

# SEE2001: ELECTROMAGNETIC PRINCIPLES FOR ENERGY ENGINEERS

---

## Effective Term

Semester A 2024/25

## Part I Course Overview

### Course Title

Electromagnetic Principles for Energy Engineers

### Subject Code

SEE - School of Energy and Environment

### Course Number

2001

### Academic Unit

School of Energy and Environment (E2)

### College/School

School of Energy and Environment (E2)

### 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

PHY1201 General Physics I;  
MA1200 Calculus and Basic Linear Algebra I or  
MA1300 Enhanced Calculus and Linear Algebra I; AND  
MA1201 Calculus and Basic Linear Algebra II or  
MA1301 Enhanced Calculus and Linear Algebra II

### Equivalent Courses

Nil

### Exclusive Courses

Nil

## Part II Course Details

### Abstract

This course aims to lay down the basic knowledge of electricity, magnetism, waves, optics and modern physics related to energy science. Upon successful completion of the course, students are expected to have enhanced ability in comprehending technical information, reasoning through scientific questions and analysis, and applying physics principles to solve problems related to energy issues.

### Course Intended Learning Outcomes (CILOs)

CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1 Recognize basic laws and principles of electricity and apply such concepts in problem solving.	20		x	
2 Identify underlying physical principles of magnetism.	20		x	
3 Apply the basic concepts and theories on electricity, magnetism and wave to explain and predict phenomena related to energy science.	20		x	
4 Analyse and solve problems involving electromagnetic radiation and physical optics.	20		x	
5 Describe fundamentals of quantum physics and applications of the Schrodinger Equation.	20		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	Students will engage in lectures to obtain theories and concepts.	1, 2, 3, 4, 5	2
2 Tutorials	Students will engage in lectures with facilitated discussions, apply theories and concepts on practical examples.	1, 2, 3, 4, 5	1

### Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Assignments	1, 2, 3, 4, 5	25	
2	Midterm test/Quizzes	1, 2, 3, 4	25	

**Continuous Assessment (%)**

50

**Examination (%)**

50

**Examination Duration (Hours)**

2

**Additional Information for ATs**

Examination duration: 2 hrs

Percentage of continuous assessment, examination, etc.: 50% by continuous assessment; 50% by exam

To pass a course, a student must do ALL of the following:

- 1) obtain at least 30% of the total marks allocated towards continuous assessment (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**

1. Assignments

**Criterion**

Ability to analyse and solve problems related to application of electromagnetic principles in energy engineering

**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**

2. Midterm test /Quizzes

**Criterion**

Ability to analyse and solve problems related to application of electromagnetic principles in energy engineering

**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**

3. Examination

**Criterion**

Ability to analyse and solve problems related to application of electromagnetic principles in energy engineering

**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

---

## Part III Other Information

**Keyword Syllabus**

OSCILLATIONS AND WAVES

- Oscillations
- Traveling Waves
- Superposition and Standing Waves

ELECTRICITY AND MAGNETISM

- The Electric Field
- Discrete Charge Distributions
- Continuous Charge Distributions
- Electric Potential
- Capacitance
- Electric Current and Direct-Current Circuits
- The Magnetic Field
- Sources of the Magnetic Field

- Magnetic Induction
- Alternating-Current Circuits
- Maxwell's Equations and Electromagnetic Waves

**LIGHT**

- Properties of Light
- Optical Images
- Interference and Diffraction

**MODERN PHYSICS**

- Wave-Particle Duality and Quantum Physics
- Applications of the Schrodinger Equation
- Atoms
- Molecules
- Solids

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

Title	
1	Nil

**Additional Readings**

Title	
1	Physics for Scientists and Engineers by Paul A. Tipler and Gene Mosca, 5th edition (Extended version), W. H. Freeman, 2004.
2	Physics for Scientists and Engineers with Modern Physics by Raymond A. Serway, 4th Edition, Saunders College Pub, 1996.