

# MNE3104: SUSTAINABLE AND RENEWABLE ENERGY

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## Effective Term

Semester A 2023/24

## Part I Course Overview

### Course Title

Sustainable and Renewable Energy

### Subject Code

MNE - Mechanical Engineering

### Course Number

3104

### Academic Unit

Mechanical Engineering (MNE)

### 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

### Equivalent Courses

Nil

### Exclusive Courses

Nil

## Part II Course Details

### Abstract

This course introduces a range of renewable technologies, including biomass, wind, wave, tidal and photovoltaic, and evaluate the potential impact of embracing a major shift to the development and utilization of renewable energy. The students will learn about the fundamental concepts of sustainability, renewable technology, and the methods to evaluate their significance. Sustainable and renewable energy in the wider technology, application, and environmental contexts will be discussed.

### Course Intended Learning Outcomes (CILOs)

CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe issues relevant to the emergence and ongoing development of sustainable processes in the wider technological, economic, social and environmental contexts.	x		
2	Evaluate the renewable energy sources to grid connection and utilization.		x	
3	Identify the methodologies and tools available for sustainable and renewable energy application.		x	x
4	Recognise the context of the drivers, challenges and indicators to measure sustainable and renewable energy.		x	
5	Analyse the different sources of renewable sources and innovative technologies in harnessing their energy.	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.

### Teaching and Learning Activities (TLAs)

TLAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Lectures on (1) The Basics of Energy and Power; (2) Electrical Fundamentals; (3) Solar Energy; (4) Wind Energy; (5) Electric Vehicle; (6) Biomass Energy; (7) Water (Hydro and Ocean) Energy	1, 2, 3, 4, 5 2.5 hrs/week

2	In-class exercises	In-class exercises will be handed out to students to assess students' concepts and grasp of knowledge taught in class	1, 2, 3, 4, 5	0.5 hr/week
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**Assessment Tasks / Activities (ATs)**

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Assignments and Quizzes	1, 2, 3, 4	30	
2	Exercise Reports	1, 2, 3, 4, 5	20	
3	Mid Term Test	1, 2, 3, 4	20	
4	Term Paper	1, 2, 3, 4, 5	30	

**Continuous Assessment (%)**

100

**Examination (%)**

0

**Assessment Rubrics (AR)****Assessment Task**

Assignments and Quizzes

**Criterion**

Ability to analyze and calculate practical problems in sustainable and renewable energy.

**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**

Exercise Reports

**Criterion**

Ability to evaluate and analyze sustainable and renewable energy problems, and to discuss their calculations/findings to others.

**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

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**Assessment Task**

Mid Term Test

**Criterion**

Ability to apply renewable energy knowledge to solve problems related to energy 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

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**Assessment Task**

Term Paper

**Criterion**

Ability to design 100% renewable energy system, and to determine the potential for different renewable energy sources and the expected need.

**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

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**Part III Other Information****Keyword Syllabus**

- Solar thermal, photovoltaics
- Wind
- Water, wave, tidal
- Biomass
- Transport, electric vehicles
- Renewable compatible energy storage

**Reading List****Compulsory Readings**

	<b>Title</b>
1	L.D. Danny Harvey, Energy and the New Reality 1 and 2, 2011, Earthscan Publishing.
2	D. Buchla, T. Kissell, T. Floyd, Renewable Energy Systems, Pearson, 2015.

**Additional Readings**

	<b>Title</b>
1	Boyle, B., Renewable Energy, Oxford University Press, 2012.
2	Energy Principles and Renewable Energy. Online course by University of Queensland (UQ) <a href="https://courses.edx.org/courses/course-v1:UQx+ENGY0x+3T2018/course/">https://courses.edx.org/courses/course-v1:UQx+ENGY0x+3T2018/course/</a>