CA5250: RENEWABLE ENERGY FOR A SUSTAINABLE BUILDING PERFORMANCE

Effective Term
Semester A 2025/26

Part I Course Overview

Course Title
Renewable Energy for a Sustainable Building Performance

Subject Code
CA - Civil and Architectural Engineering
Course Number
5250

Academic Unit
Architecture and Civil Engineering (CA)

College/School
College of Engineering (EG)

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

The course is structured to provide students with essential knowledge and practical insights into renewable energy applications for sustainable building performance. It delves into various renewable energy technologies including solar, wind, and geothermal energy, alongside innovative approaches to zero carbon and energy-efficient building design and operation. Through interactive lectures, assignments, and assessments, students explore and discuss various strategies, enhancing their understanding and ability to design and implement effective renewable energy solutions in buildings. This approach prepares students to tackle complex sustainability challenges, assisting them to contribute effectively to the advancement of environmental sustainability in the built environment.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Explain the fundamental principles of various renewable energy technologies, including solar, wind, geothermal energy, and renewable cooling and heating systems, within the context of sustainable building design and operation;		x	x	
2	Assess the potential impacts and effectiveness of different renewable energy systems and policies on building performance and sustainability development;		x	x	
3	Apply knowledge of renewable energy solutions to design and evaluate zero carbon and energy-efficient buildings, ensuring they meet current environmental standards.		x	x	x
4	Demonstrate the ability to critically analyse and contribute to future developments in renewable energy.		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	Student will engage in lecture activities about the topics closely related to renewable energy and its applications in buildings.	1, 2, 3, 4	

2	Tutorial	Students will participate in class discussions and activities focused on solving issues related to renewable energy system design, operation, control and multi-aspect performance analysis.	2, 3, 4	

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks ("-" for nil entry)	Allow Use of GenAI?
1	Mid-term Test	1, 2, 3	25	nil	No
2	Individual assignments	2, 3, 4	25	Two assignments	Yes

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 the course, a student must obtain minimum marks of 30% in both coursework and examination components, and an overall mark of at least 40%.

Assessment Rubrics (AR)

Assessment Task

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

Criterion

ABILITY to UNDERSTAND and APPLY theories and knowledge to topics related to renewable energy applications in buildings.

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

Criterion
ABILITY to UNDERSTAND and APPLY theories and knowledge to topics related to renewable energy applications and performance analysis in buildings.

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

Criterion
ABILITY to UNDERSTAND and APPLY theories and knowledge to topics related to renewable energy system design, control, performance analysis.

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

Criterion

ABILITY to UNDERSTAND and APPLY theories and knowledge to topics related to renewable energy applications in buildings.

Excellent

(A+, A, A-) High

Good

(B+, B) Significant

Marginal

(B-, C+, C) Basic

Failure

(F) Not even reaching marginal levels

Assessment Task

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

Criterion

ABILITY to UNDERSTAND and APPLY theories and knowledge to topics related to renewable energy applications and performance analysis in buildings.

Excellent

(A+, A, A-) High

Good

(B+, B) Significant

Marginal

(B-, C+, C) Basic

Failure

(F) Not even reaching marginal levels

Assessment Task

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

Criterion

ABILITY to UNDERSTAND and APPLY theories and knowledge to topics related to renewable energy system design, control, performance analysis.

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

Renewable Energy, Sustainable Building, Solar Energy, Wind Energy, Geothermal Energy, Zero Carbon Buildings, Energy Efficiency, Renewable Cooling, Renewable Heating, Polygeneration.

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
1	Duffie, J. A., & Beckman, W. A. (2013). Solar Engineering of Thermal Processes. Hoboken, NJ: John Wiley & Sons.
2	Twidell, J., & Weir, T. (2015). Renewable Energy Resources. New York, NY: Routledge.
3	Boyle, G. (Ed.). (2012). Renewable Energy: Power for a Sustainable Future. Oxford, UK: Oxford University Press.
4	Sorensen, B. (2017). Renewable Energy: Physics, Engineering, Environmental Impacts, Economics & Planning. London, UK: Academic Press.
5	Khan, B. H. (2016). Non-Conventional Energy Resources. New Delhi, India: Tata McGraw-Hill Education.
6	Gevorkian, P. (2018). Sustainable Energy System Engineering: The Complete Green Building Design Resource. New York, NY: McGraw-Hill Education.
7	Chiras, D. D. (2015). The Solar House: Passive Heating and Cooling. White River Junction, VT: Chelsea Green Publishing.
8	Sayigh, A. (Ed.). (2019). Comprehensive Renewable Energy. Oxford, UK: Elsevier.
9	Khatib, T. (Ed.). (2016). Wind Energy Engineering: A Handbook for Onshore and Offshore Wind Turbines. Oxford, UK: Academic Press.
10	Lund, H. (2014). Renewable Energy Systems: A Smart Energy Systems Approach to the Choice and Modeling of 100% Renewable Solutions. London, UK: Academic Press.
11	Maczulak, A. E. (2010). Renewable Energy: Sources and Methods. New York, NY: Facts on File.
12	Maczulak, A. E. (2010). Renewable Energy: Sources and Methods. New York, NY: Facts on File.