CCUS technologies

Fair

(C+, C, C-) Fair understanding of concepts and ability to analyze and solve problems related to CCUS technologies

Marginal

(D) Marginally acceptable understanding of concepts and ability to analyze and solve problems related to CCUS technologies

Failure

(F) Poor understanding of concepts and ability to analyze and solve problems related to CCUS technologies

Assessment Task

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

Criterion

Ability to explain concepts, analyze and solve problems related to CCUS technologies

Excellent

(A+, A, A-) Excellent understanding of concepts and ability to analyze and solve problems related to CCUS technologies

Good

(B+, B, B-) Good understanding of concepts and ability to analyze and solve problems related to CCUS technologies

Fair

(C+, C, C-) Fair understanding of concepts and ability to analyze and solve problems related to CCUS technologies

Marginal

(D) Marginally acceptable understanding of concepts and ability to analyze and solve problems related to CCUS technologies

Failure

(F) Poor understanding of concepts and ability to analyze and solve problems related to CCUS technologies

Assessment Task

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

Criterion

Ability to explain concepts, analyze and solve problems related to CCUS technologies

Excellent

(A+, A, A-) Excellent understanding of concepts and ability to analyze and solve problems related to CCUS technologies

Good

(B+, B, B-) Good understanding of concepts and ability to analyze and solve problems related to CCUS technologies

Fair

(C+, C, C-) Fair understanding of concepts and ability to analyze and solve problems related to CCUS technologies

Marginal

(D) Marginally acceptable understanding of concepts and ability to analyze and solve problems related to CCUS technologies

Failure

(F) Poor understanding of concepts and ability to analyze and solve problems related to CCUS technologies

Assessment Task

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

Criterion

Ability to explain concepts, analyze and solve problems related to CCUS technologies

Excellent

(A+, A, A-) Excellent understanding of concepts and ability to analyze and solve problems related to CCUS technologies

Good

(B+, B) Good understanding of concepts and ability to analyze and solve problems related to CCUS technologies

Marginal

(B-, C+, C) Marginally acceptable understanding of concepts and ability to analyze and solve problems related to CCUS technologies

Failure

(F) Poor understanding of concepts and ability to analyze and solve problems related to CCUS technologies

Assessment Task

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

Criterion

Ability to explain concepts, analyze and solve problems related to CCUS technologies

Excellent

(A+, A, A-) Excellent understanding of concepts and ability to analyze and solve problems related to CCUS technologies

Good

(B+, B) Good understanding of concepts and ability to analyze and solve problems related to CCUS technologies

Marginal

(B-, C+, C) Marginally acceptable understanding of concepts and ability to analyze and solve problems related to CCUS technologies

Failure

(F) Poor understanding of concepts and ability to analyze and solve problems related to CCUS technologies

Assessment Task

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

Criterion

Ability to explain concepts, analyze and solve problems related to CCUS technologies

Excellent

(A+, A, A-) Excellent understanding of concepts and ability to analyze and solve problems related to CCUS technologies

Good

(B+, B) Good understanding of concepts and ability to analyze and solve problems related to CCUS technologies

Marginal

(B-, C+, C) Marginally acceptable understanding of concepts and ability to analyze and solve problems related to CCUS technologies

Failure

(F) Poor understanding of concepts and ability to analyze and solve problems related to CCUS technologies

Part III Other Information

Keyword Syllabus

Carbon capture, gas separation, absorption and stripping, adsorption, membrane, geological storage, carbon dioxide utilization, carbon budget, carbon neutrality, negative emissions, carbon removal, climate changes, climate goals.

Reading List**Compulsory Readings**

Title	
1	Nil

Additional Readings

Title	
1	Smit,B., Reimer, J.A., Oldenburg, C.M., Bourg, I.C. (2014) Introduction to Carbon Capture and Sequestration. Imperial College Press.
2	Intergovernmental Panel on Climate Change (IPCC), Climate Change 2022: Mitigation of Climate Change: Working Group III Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, 2022: https://www.ipcc.ch/report/ar6/wg3/ .
3	International Energy Agency (IEA), "CO2 Capture and Utilisation": https://www.iea.org/energy-system/carbon-capture-utilisation-and-storage/co2-capture-and-utilisation%23overview