

MSE4176: ENERGY MATERIALS FOR THE CURRENT CENTURY

Effective Term

Semester A 2024/25

Part I Course Overview

Course Title

Energy Materials for the Current Century

Subject Code

MSE - Materials Science and Engineering

Course Number

4176

Academic Unit

Materials Science and Engineering (MSE)

College/School

College of Engineering (EG)

Course Duration

One Semester

Credit Units

3

Level

B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction

English

Medium of Assessment

English

Prerequisites

Nil

Precursors

Nil

Exclusive Courses

Nil

Part II Course Details

Abstract

Energy has become a large societal issue due to the current reliance on non-renewable energy resources and their negative impact on the environment. A growing interest in clean and renewable energy resources makes researchers around the globe to discover new materials. This course aims to introduce the conventional fossil fuels and their utilizations, renewable

solar/wind/water energies, as well as energy generation and storage that revolutionize the current world with various energy options.

Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if DEC-A1 app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe the conventional fossil fuels	25		x	
2	Describe the fossil fuel utilizations	25		x	
3	Describe the renewable solar/wind/water energies	25		x	
4	Describe the energy generation and storage	25		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 on energy materials	1, 2, 3, 4	11 weeks
2	Presentation	Take the role to communicate the skills	1, 2, 3, 4	2 weeks

Assessment Tasks / Activities (ATs)

ATs		CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Individual presentation	1, 2, 3, 4	40	
2	Assignments/tests	1, 2, 3, 4	20	

Continuous Assessment (%)

60

Examination (%)

40

Examination Duration (Hours)

2

Additional Information for ATs

For a student to pass the course, at least 30% of the maximum mark for the examination must be obtained

Assessment Rubrics (AR)

Assessment Task

1. Individual presentation

Criterion

Understanding and explaining fundamental problem. Ability to identify new materials to solve such problems. Ability to explain prospects to solve the problem occurred.

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Basic

Failure (F)

Not reaching marginal level

Assessment Task

2. Assignment

Criterion

Understanding the concepts of new energy materials, and their applications.

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Basic

Failure (F)

Not reaching marginal level

Assessment Task

3. Examination

Criterion

Provide new materials design with well-designed concepts.

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)

Basic

Failure (F)

Not reaching marginal level

Part III Other Information

Keyword Syllabus

Conventional fossil fuels

- Coal, oil, natural gas

Fossil fuel utilizations

- Thermodynamics, engines

Renewable energies

- Solar, wind, water energies

Energy generation and storage

- Electricity generation, batteries

Reading List

Additional Readings

	Title
1	Nature Materials, Nature Photonics, Advanced Materials, American Chemical Society Journals, American Institute of Physics Journals and Elsevier Journals